



Socioeconomic Impact Assessment of 2022 Air Quality Management Plan

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Socioeconomic Analysis

South Coast Air Quality Management District

Diamond Bar, California

REMI USER CONFERENCE

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What does South Coast AQMD do?

- Control air pollution to protect public health
 - South Coast AQMD: largest regional air agency in the U.S., covering 17 million residents in 4 counties
 - Jurisdiction: Orange County and the urban portions of Los Angeles, Riverside and San Bernardino counties
 - Regulate emissions of air pollutants from a multitude of sources, mostly “stationary”



Sources

Air Quality

Health

How does South Coast AQMD control air pollution?

Air Quality
Management Plans
(AQMP)



Regulations, Incentives,
and Other Innovative
Measures



Public Outreach
& Enforcement

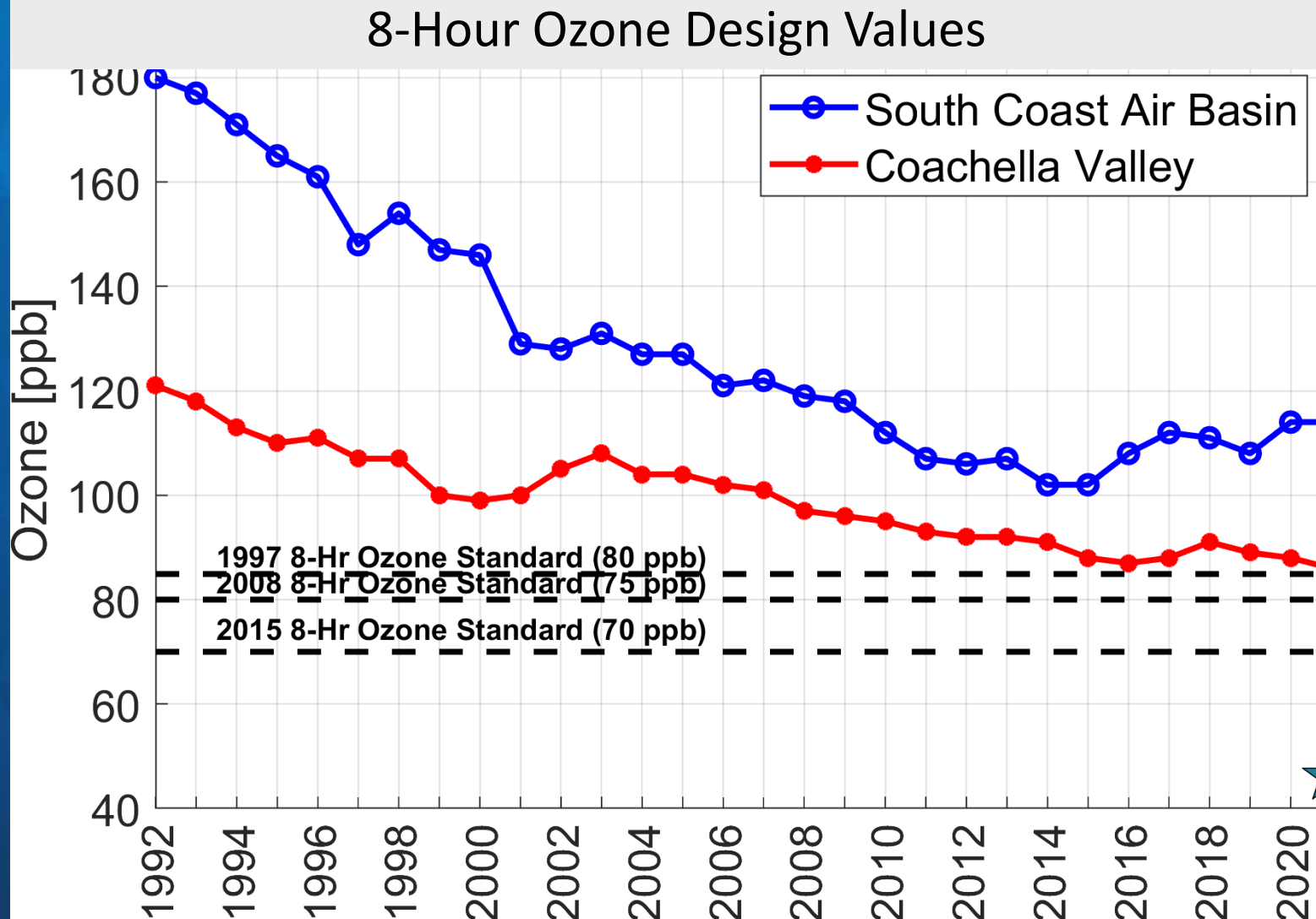


2022 Air Quality Management Plan

- Air Quality Management Plan (AQMP)
 - Region's blueprint to attain federal and state ambient air quality standards
- South Coast Air Basin is in non-attainment for multiple standards
 - Extreme non-attainment for ozone standards
 - Serious non-attainment for PM2.5 standards
 - Unique topography and economic activities contribute to the worst air quality in the nation, despite decades of continuous improvement
- 2022 AQMP focuses on the federal 2015 8-hour ozone standard with attainment year in 2037
 - Standard strengthened from 75 to 70 parts per billion (ppb)
 - Costs not considered when setting health-based standards pursuant to the federal Clean Air Act



Ozone Trends in the South Coast Air Basin

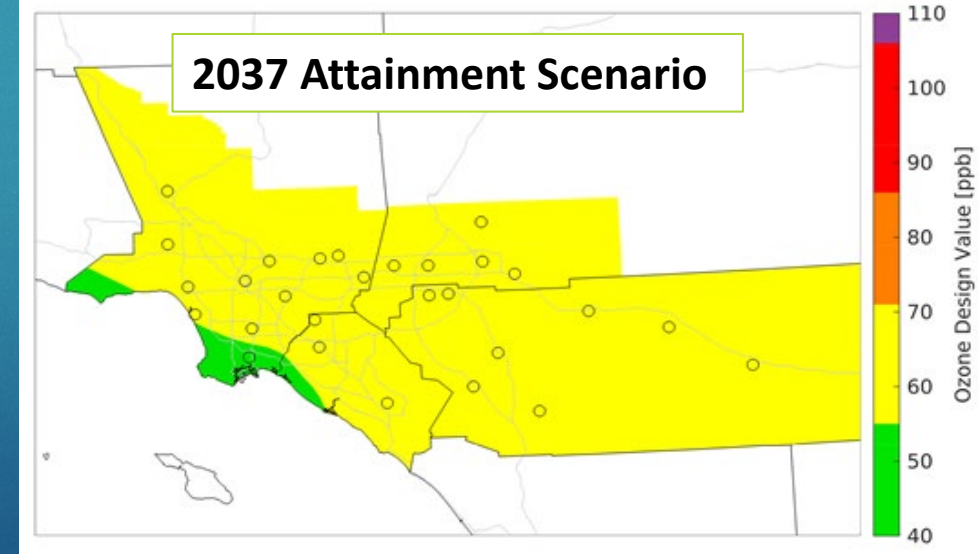
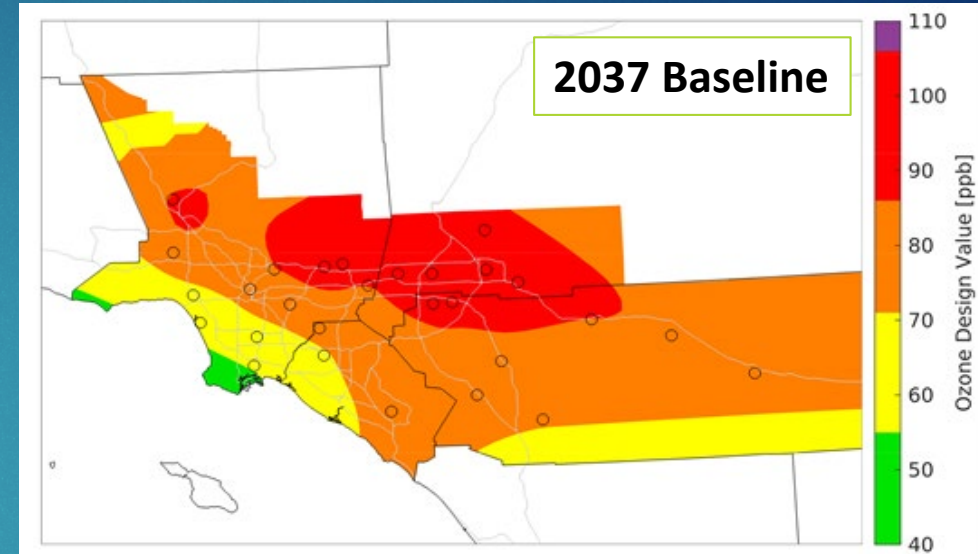
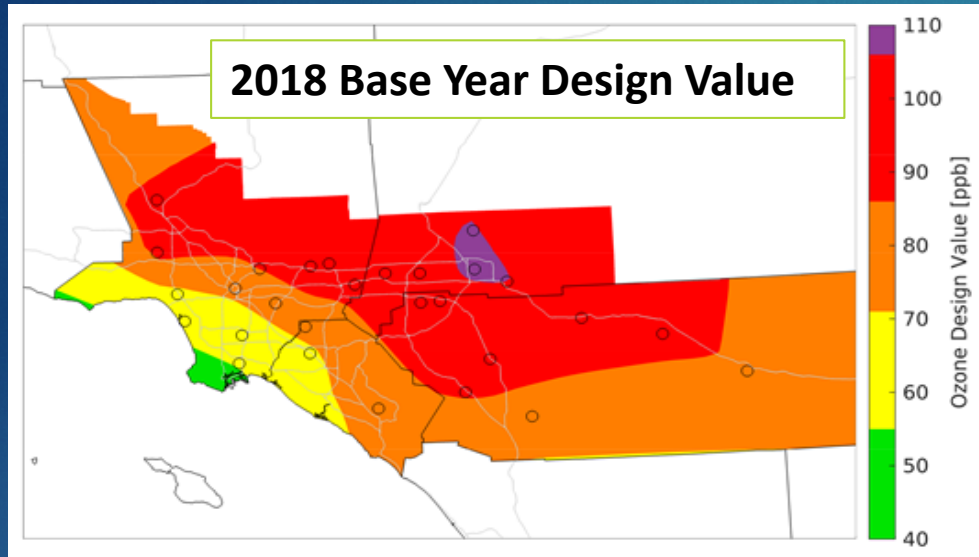


Overall air quality has dramatically improved

High ozone in recent years were due to adverse meteorology. Continued emission reductions will improve ozone

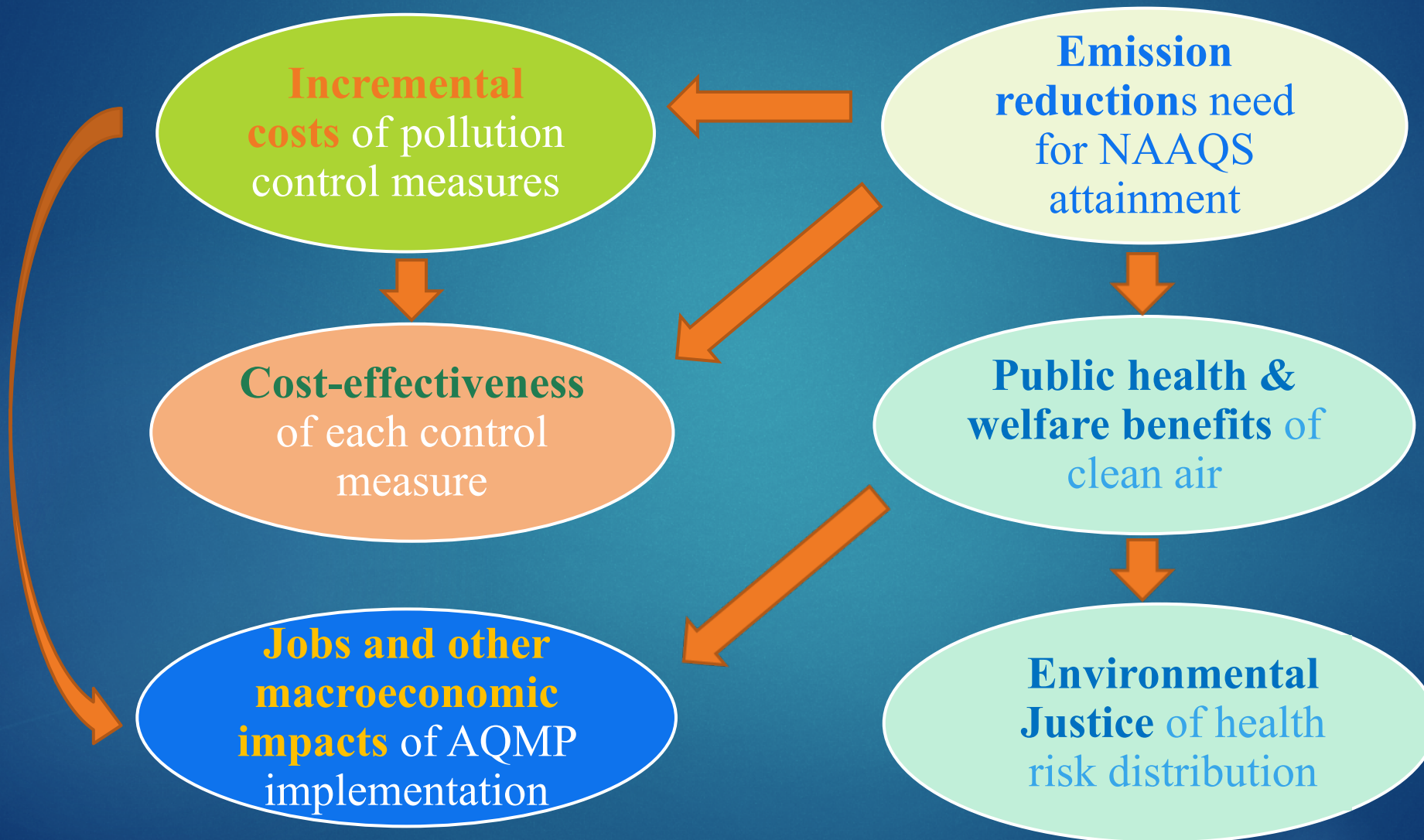
Approximate Ozone Background Level

Maximum Daily 8-hour Average Ozone



The 2022 AQMP control measures were crafted with the goal of achieving attainment with the 2015 ozone standard.

2022 AQMP Socioeconomic Analysis



Cost of 2022 AQMP Control Measures

South Coast AQMD's 2022 AQMP Control Measures	Average Annual Amortized Cost, 2023-2037 (Millions of 2021 dollars)
L-CMB-06: Electric Generating Facilities	\$267
MOB-11: Emission reductions from incentive programs	\$155
L-CMB-04: Large Internal Combustion Emergency Standby Engines	\$153
R-CMB-04: Residential Other Combustion	\$125
C-CMB-04: Small Internal Combustion Engines (Non-permitted)	\$123
C-CMB-05: Miscellaneous Small Commercial Combustion Equipment (Non-permitted)	\$110
L-CMB-02: Large Boilers and Process Heaters	\$73
C-CMB-03: Commercial Cooking	\$72
R-CMB-03: Residential Cooking	\$19
L-CMB-03: Large Internal Combustion Prime Engines	\$15
MOB-05: Accelerated retirement of older light-duty and medium-duty vehicles	\$15
L-CMB-07: Petroleum Refining	\$8
L-CMB-10: Miscellaneous Combustion	\$6
CTS-01: Further Emission Reduction from Coatings, Solvents, Adhesives, and Sealants	\$5
FUG-01: Improved Leak Detection and Repair	\$4
L-CMB-05: Large Turbines	\$2
L-CMB-08: Landfills and POTWs	\$1
L-CMB-01: NOx RECLAIM	\$1
L-CMB-09: Incineration	<\$1
Total	\$1,155*

CARB Control Measures	Average Annual Amortized Cost, 2023-2037 (Millions of 2021 dollars)
Cleaner Fuel and Vessel Requirements for Ocean-Going Vessels	\$359
Zero-Emission Standard for Space and Water Heaters	\$251
Advanced Clean Fleets Regulation	\$231
Cleaner Fuel and Visit Requirements for Aviation	\$192
Airport Aviation Emissions Cap	\$174
Cargo Handling Equipment Amendments	\$118
Zero-Emissions Trucks Measure	\$105
In-Use Locomotive Regulation	\$84
Transport Refrigeration Unit Regulation Part 2	\$64
Commercial Harbor Craft Amendments	\$39
Amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation	\$39
Off-Road Equipment Zero-Emission Standards Where Feasible	\$22
Tier 5 Off-Road Vehicles and Equipment	\$11
Off-Road Equipment Tier 5 Standard for Preempted Engines	\$8
On-Road Motorcycle New Emissions Standards	\$7
More Stringent NOx and PM Standards for Ocean-Going Vessels	\$4
Consumer Products Standards	\$4
On-Road Heavy-Duty Vehicle Low-NOx Engine Standards	\$3
Spark-Ignition Marine Engine Standards	\$1
Clean Miles Standard	-\$18
Total	\$1,695*

*Significant costs will continue after 2037. For South Coast AQMD measures, less than a quarter of all incremental costs are incurred by 2037.

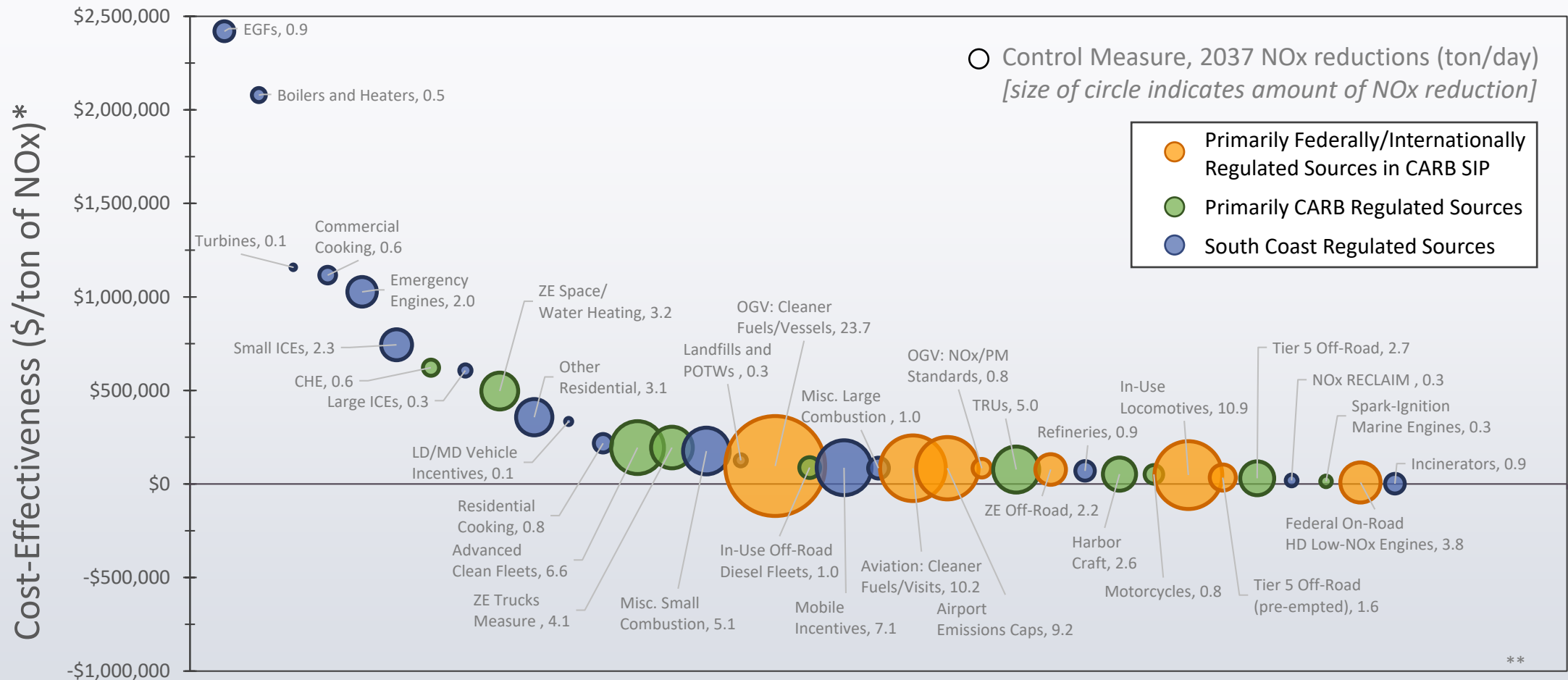
Cost-Effectiveness Analysis

- ▶ Health and Safety Code Section 40728.5 requires cost-effectiveness of AQMP control measures to be considered
 - ▶ Evaluate cost-effectiveness of each control measure to the greatest extent possible
 - ▶ Rank each control measure by cost-effectiveness
- ▶ Cost-Effectiveness is the total cost (capital and annual operating costs) to achieve a standard over the emission reductions for the life of the equipment *compared to a business-as-usual scenario*

$$\text{Cost-Effectiveness} = \frac{\text{Total Costs}^*}{\text{Tons of Emissions Reduced}}$$

* Total costs are estimated as incremental to the business-as-usual scenario

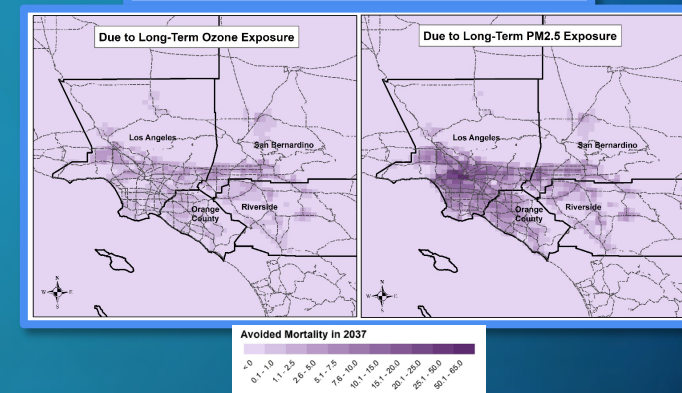
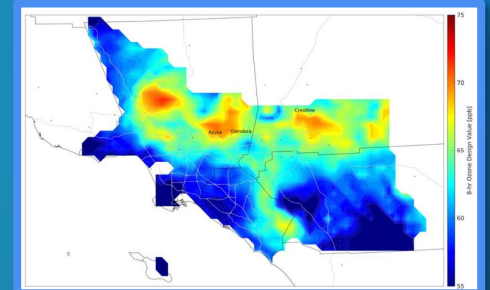
Cost-Effectiveness of Control Measures and NOx Emission Reductions



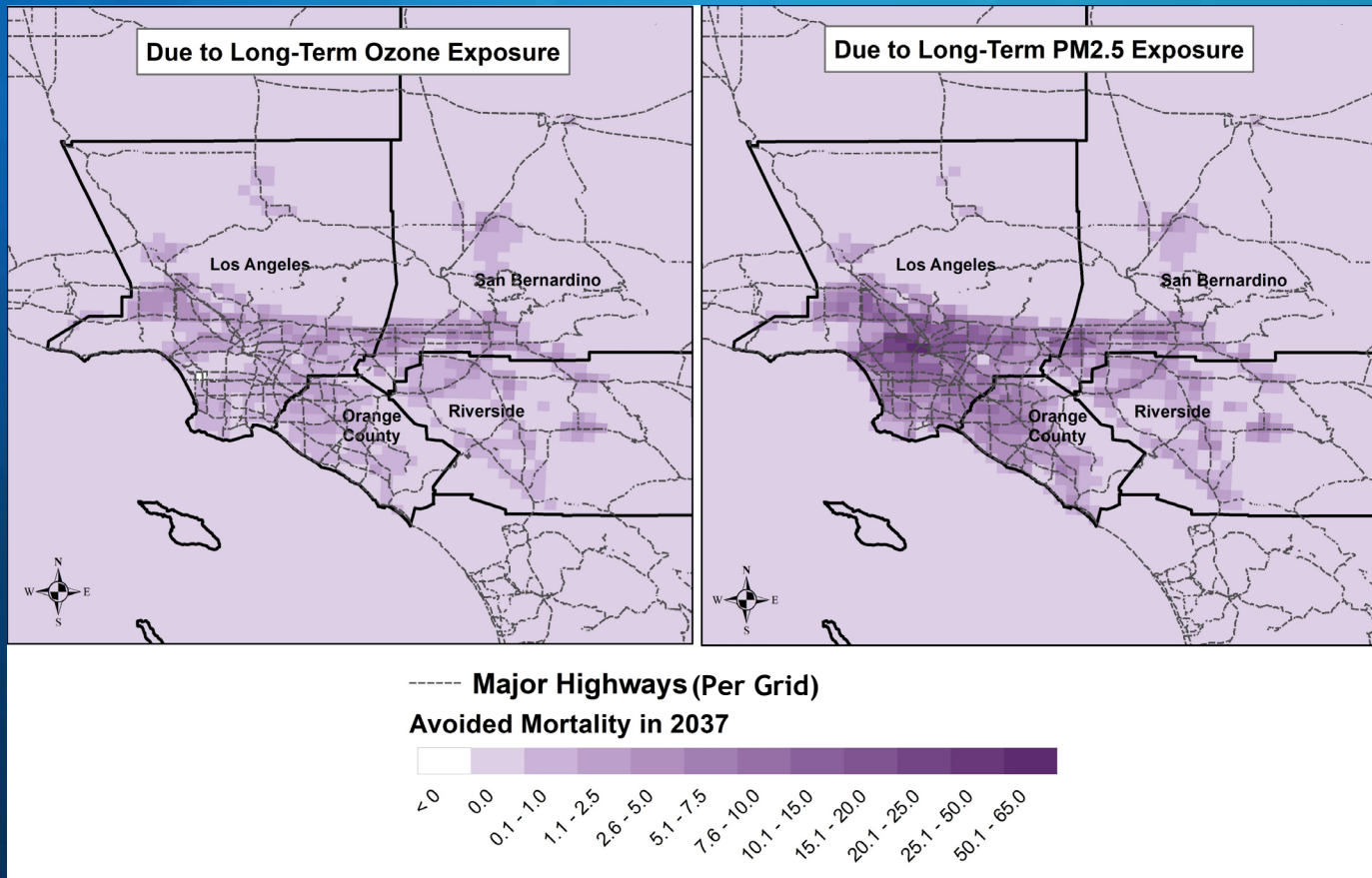
Control Measures Ranked by Cost-Effectiveness

Public Health Benefits

- Primary purpose of AQMP is to improve air quality and public health
- Public health benefits assessed using U.S. EPA methods:
 - Model air quality improvement due to implementation of 2022 AQMP and control measures, using CMAQ model
 - Model health benefits using U.S. EPA's BenMAP
- Benefits are converted to dollars based on standard methods used by U.S. EPA, CARB, etc.
 - Avoided premature death, reduced asthma, etc.
 - Focus of 2022 AQMP is to reduce ozone, but most measures will also have a co-benefit of reducing PM2.5
 - PM2.5 tends to have higher public health impacts than ozone



Avoided Premature Deaths



Avoided Premature Deaths		
	2032	2037
Mortality, Respiratory / Mortality, All Cause	1,619	3,031
Ozone	339	744
Los Angeles	124	309
Orange	48	85
Riverside	84	164
San Bernardino	83	186
PM2.5	1,280	2,287
Los Angeles	821	1,471
Orange	184	300
Riverside	128	236
San Bernardino	146	279

Summary of Public Health Benefits

	Monetized Public Health Benefits (Billions of \$2021)			
	2032	2037	Annual Average (2025-2037)*	Present Value (2025-2037)**
Mortality-related benefits	\$19.3	\$39.1	\$18.7	\$129.6
Long-Term Ozone Exposure	\$4.0	\$9.6	\$4.2	\$29.4
Long-Term PM2.5 Exposure	\$15.3	\$29.5	\$14.4	\$100.2
Morbidity-related benefits	\$0.7	\$1.4	\$0.7	\$4.7
Grand Total	\$20.0	\$40.5	\$19.4	\$134.3

* Several proposed clean air strategies in the 2022 AQMP will be implemented beginning in 2023. However, to be conservative and in consideration of the transition from VOC-limited to NOx-limited ozone formation regime for several areas in the South Coast Air Basin, it is assumed that there would be minimum clean air benefits during the first two years of 2022 AQMP implementation, and health benefits of implementing the 2022 AQMP would begin accruing only in 2025

** Discounted to year 2022 using a 4% discount rate.

REMI Model

- South Coast AQMD uses a custom built regional economic impact model (REMI) of the 4-county region based on 21 sub-county geographical units.
- The model simulates numerous macroeconomic variables including jobs, occupation, output, cost of production, and value-added by sector.

REMI Modeling Assumptions

- Implementation of the 2022 AQMP imposes costs and generates benefits in the region.
- These costs and benefits will affect the economic decisions of producers and consumers in the region resulting in economic impacts.
- All these direct effects cascade through the regional economy and produce indirect and induced macroeconomic impacts.
- South Coast AQMD uses a regional economic impact model from REMI Inc. (PI+ v3.0) to simulate the impacts of the AQMP on the regional economy.

Components of Macroeconomic Impacts

- Regional job impacts were simulated for incremental costs only, public health benefits only, and a combined scenario
- Other macroeconomic impacts were simulated for:
 - Job Impacts by occupational earnings group
 - Impacts on value added by sector
 - Impacts on relative cost of production by sector
 - Impacts on relative delivery prices by sector
 - Impacts on export and imports

Incremental Cost REMI Modeling Assumptions

- Policy variables on incremental costs:
 - Industry: the production cost policy variable is used and associated spending is modeled with exogenous industry demand policy variable
 - Consumers: the consumer spending policy variable is used in conjunction with consumer spending reallocation to model impact on consumers
 - Local government: the local government spending policy is used to model increased governmental service, such as permitting

Public Health Benefits REMI Modeling Assumptions

- Public Health Benefits are valued using two general types of methodologies:
 - Willingness-to-pay (WTP) to reduce health risk
 - Avoided cost of illness (COI), direct and indirect
- Benefits valued based on WTP are modeled using the non-pecuniary amenity aspects policy variable
 - Increases attractiveness of the region relative to the rest of the nation
 - Induces economic migration
- Benefits valued primarily on avoided COI are modeled with:
 - Reduced consumer spending on healthcare-related goods and services
 - Reallocation of consumer spending from healthcare to other goods, services, and savings
 - Increased labor productivity for all industries

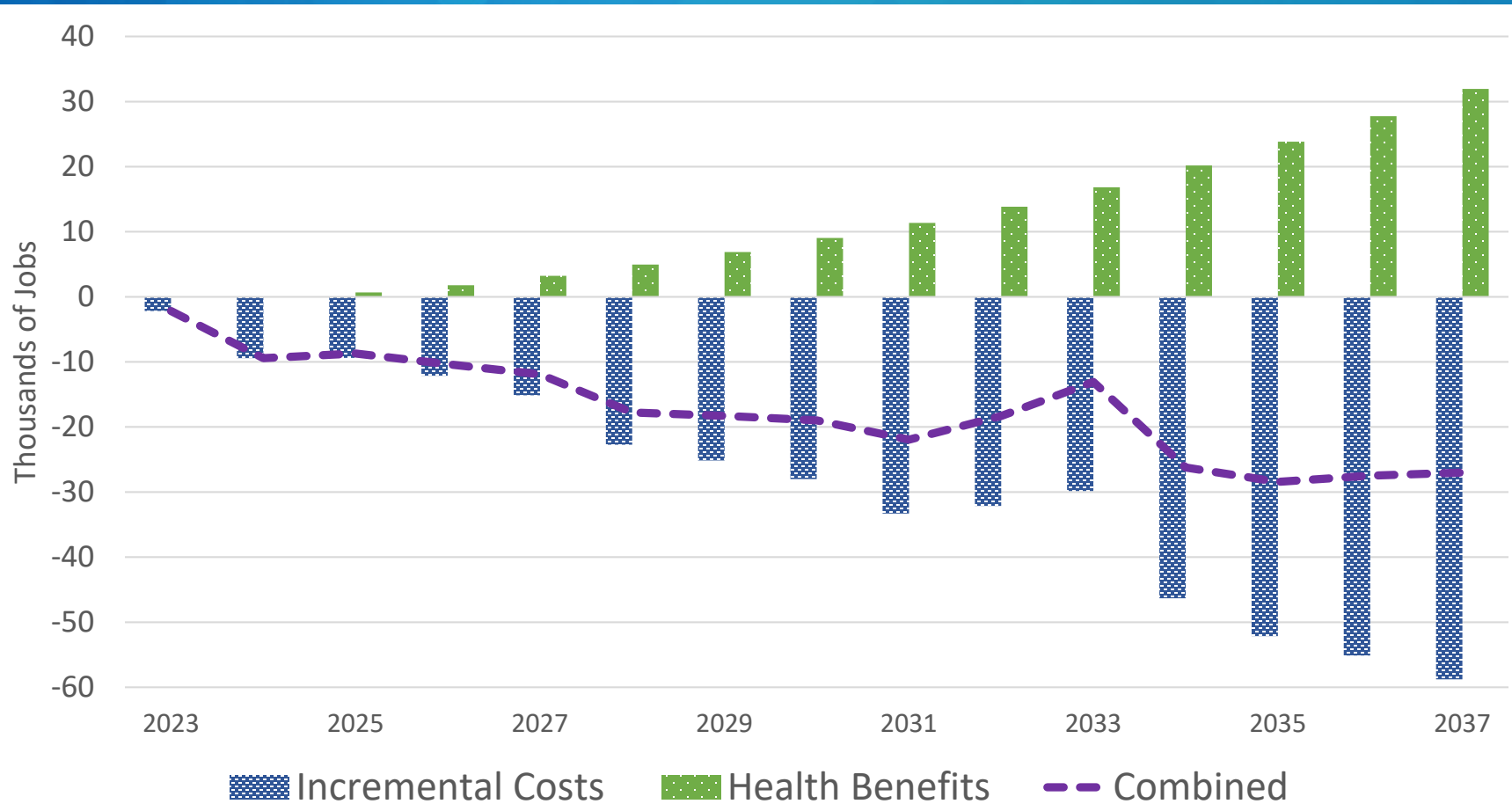
Job Impacts of Public Health Benefits

- Annual Job Impacts

Primary Scenario	Jobs		Average Annual (2023-2037)	
	2032	2037	Jobs	% Change
Quantified Public Health Benefits	13,848	31,945	11,490	0.11%
Mortality-Related Benefits	12,866	30,104	10,695	0.10%
Morbidity-Related Benefits	981	1,840	793	0.01%

- Job impacts are positive for all years and increase over time corresponding with health benefits
- Mortality-related benefits contribute to the most job growth in the region
- All public health benefits are projected to increase the number of jobs per year in the region by about 11,500 on average or 0.11% above baseline employment

Summary of Projected Job Impacts



Job impacts of benefits and costs combined

- **0.41%** annualized job growth vs. baseline growth of 0.44% between 2023-37
- An annual average of **17,000 jobs** foregone in an economy with over 10 million jobs

Net Jobs Impacts

- Almost 29,000 jobs will be foregone on an annual average
 - Companies, organizations, households will allocate more budget to invest in air quality controls and clean technologies
 - Creates jobs for clean technology and control suppliers, but they are not necessarily based in Southern California
- More than 11,000 jobs will be gained on an annual average
 - Some sectors benefit from air quality controls (e.g., electric utilities)
 - Benefits of improved air quality also improve quality of life and economic output of the region
- On the net, the results show an annual average of 0.16% of jobs foregone between 2023-2037 in an economy with more than 10 million jobs
 - Analysis does not consider any significant increases in government funding to offset costs

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COMMENTS OR
QUESTIONS?



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