

2012 U.S. – Taiwan Sustainability Symposium

**Creating Sustainable Cities and Promoting
Sustainable Ports in the Asia Pacific Region**

**2012台美永續論壇 — 建構永續城市 推動永續經
營港灣**

Session B2: Port City Human Health and Environment

議題B2：港口城市的人民健康與環境

December 10, 2012





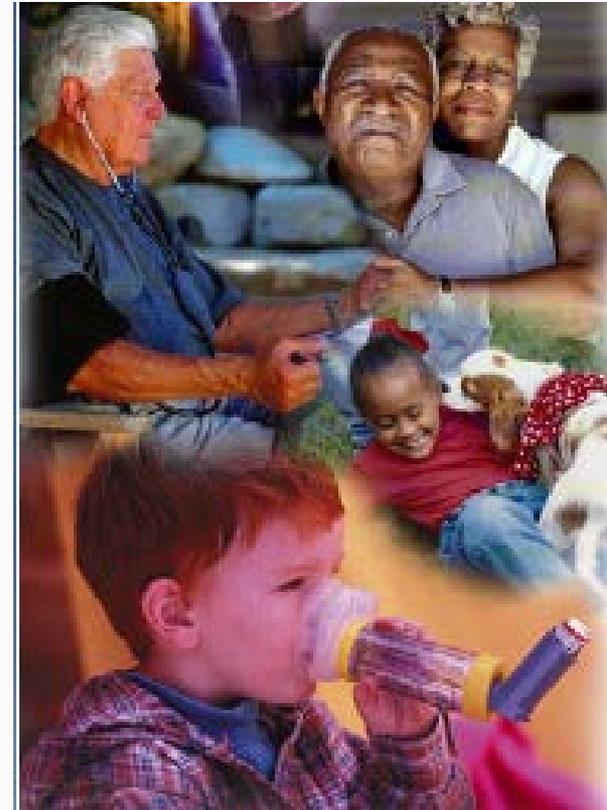
Air Pollutants and Impacts

- Exposure to diesel PM may result in both cancer and non-cancer health effects, including premature death
 - US EPA has classified PM_{2.5} as a likely human carcinogen
 - In June 2012, IARC, which is part of the WHO, concluded that “diesel engine exhaust causes lung cancer in humans.” –Dr. Christopher Portier, Chairman of the IARC working Group (http://press.iarc.fr/pr213_E.pdf)
- Non-cancer health effects may include eye and lung irritation, allergic reactions in the lungs, asthma exacerbation, blood toxicity, immune system dysfunction, and developmental disorders.
- NO_x adverse health effects in humans: respiratory irritation, immune system suppression, and asthma exacerbation.



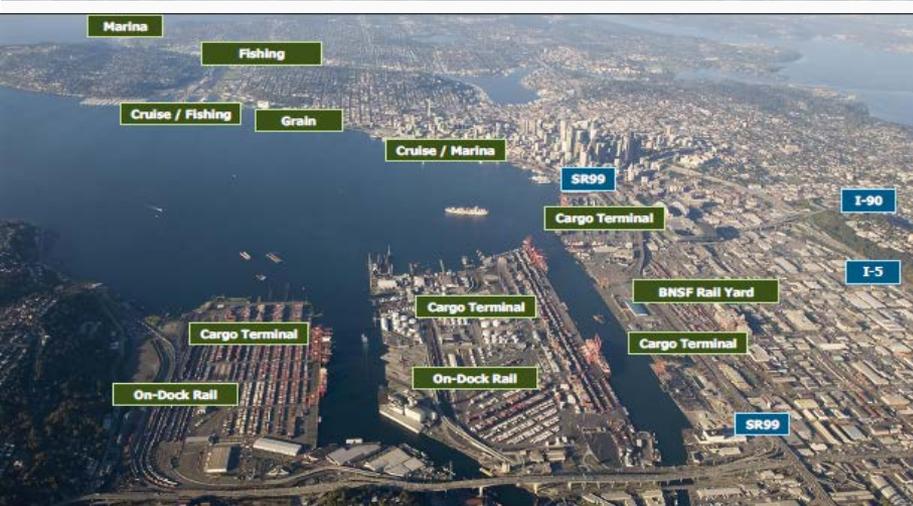
Air Pollutants and Impacts

- Air emissions degrade air quality, impair visibility and contribute to climate change
- Children, elderly and immune compromised individuals disproportionately affected by diesel emissions
- Children are especially sensitive because their respiratory systems are still developing, and they have a faster breathing rate





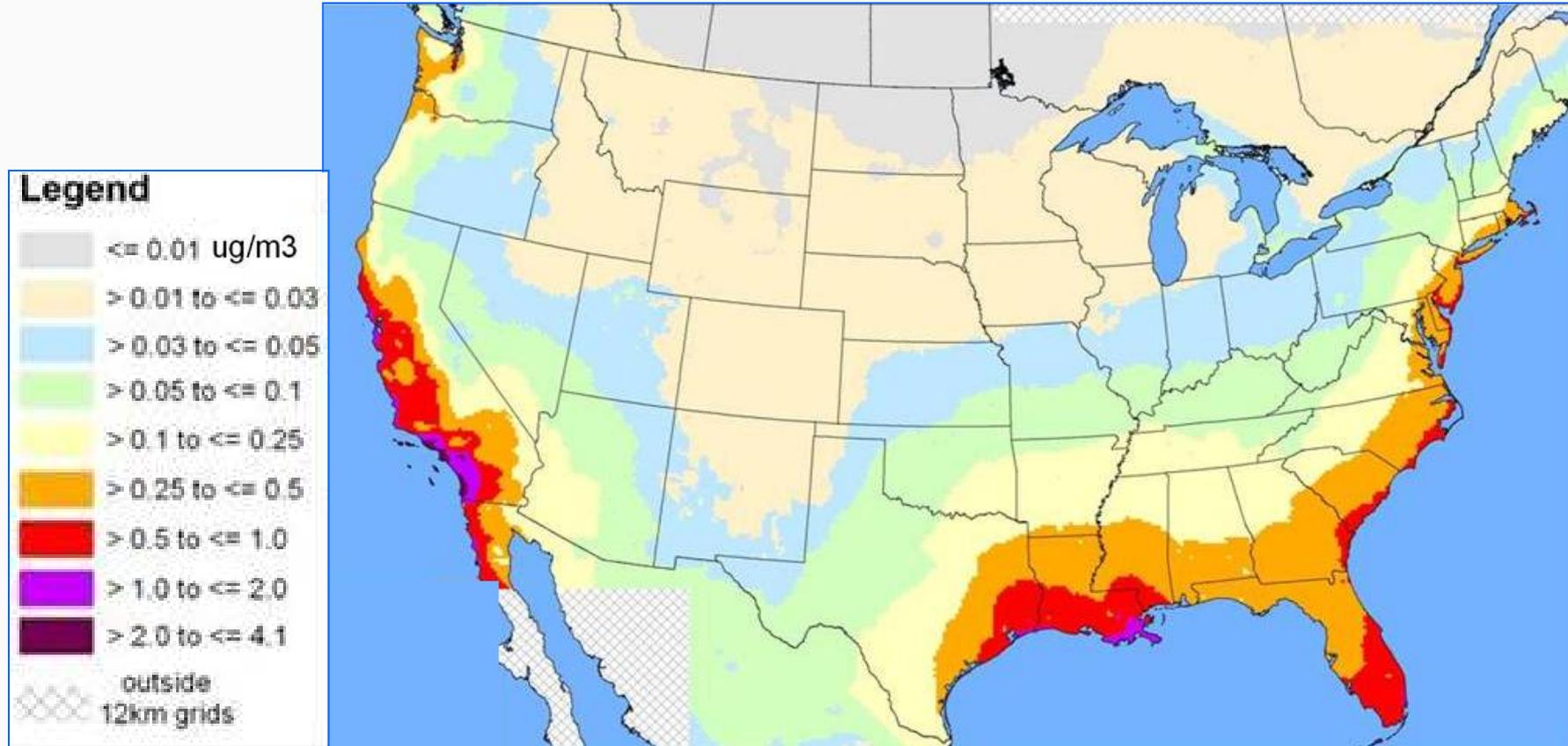
Proximity to Population Centers





Air Quality Improvements with OGV Low Sulfur Marine Fuel Switching

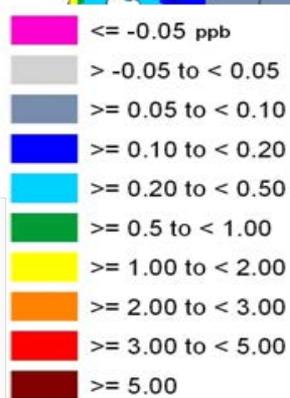
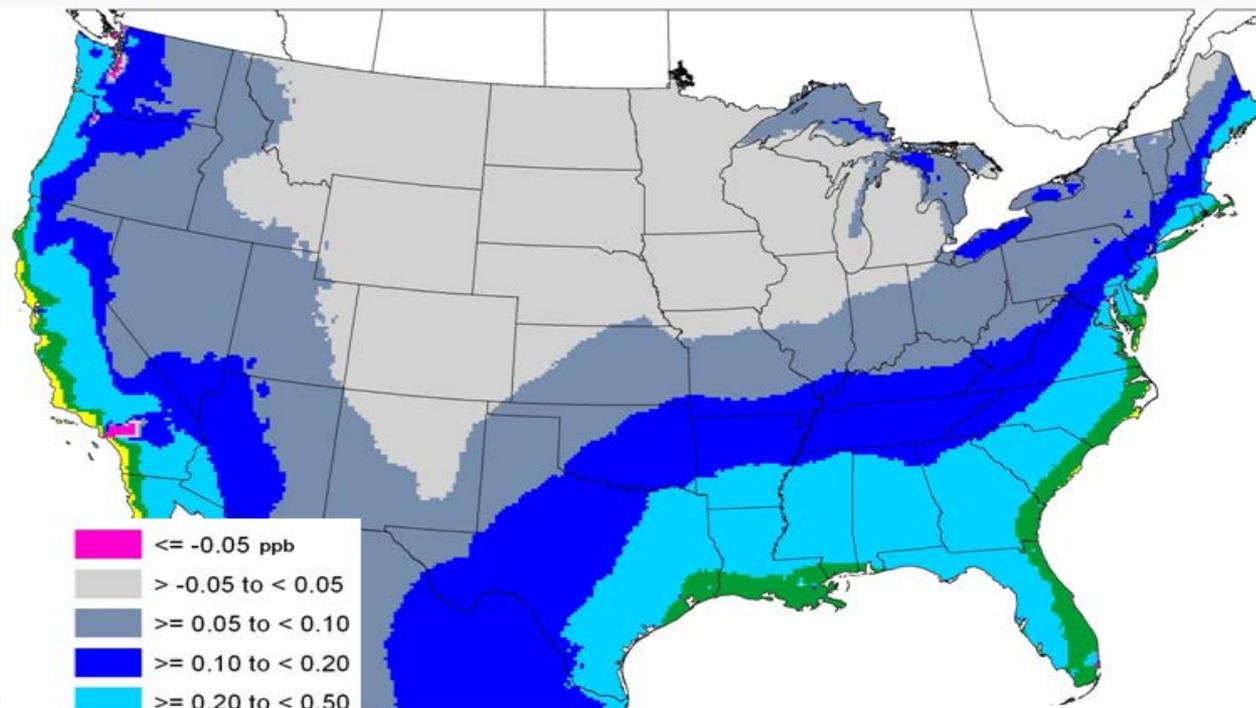
2020 Potential $PM_{2.5}$ Reductions





Air Quality Improvements with OGV Low Sulfur Marine Fuel Switching

2020 Potential ECA Ozone Reductions



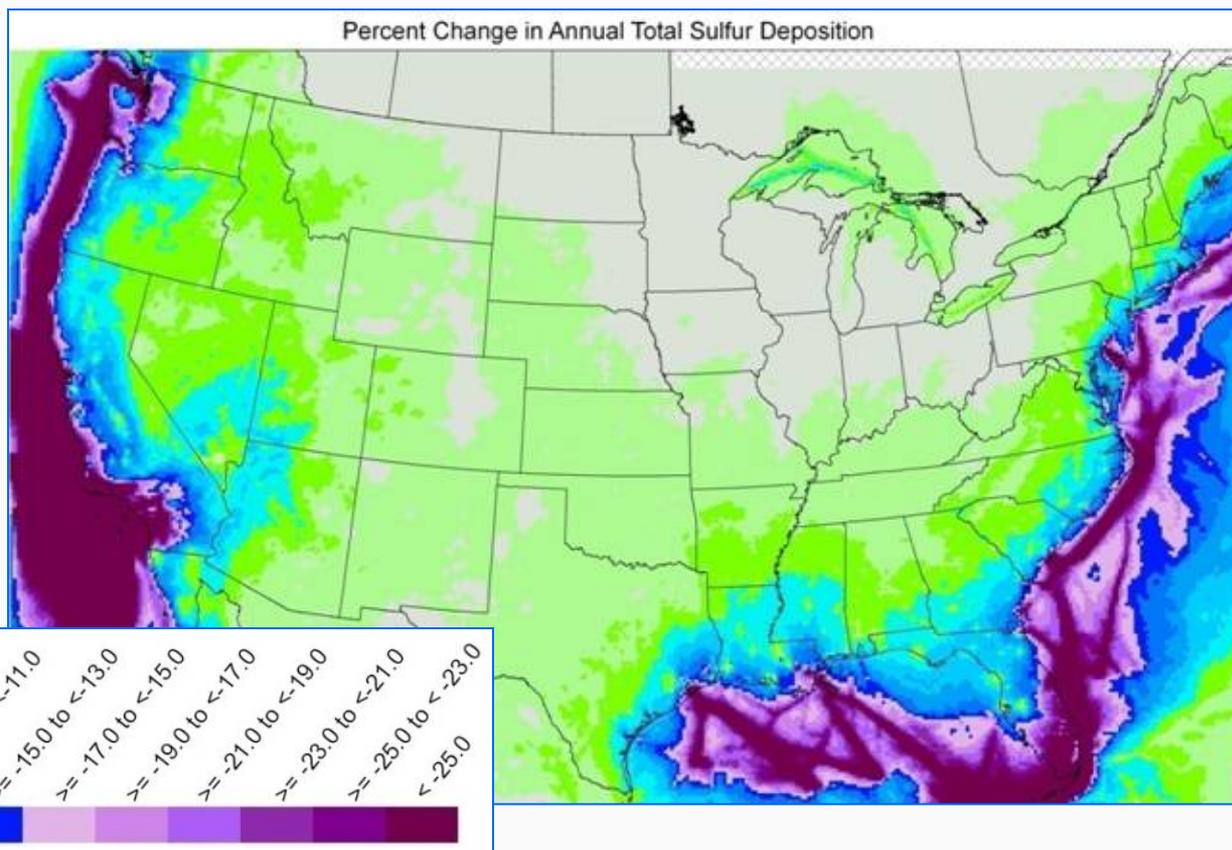
Ozone (Smog) reductions from the ECA reach well into the U.S. interior



Air Quality Improvements with OGV Low Sulfur Marine Fuel Switching

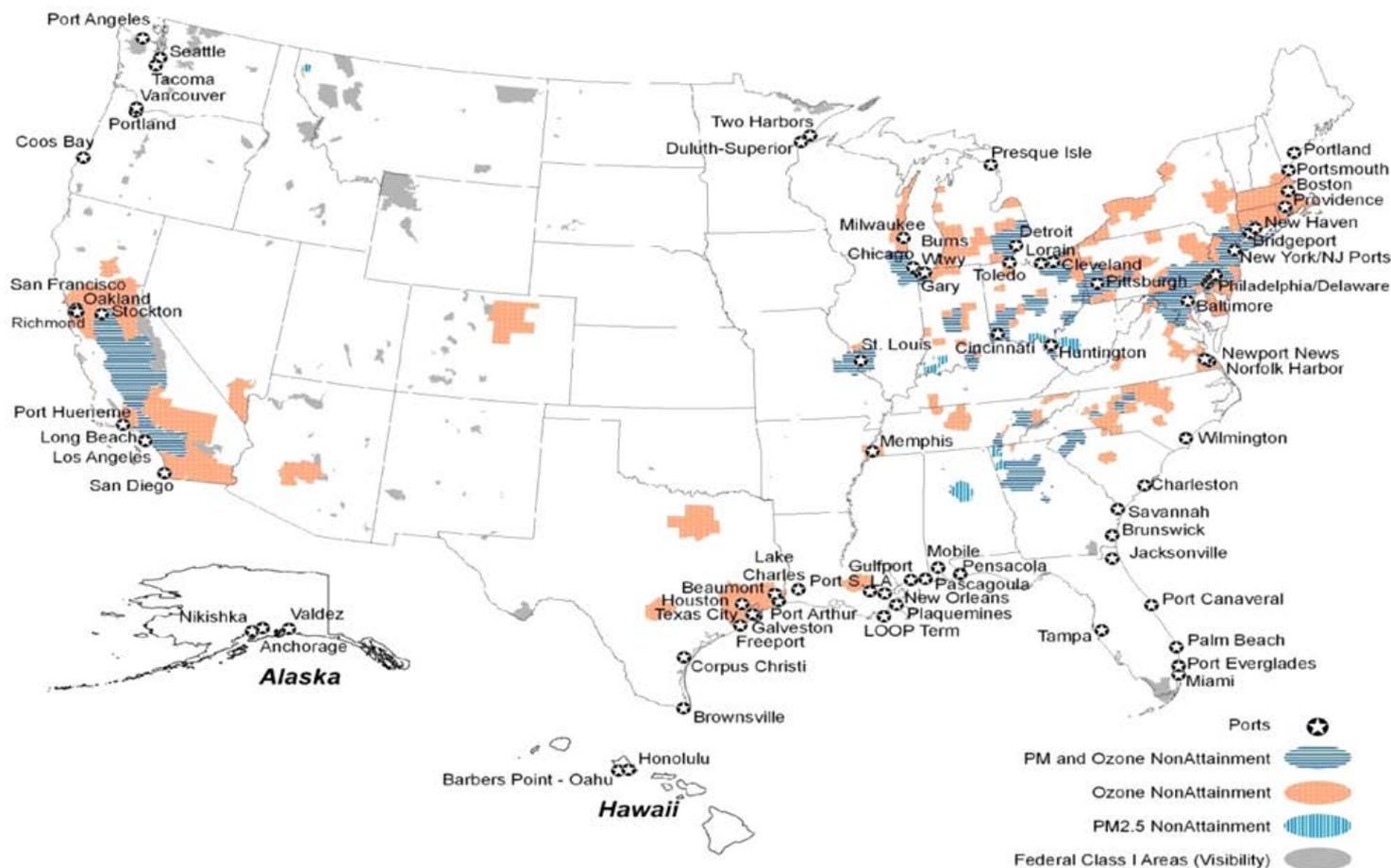
2020 Potential Sulfur Deposition Reductions

Marine and terrestrial ecosystems sulfur deposition reduced between 5% to greater than 25%,





Sustainable ports must equate to healthy air: U.S. port and non-attainment areas

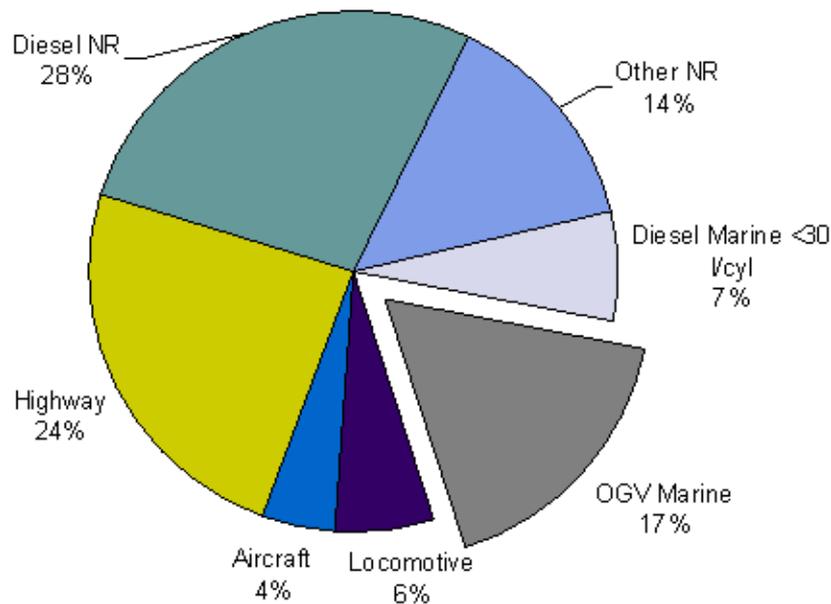




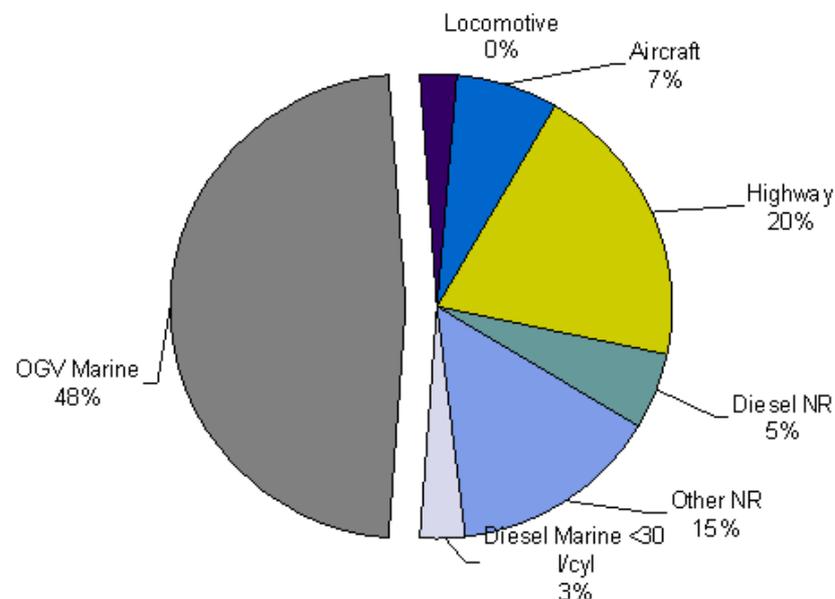
Ship Emissions

Growing Percentage of the U.S. PM2.5 Inventory without Cleaner Fuels

2009 Mobile Source PM2.5 Inventory



2030 Mobile Source PM2.5 Inventory

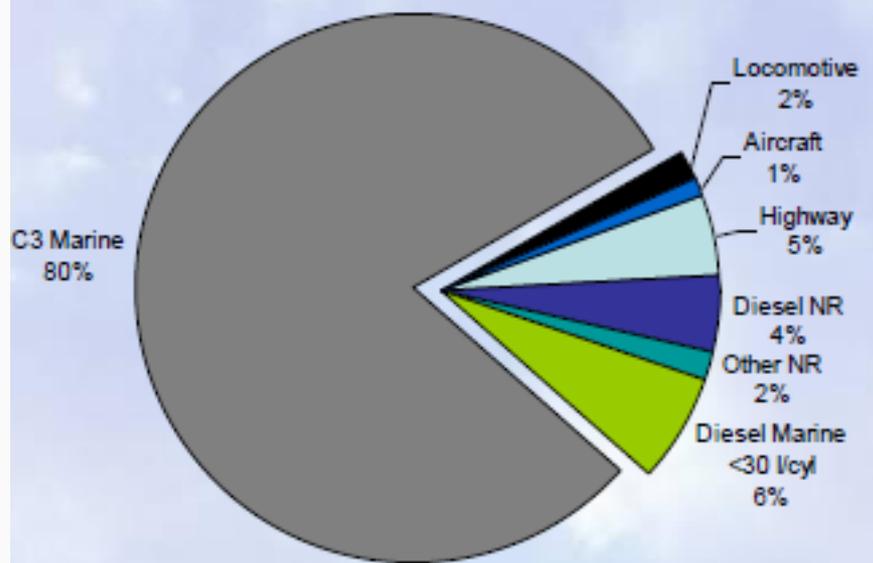


Source of inventory estimates: C3 Marine NPRM (July, 2009)
Does not reflect IMO MARPOL Annex VI Amendments (October 2008)

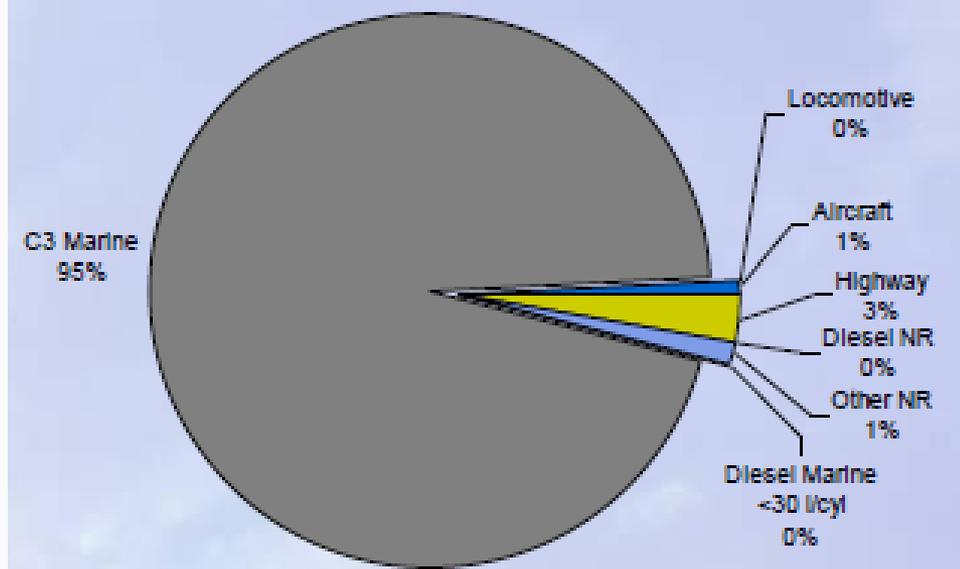


Ship Emissions Growing Percentage of the U.S. SO_x Inventory without Cleaner Fuels

2009 Mobile Source SO_x Inventory



2030 Mobile Source SO_x Inventory



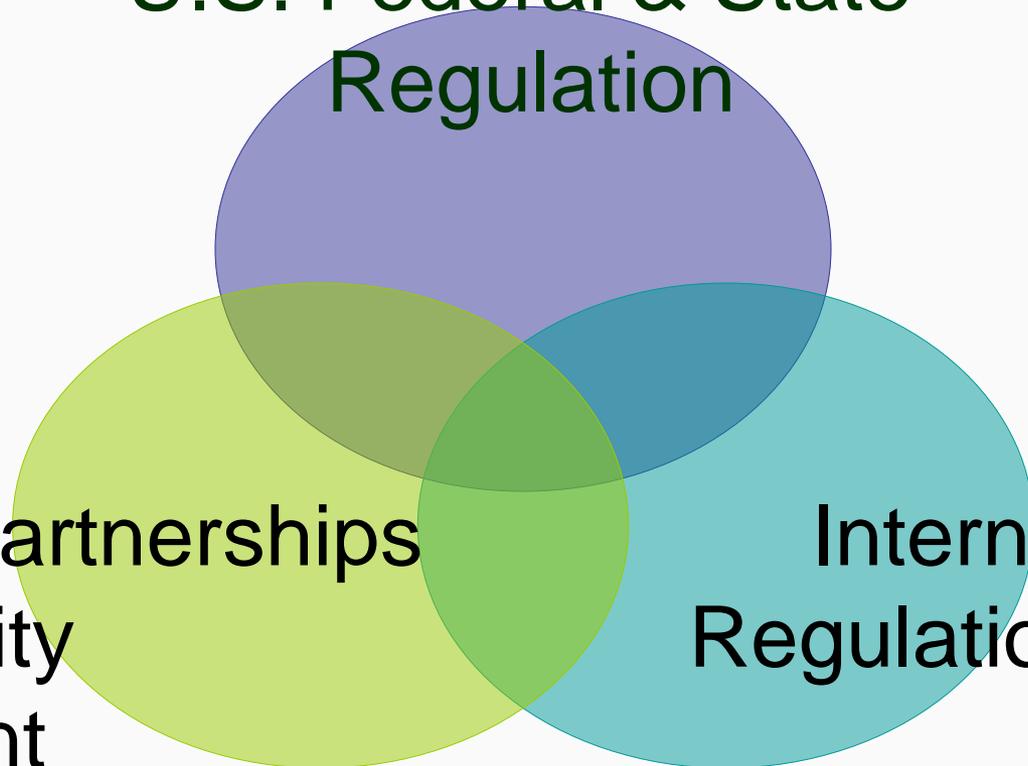


US Mechanisms to Reduce Air Pollution

U.S. Federal & State
Regulation

Voluntary Partnerships
& Community
Engagement

International
Regulation/Treaties





Examples of US EPA Marine Engine Regulations – Federal Level Regulation

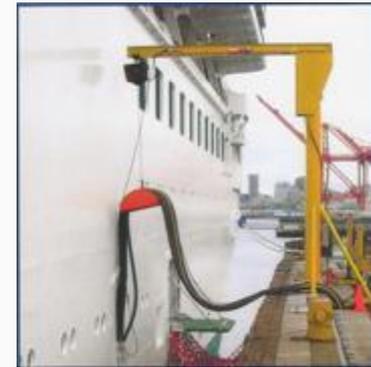
- USEPA Marine Engine Regulations
 - 1999 Marine Engine Rule
 - 2002 Recreational Engine Rule
 - 2003 Category 3 Engine Rule
 - 2008 Category 1 & 2 Engine Rule
 - 2009 Category 3 Engine Rule





Examples of California State Marine Rules & Regulations

- CARB At-Berth Ocean-Going Vessels Regulation



- Harbor Craft Regulation



- OGV Vessel Fuel Switching



- OGV Vessel Speed Reduction



Voluntary & Incentive Programs: West Coast Collaborative

www.westcoastcollaborative.org



WEST COAST COLLABORATIVE
A public-private partnership to reduce diesel emissions



Examples of Going Above and Beyond Emission Standards





Monetized Benefits

- Energy Efficiency for Ships
 - Potential to save ship operators \$34 to \$60 billion in fuel costs in 2020
- Marine Vessel Low Sulfur Fuel
 - Estimated benefits of improved air quality as a result of the fuel switching off North American shores are between \$47 and \$110 billion.
 - 5,500 and 14,000 premature deaths,
 - 3,800 emergency room visits, and
 - 4,900,000 cases of acute respiratory symptoms.



More is Needed

- Growth in global movement of goods
- Growth in population



Opportunity & Collaboration

- Build network of experts (authorities, ports, industry, academia, NGO)
- Share experience
- Learn from each other
- Continue to collaborate and work towards solutions



Thank you