Current and Future Year Emission Impacts on Air Quality, Health Risk, and Environmental Justice in Southeast Los Angeles County

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GATEWAY CITIES
COUNCIL OF GOVERNMENTS

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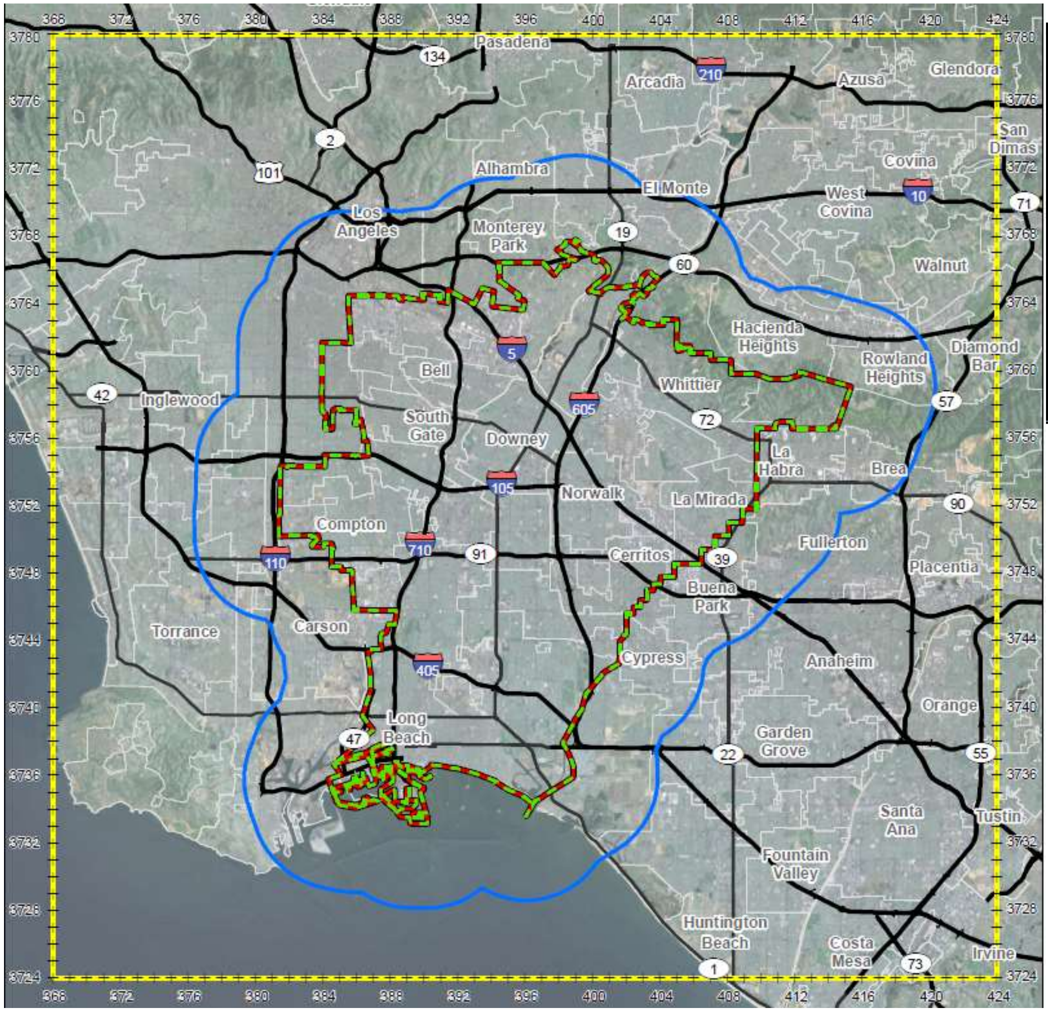
Background

Gateway Cities Air Quality Study

- Why this study
  - Mobility and air quality/health effects are major concerns in Southern California and to the Gateway Cities Communities
  - History: MATES-I, II, and III studies & POLA, POLB
- Presentation focus
  - Overview of Methodology
  - Results and Findings
- Large public outreach, consensus building with all stakeholders, public communication – not discussed here

Gateway Cities Study Area



Legend

- SCAQMD Area Source Emissions
- Gateway Cities Boundary
- 5-km Buffer Distance From Gateway Cities Boundary

56 km x 56 km

~ 2 million residents

Rail line, on-road at link level

Watercraft , railyard, airports at property boundaries

I-710 Truck Traffic

Objectives

Study objectives originally established in 2005 as part of I-710 major corridor study:

1. Determine existing air quality and health impacts
2. Determine future air quality and health impacts, given adopted measures and programs
3. Identify and analyze new air quality improvements strategies
4. Develop a conceptual plan to implement and measure air quality improvements for the region
5. Work with public agencies and stakeholders to develop consensus for the plan

Methodology Overview

Develop a comprehensive 2009 and 2035 emission inventory

- Obtain data from AQMD (non-road, stationary, area, etc)
- Develop link and TAZ geospatial inventory for on-road sources
- Additional measures – evaluate in terms of AQ/HRA

Develop hi-resolution (~ 1km) dataset

- Local 3-D meteorological (1-yr)
- Land-use and terrain

Apply this using 3-D Air Quality Modeling System

- CALMET/CALPUFF
- Receptor at block group census level + sensitive

Health Risk Assessment Metrics

1. Air Pollution Component of Potential Lifetime Cancer Risk

2. Air Pollution Non-Cancer Chronic Health Index

   - Respiratory Non-Cancer Chronic Health Index (e.g., increased chronic bronchitis)

   - Developmental Non-Cancer Chronic Health Index(e.g., increased stillbirths)

3. PM2.5 Potential Annual Mortality Risk (≥ 30 years old)

4. PM2.5 Potential Annual Morbidity Risk (≥ 65 years old)

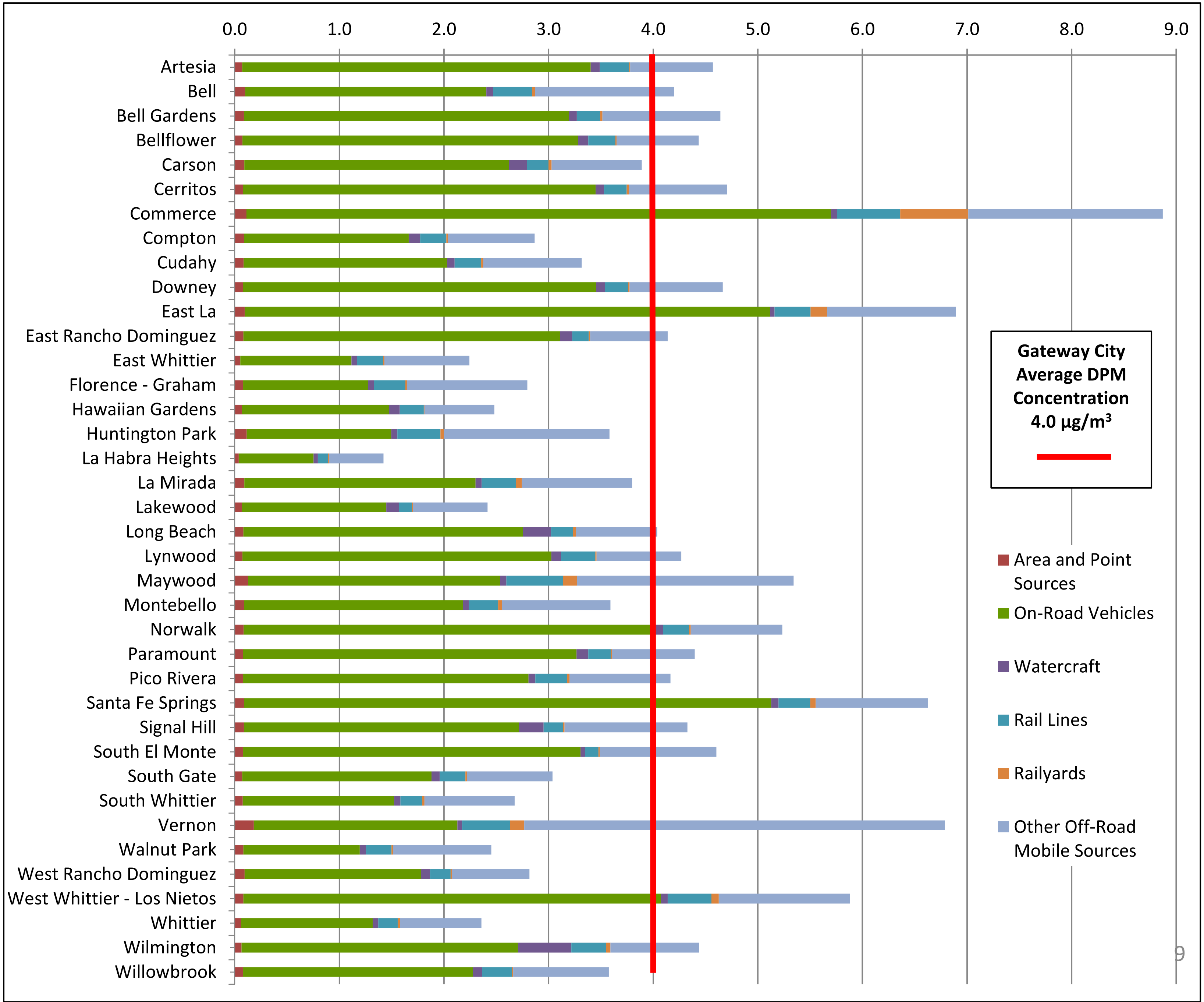
Results: Current Air and Health Impacts

Base year (2009) analysis found significant levels of air pollution and adverse health impacts.

Pollutants of greatest concern:

- Fine particulate matter (PM2.5) – contributes to premature death and unscheduled hospitalizations
- Diesel particulate matter (DPM) – contributes to cancer
- Nitrogen oxide (NOx) – major contributor to ozone (smog); also creates PM2.5

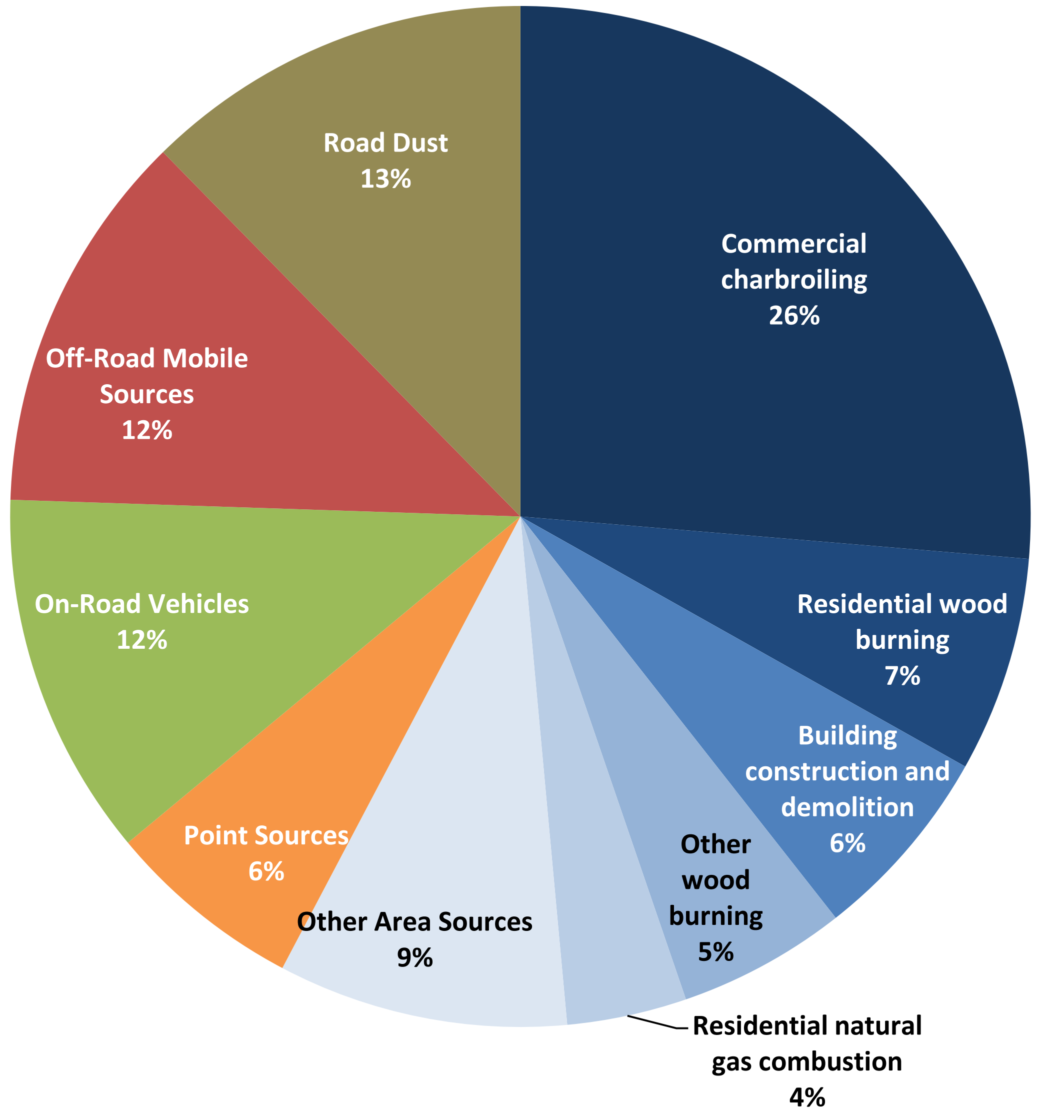
2009 Average DPM Concentration by City



Results: 2009 Air Pollution Health Risk

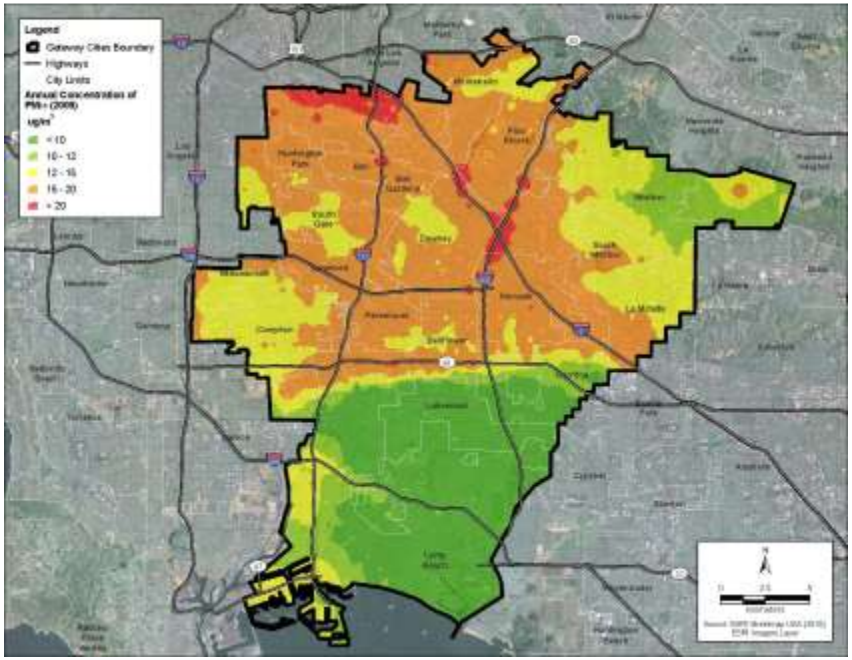
Health Risk Type		Gateway Cities Average Risk (per million)	Gateway Cities Maximum Risk (per million)
Cancer Risk	Residents	1,328	5,032
	Non-Resident Workers	259	983
PM2.5 Health Risk	Mortality (30+)	503	1,741
	Respiratory Hospitalization (65+)	298	574
	Cardiovascular Hospitalization (65+)	192	368

PM2.5 Emissions by Source Type, 2035



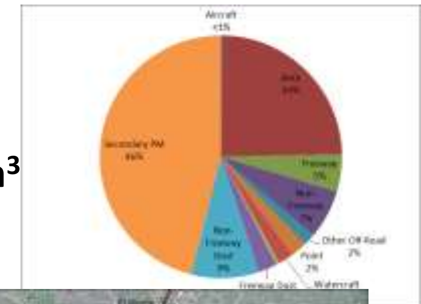
Findings in 2009 and 2035

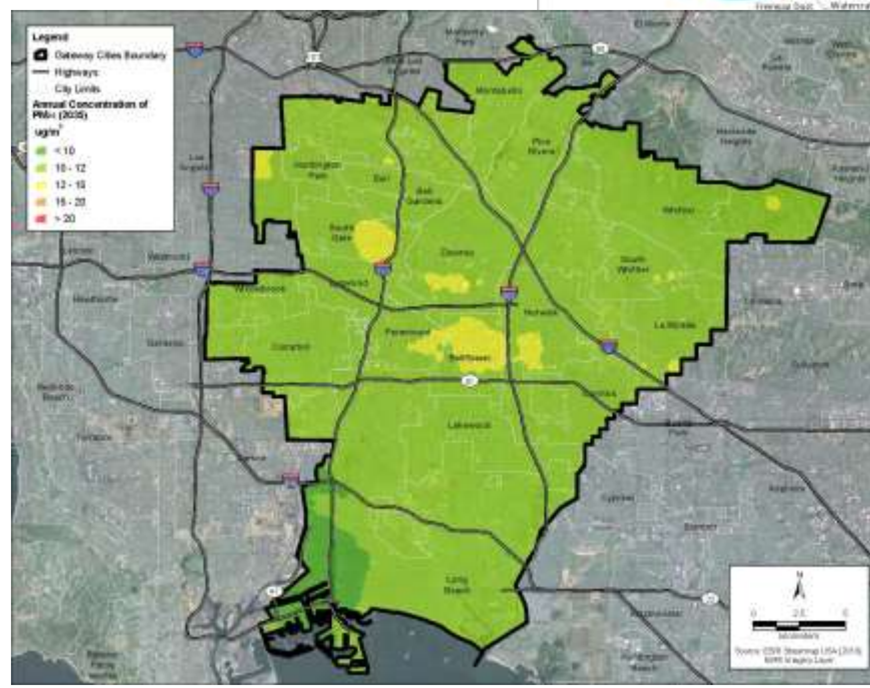
Annual Average $PM_{2.5}$ Concentrations 2009 and 2035 (21% reduction)

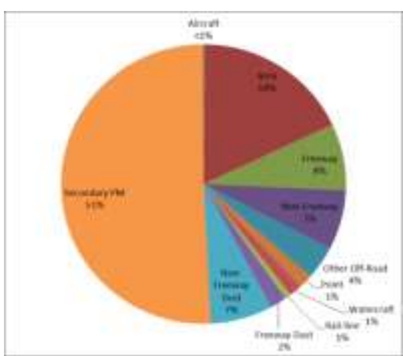


2035

GC Average = 11.2 µg/m³





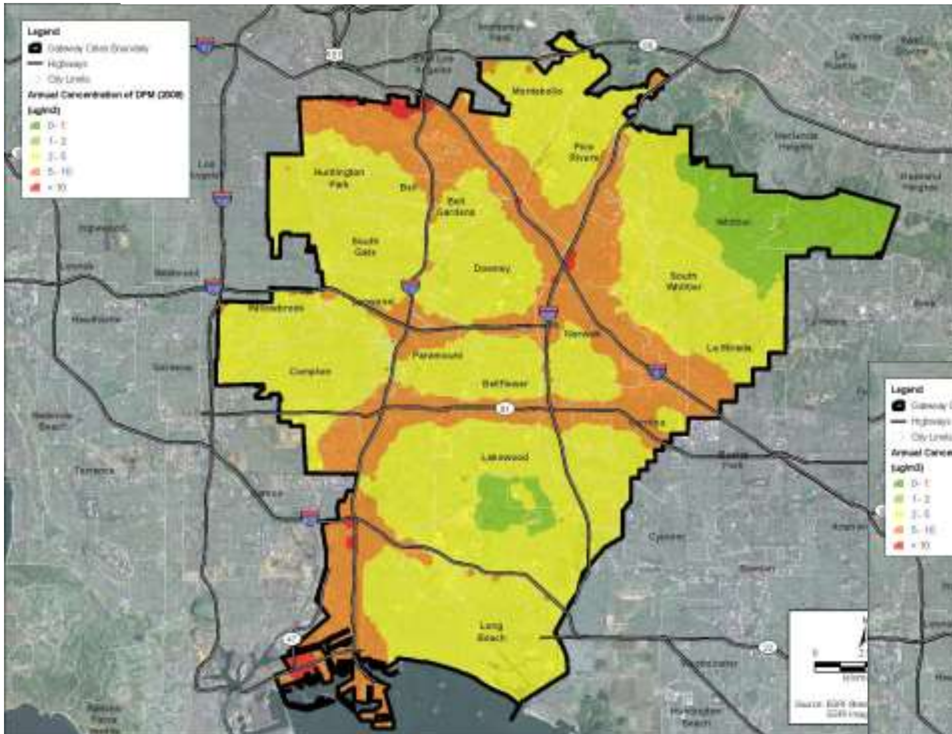


2009

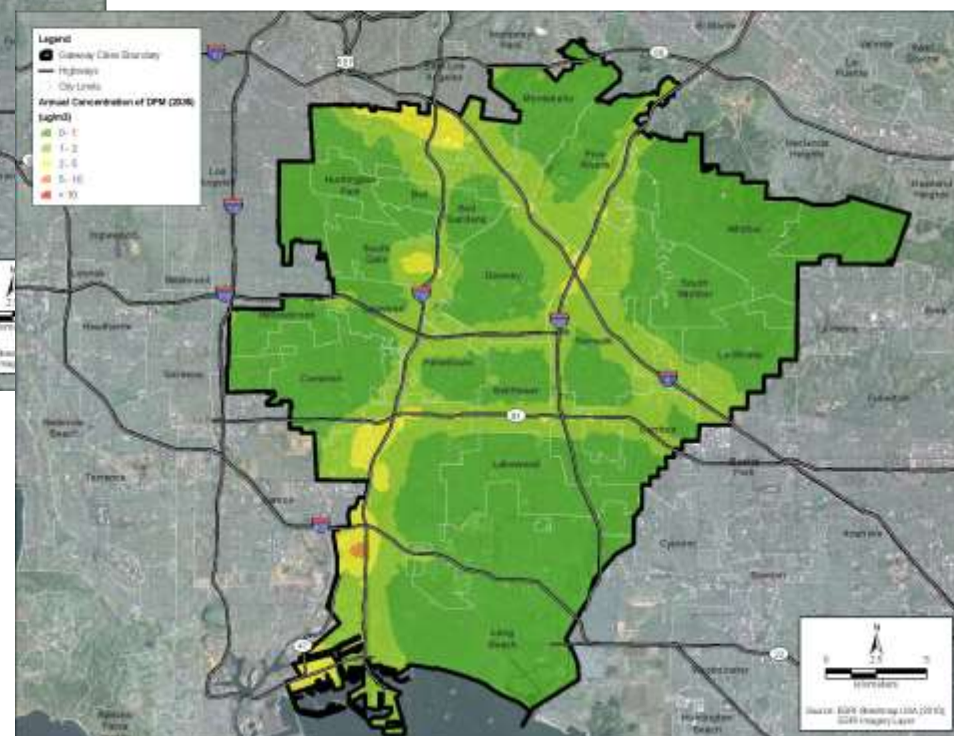
GC Average = 14.3 µg/m³

DPM Concentration in 2009 to 2035

Annual Average DPM Concentrations 2009 and 2035 (78% reduction)

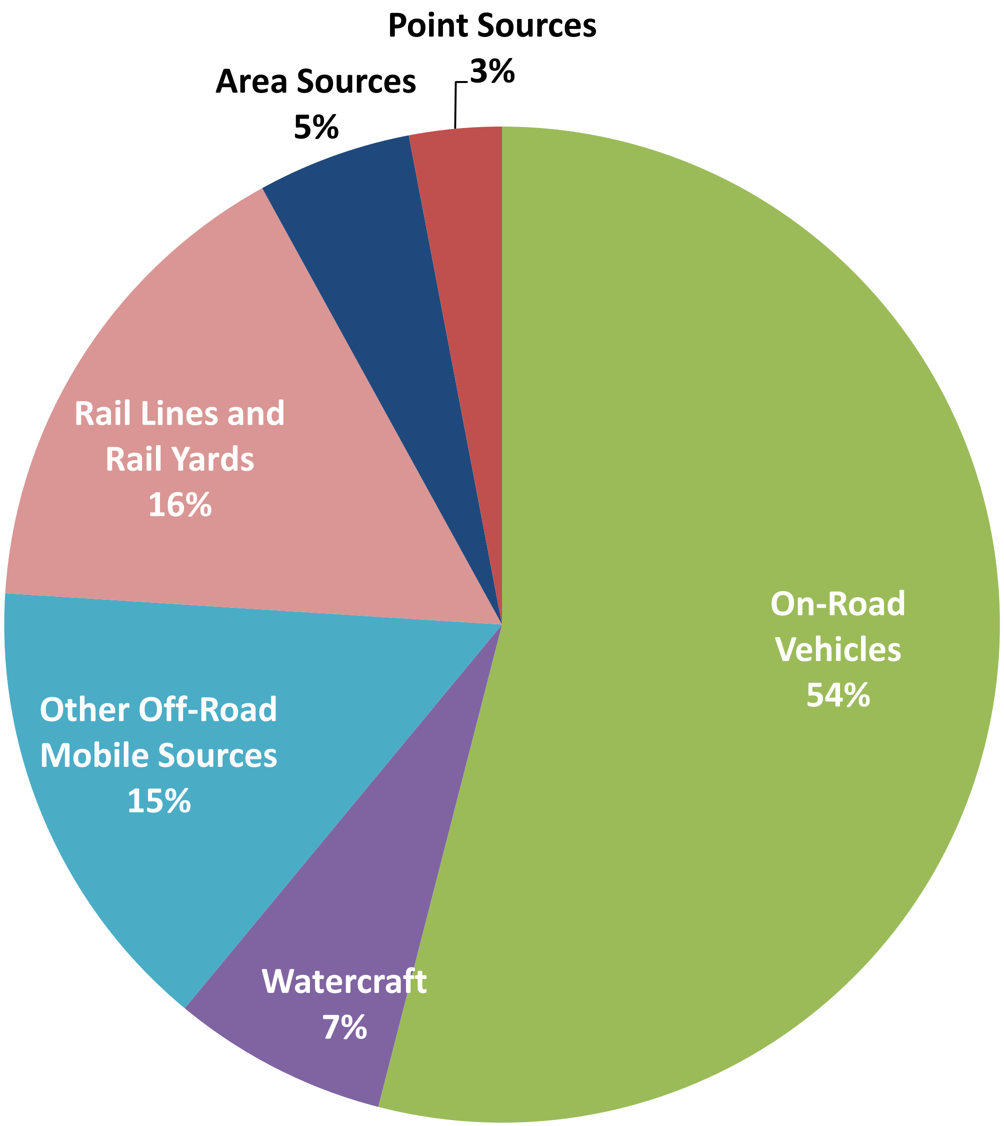


2009
Gateway Cities Average = 4.0 µg/m^3



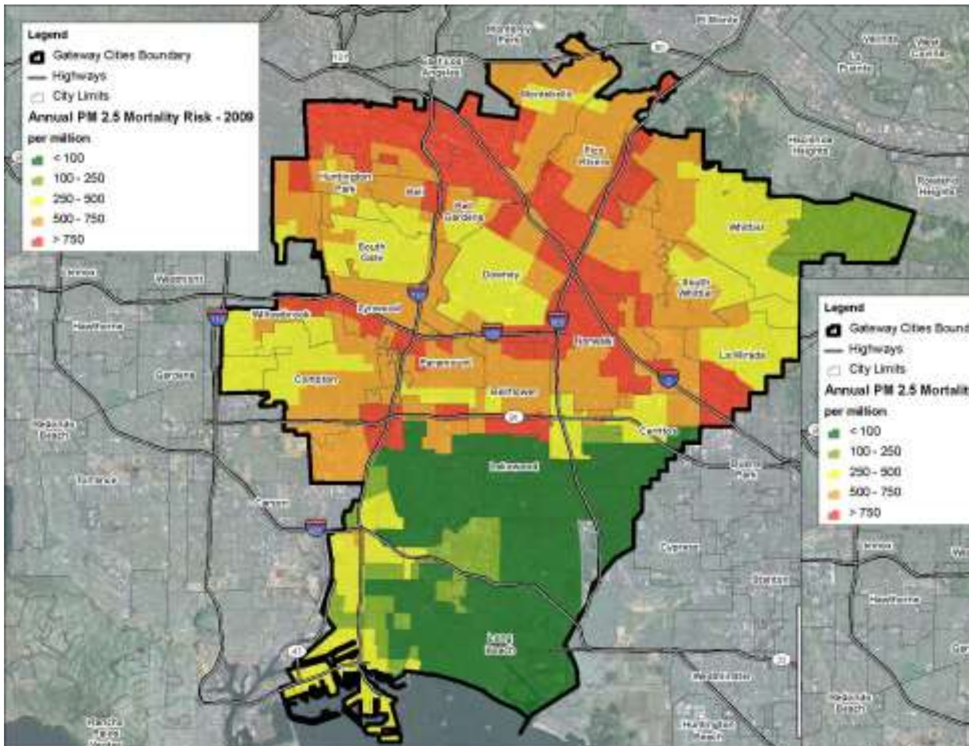
2035
Gateway Cities Average = 0.9 µg/m^3

Source Contribution to DPM Concentration, 2035



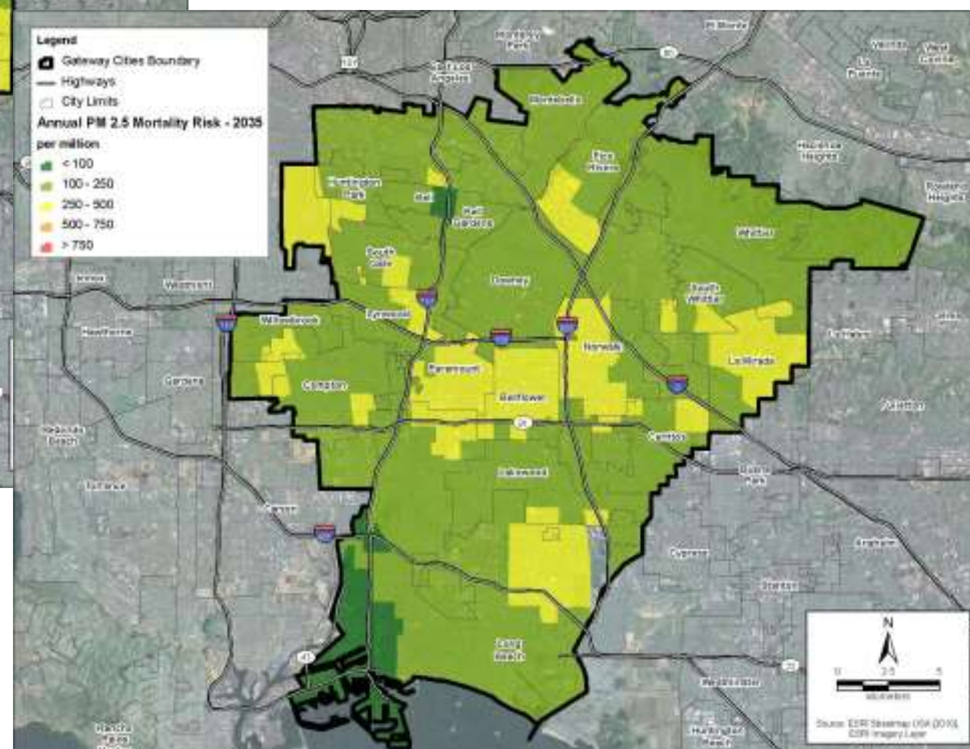
PM2.5 Health Risk in 2009 and 2035

By 2035, average PM2.5 mortality risk (30+) will drop 57%



2009

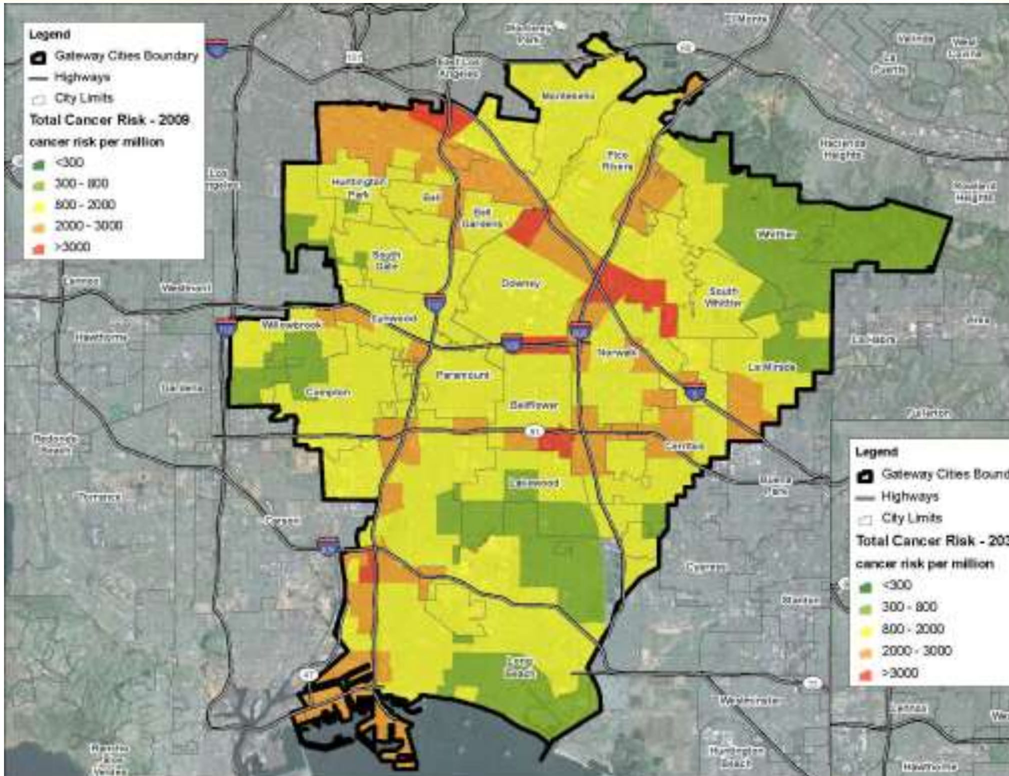
Gateway Cities Average = 503 per million



2035

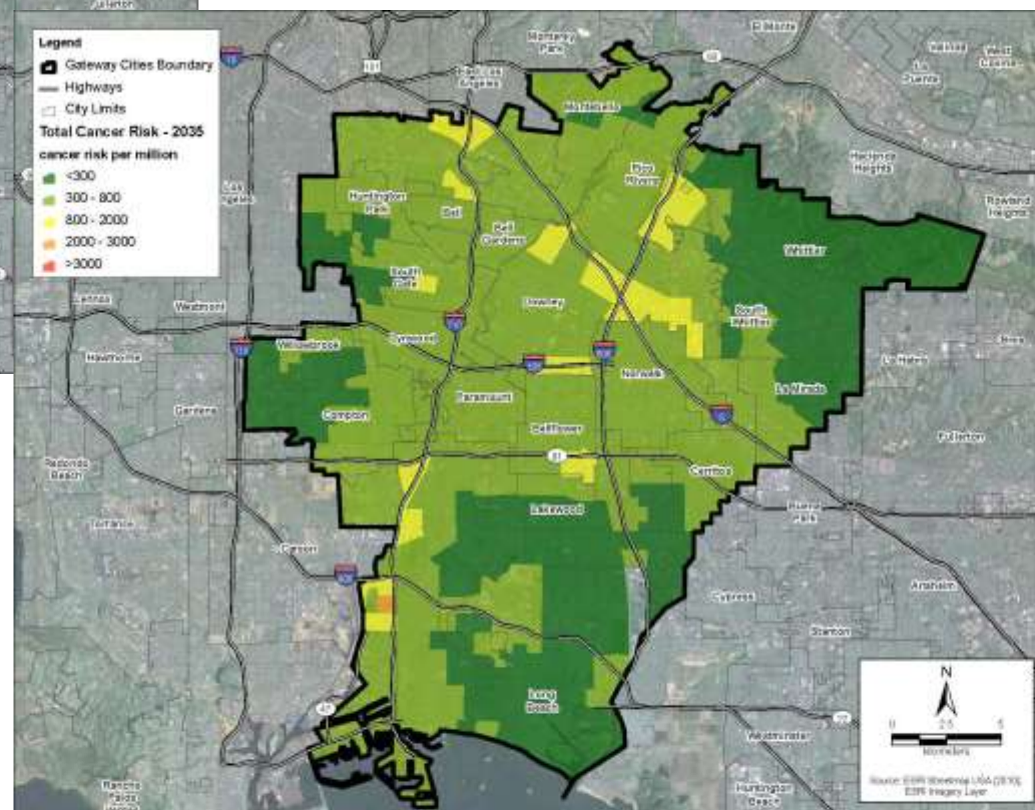
Gateway Cities Average = 208 per million

Air Pollution Potential Lifetime Cancer Risk in 2009 and 2035



2009

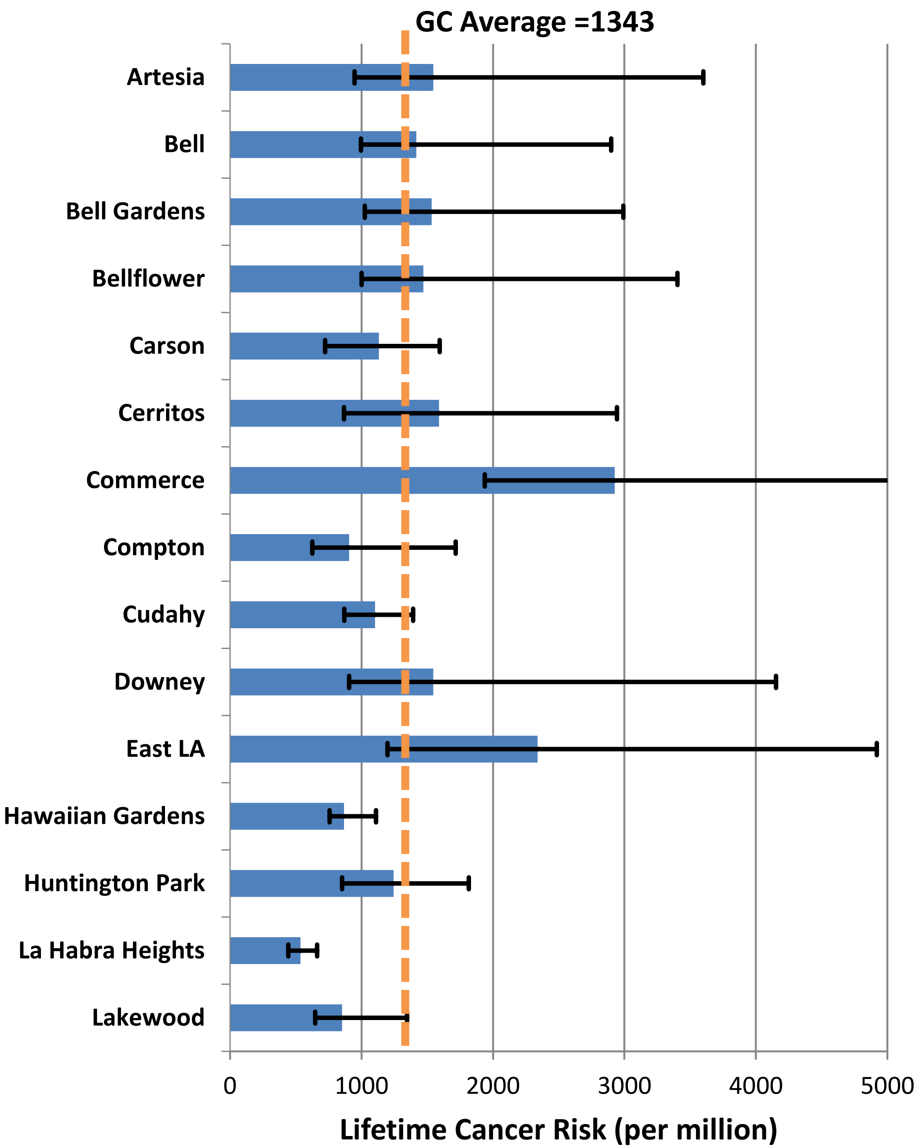
Gateway Cities Average = 1,328 per million

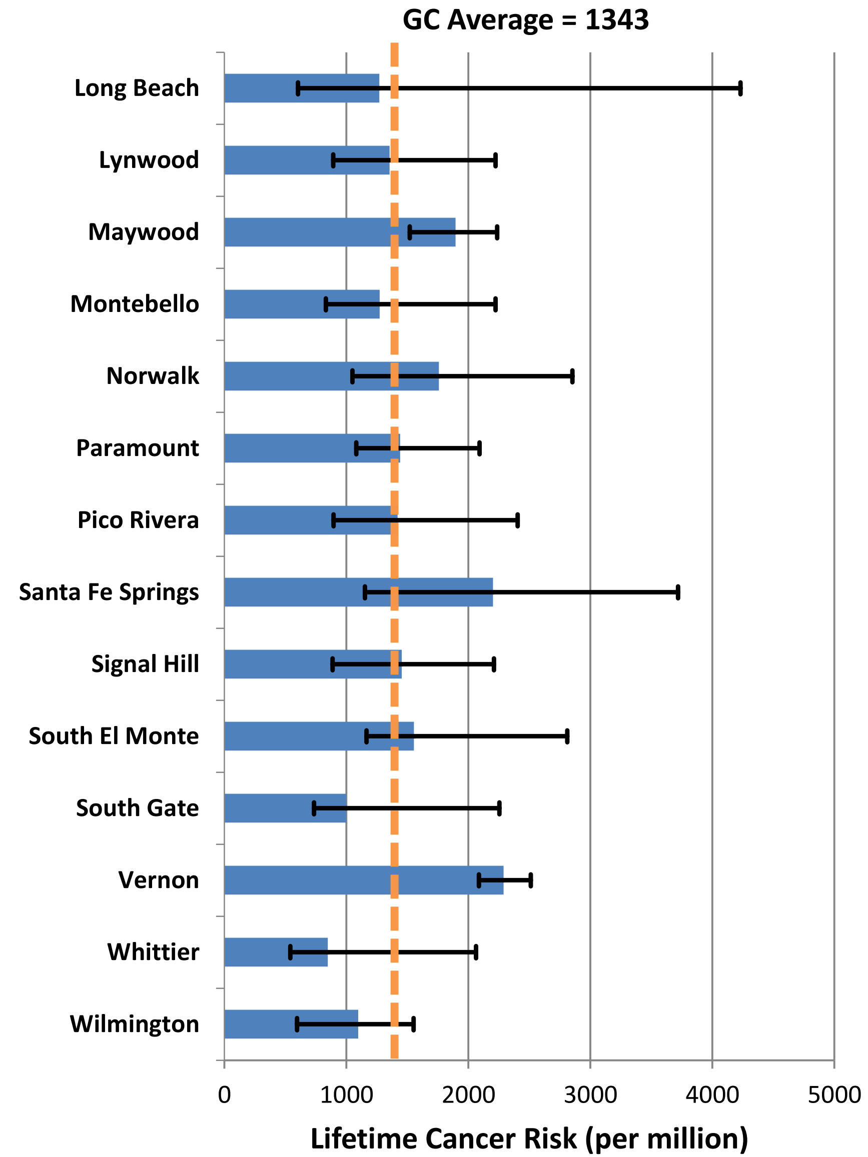


2035

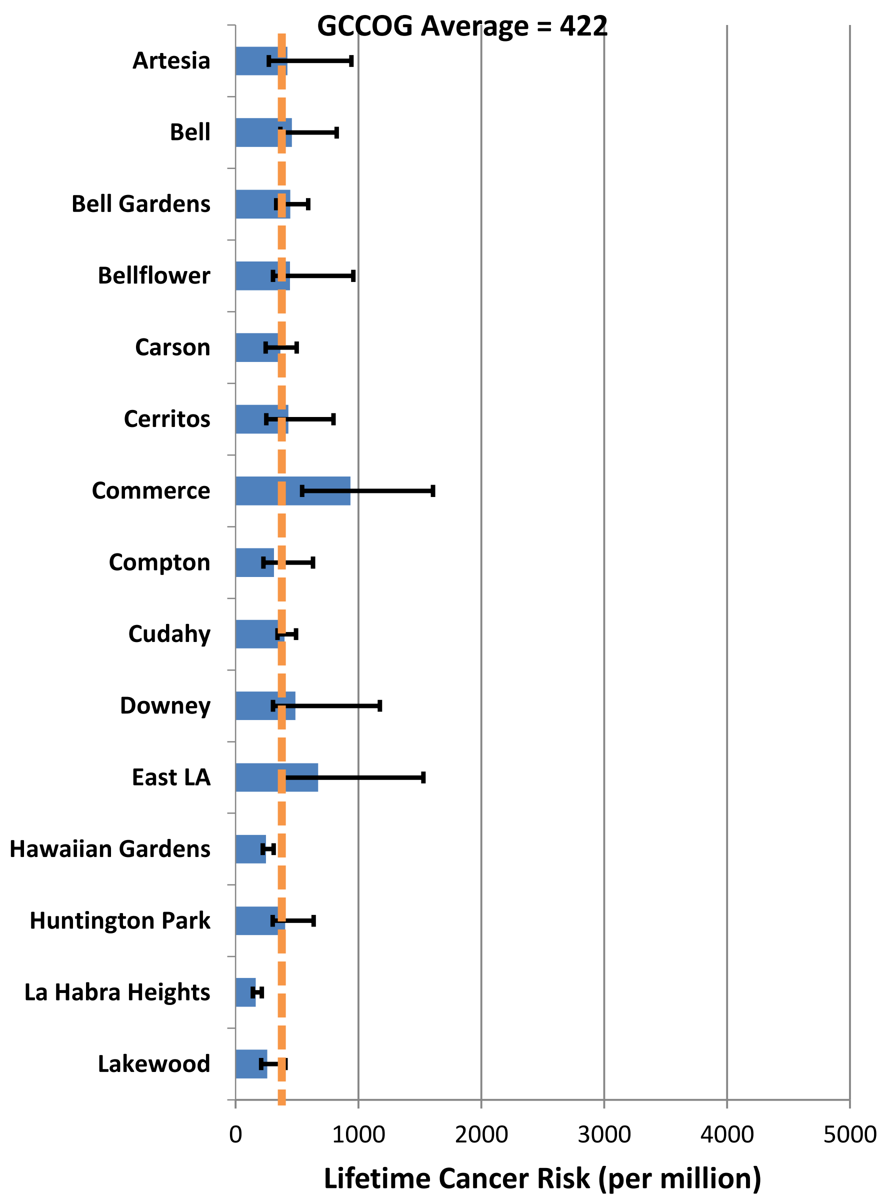
Gateway Cities Average = 410 per million

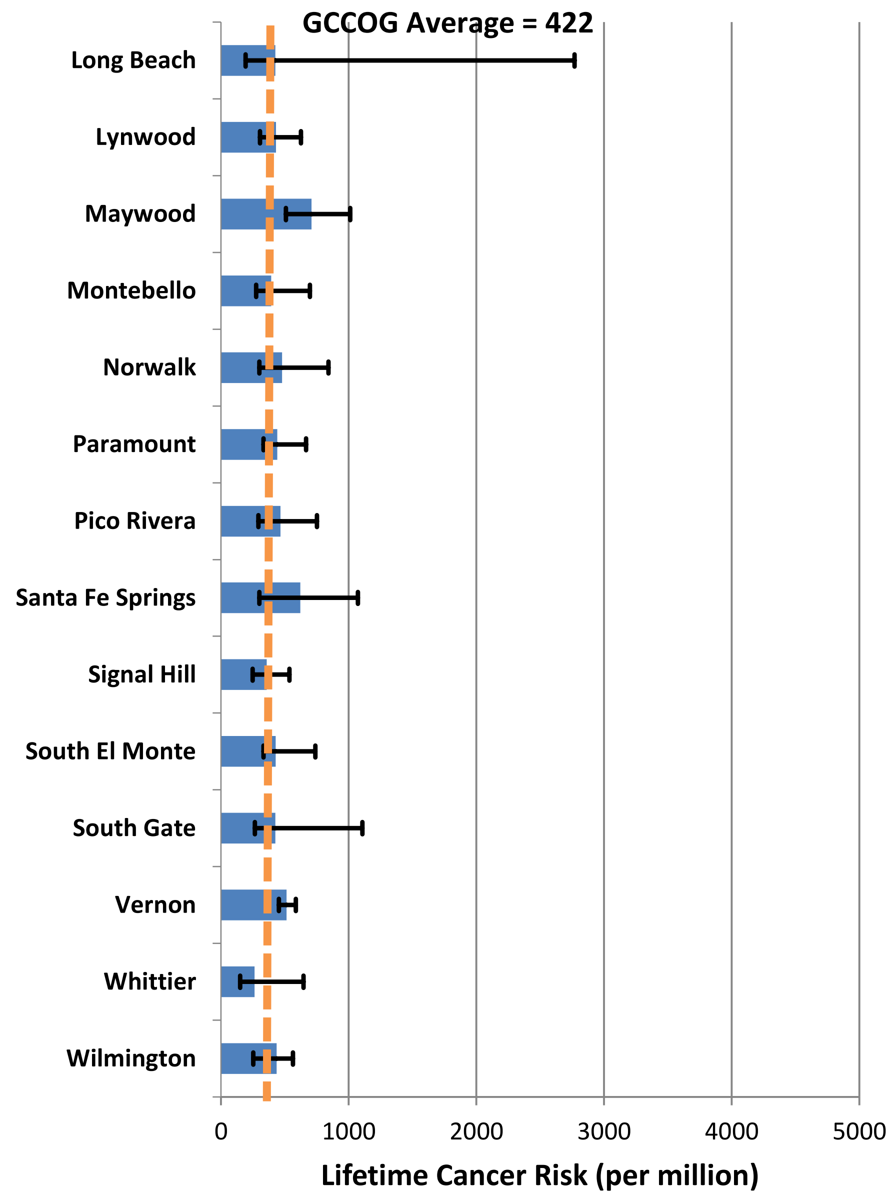
Air Pollution Potential Lifetime Cancer Risk, 2009 Avg. and Range





Air Pollution Potential Lifetime Cancer Risk, 2035 Avg. and Range





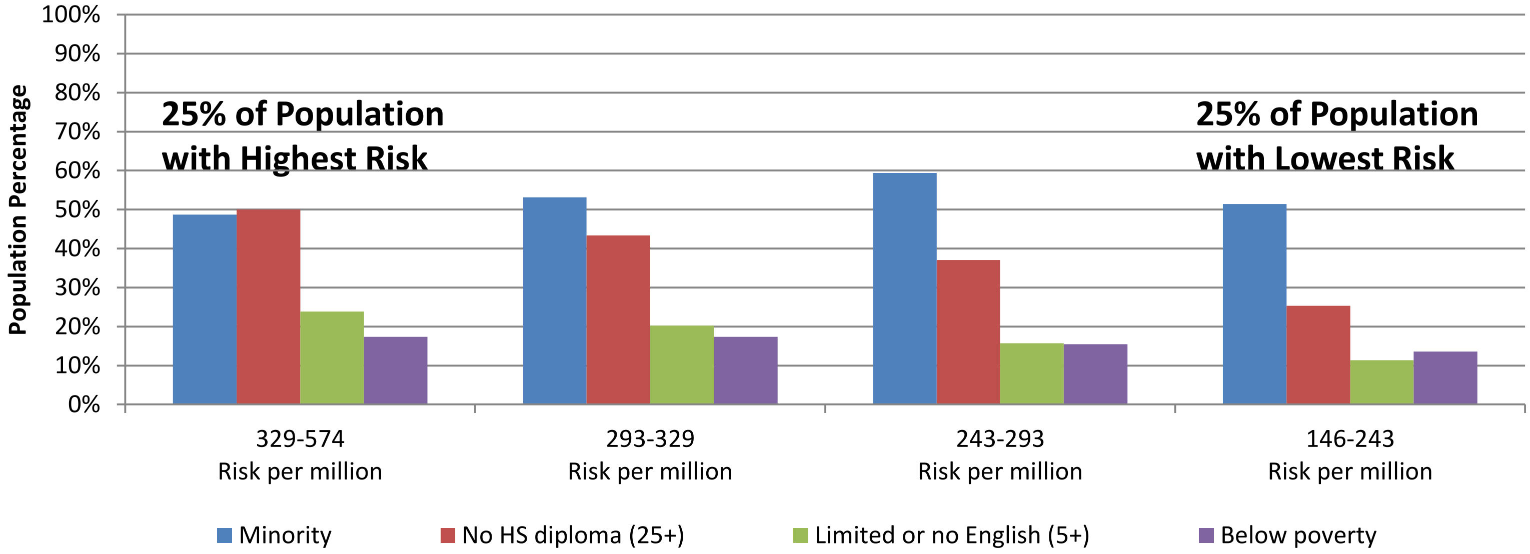
Results: Future Air Pollution Health Risk

Health Risk Type		Gateway Cities Average		Gateway Cities Maximum	
		Risk per Million in 2035	Change from 2009	Risk per Million in 2035	Change from 2009
Cancer Risk	Residents	420	-68%	2,769	-45%
	Non-Resident Workers	82	-68%	541	-45%
PM2.5 Health Risk	Mortality (30+)	208	-59%	359	-79%
	Respiratory Hospitalization (65+)	271	-9%	322	-44%
	Cardiovascular Hospitalization (65+)	174	-9%	207	-44%

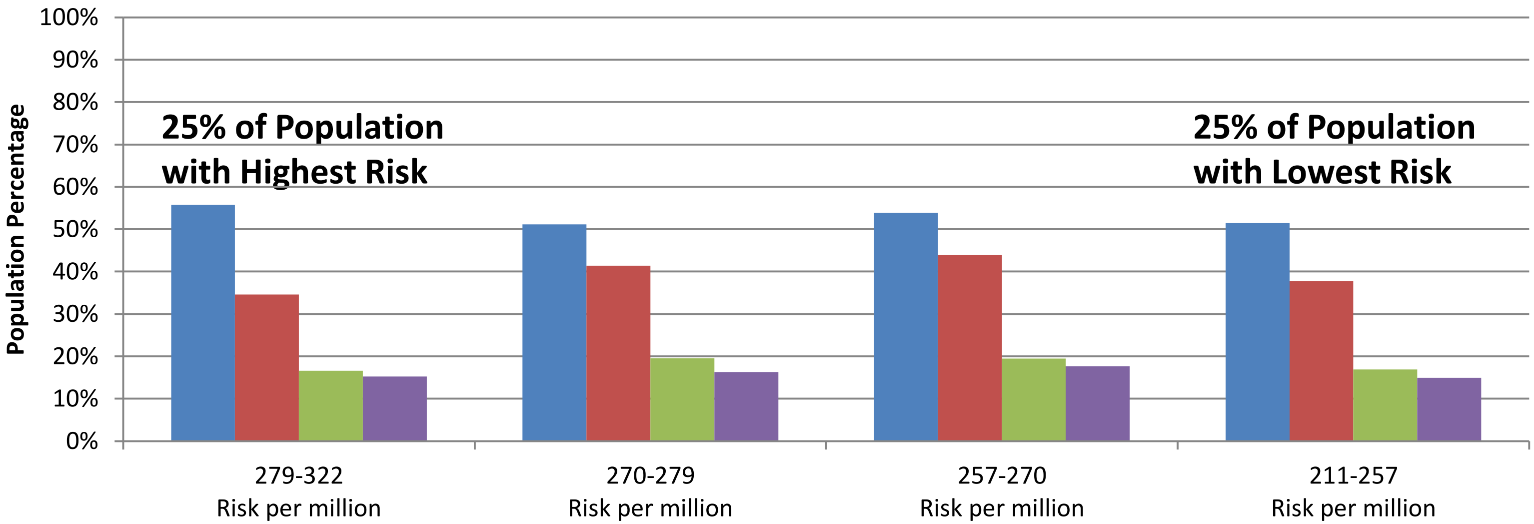
Environmental Justice Assessment

Cardiovascular Hospitalization Risk Demographic Distribution from PM2.5 Exposure

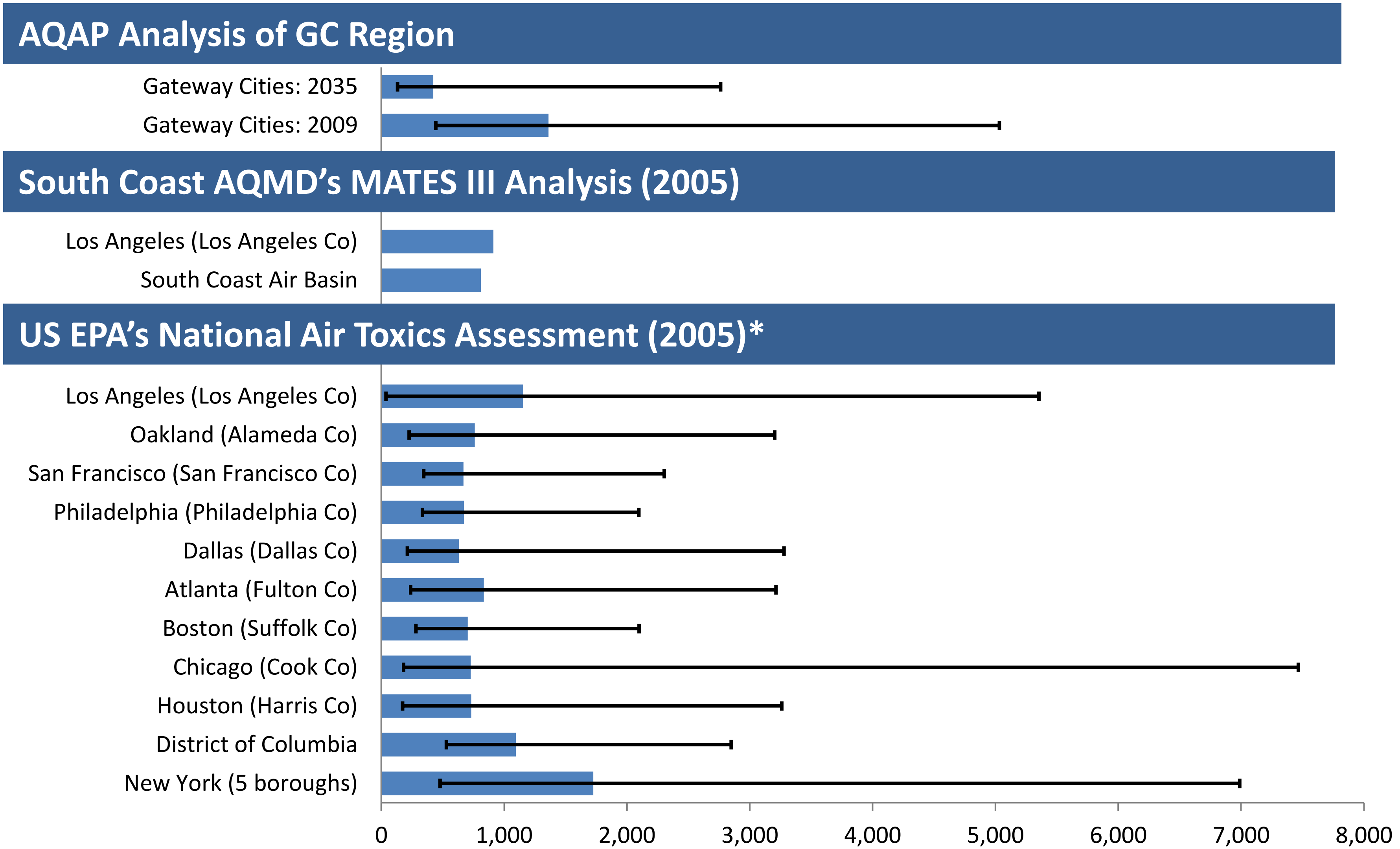
2009



2035



Air Pollution Potential Lifetime Cancer Risk: Nationwide Comparison Average and Range



* Values based on NATA estimated concentrations of diesel particulate matter, chromium-6, arsenic, benzene, 1,3-butdiene, and formaldehyde (primary and secondary), combined with OEHHA cancer risk factors

Result Highlights

Air Quality Modeling & Health Risk Analysis

Summary

- DPM emissions decrease between 2009 to 2035 by 70% despite 12% VMT growth
- Largest decrease in DPM is from changes in off-road vehicles
- Charbroiling is the biggest contributor to primary PM2.5 concentrations
- 2035 cancer risk fairly uniform across GC, but highest in Commerce, East LA, Maywood, and Santa Fe Springs. Little evidence of disproportionate impacts on disadvantaged populations
- 2035 chronic and acute non-cancer developmental health risks vary substantially across GC
  - Evidence of disproportionate impacts on low education and limited English populations
- 2035 PM2.5 mortality fairly uniform across GC: highest risk in Bellflower, Norwalk, and Paramount.
  - Risk below the level associated with NAAQS for all but 2% of population. Little evidence of disproportionate impacts.

Key Lessons Learned

- There are significant variation in emissions across the GC – air quality impacts strongly dependent on location– particularly for point source dominated emissions
- One strategy will not work equally everywhere – significant variations in emission across the GC.
- Tailored strategies to individual communities and pollutants may be more effective
- Measures targeting secondary PM2.5 precursor emissions maybe helpful (particularly for Long Beach)

Summary of Key Findings

- With only a 21% reduction in PM2.5 the mortality risk decreased 59%
- 79% reduction in DPM – large reductions in non-road vehicles and equip
- Transportation direct emissions only one-fourth of PM2.5 in 2035
  - Range from 1 to 50% across the region
- Transportation still responsible for 92% of DPM in 2035
  - On-road is 54% across the region, ranges from 28-74%
- Targeted measures need to include location and source type to evaluate cost effectiveness
- Study approach transferable to other large metropolitans

New Air Quality Improvement Strategies

To achieve further improvements in air quality and reduction of health risk in 2035, new control measures should focus on the following five goals:

1. Reduce PM Emissions from Charbroiling and Wood Burning
2. Control Road Dust Emissions
3. Accelerate Deployment of Low- and Zero-Emission Medium to Heavy-duty Trucks
4. Accelerate Deployment of Low- and Zero-Emission Cargo Handling Equipment
5. Further Reduce Ocean-Going Vessel Emissions

New Air Quality Improvement Strategies

Significant emission reductions in 2035 if all new measure are implemented to maximum extent.

- 13% reduction in PM2.5 emissions
- 53% reduction in DPM emissions
- 23% reduction in NO_x emissions

These reductions are on top of the reductions already projected to occur as required by the state and South Coast AQMD.

References

- Full study report(s) available at: http://www.gatewaycog.org/projects/gateway-cities-cog-air-quality-action-plan/
- Air Quality and Health Risk Assessment
- Air Quality Action Plan
- Early Action Plan

Webinars and Workshops also available at same web-site

Additional Slides

GHG Emissions

Summary

- **Overall reduction in GHG emissions within the GC by 20% (2009 to 2035) decrease 7.9 MMT CO2e/yr**
- Largest reductions in light-duty cars, electric utilities, petro refining (decrease 11.1 MMT CO2e/yr)
  - Includes reductions for Pavely, LCFS, Fed CAFE stds, AB32 Cap & Trade; governor EO S-03-05
  - Not included - effects of SB375 (sustainable communities) which targets 13% per capita reduction in GHG emissions from reduced VMT by 2035 based on a baseline year of 2005
  - Overall net increases from aircraft & rail operations, & heavy-duty trucks (net increase 1.8 MMT CO2e/yr)
    - Due to overall increase in activity despite per engine emission reduction

Key Lessons

- Light duty remains largest contributor at one-third in 2035
  - Continue efforts to shift from gasoline to natural gas and electric vehicles
- Electric power generate 2nd highest category at 15%
  - Reduce residential and commercial demand – renewables (solar, wind)
- Heavy-duty vehicle category represent 13% of GHG in 2035
  - Increase efficiencies via improved logistics and supply chain management; shift fleet to the extent possible to natural gas and electric

#3. New Air Quality Improvement Strategies

Options for reducing PM2.5 emissions

Goal	Possible New Control Measures
#1. Reduce PM from Charbroiling and Wood Burning	**Adopt New Rule for Restaurant Under-Fire Charbroiling** • Charbroiling responsible for 26% of all PM2.5 in 2035
	Require Low-Emission Fireplaces and Woodstoves in Residences • Residential wood burning responsible for 12% of all PM2.5 in 2035
#2. Control Dust Emissions	**Expand Municipal and Highway Street Sweeping to Reduce Road Dust** • Road dust responsible for 12% of all PM2.5 in 2035
	Expand Rules and Best Management Practices to Reduce Dust from Building Construction and Demolition • Bldg construction and demo. responsible for 6% of PM2.5 in 2035

AQAP Objectives

#3. New Air Quality Improvement Strategies

Options for reducing arsenic, DPM, and NOx emissions

Goal	Possible New Control Measures
#3. Reduce Arsenic Emissions	**Adopt New Rules for Glass Manufacturing** • Glass manufacturing responsible for most arsenic emissions • Requires further investigation into current activities
#4. Accelerate Deployment of Low- and Zero-Emission Trucks	**Encourage Zero-Emission Port-Serving Trucks** • Heavy trucks account for 54% of GCCOG air pollution cancer risk in 2035
	Encourage Low-Emission Trucks in the Gateway Cities Communities • Heavy trucks account for 54% of GCCOG air pollution cancer risk in 2035
	Provide Alternative Fuel Infrastructure for Trucks • Natural gas fueling stations • EV charging stations (once HD truck technology becomes clear)

#3. New Air Quality Improvement Strategies

Options for reducing DPM and NOx emissions

Goal	Possible New Control Measures
#5. Accelerate Deployment of Zero-Emission Cargo Handling Equipment	**Replace Diesel Yard Hostlers at Ports with Hybrid and Electric Alternatives** • Small contributor overall, but significant around ports
	Electrify Rubber Tire Gantry Cranes at Ports • Small contributor overall, but significant around ports
	Promote Zero-Emission Transport Refrigeration Units (TRUs) • Small contributor to emissions, but measure is highly cost effective
#6. Further Reduce Ocean-Going Vessel Emissions	**Expand Control of At-Berth Ship Emissions** • Ships will contribute 14% of DPM and 21% of NOx in 2035
	Develop and Deploy Clean Ship Engine Technologies • Ships will contribute 14% of DPM and 21% of NOx in 2035