



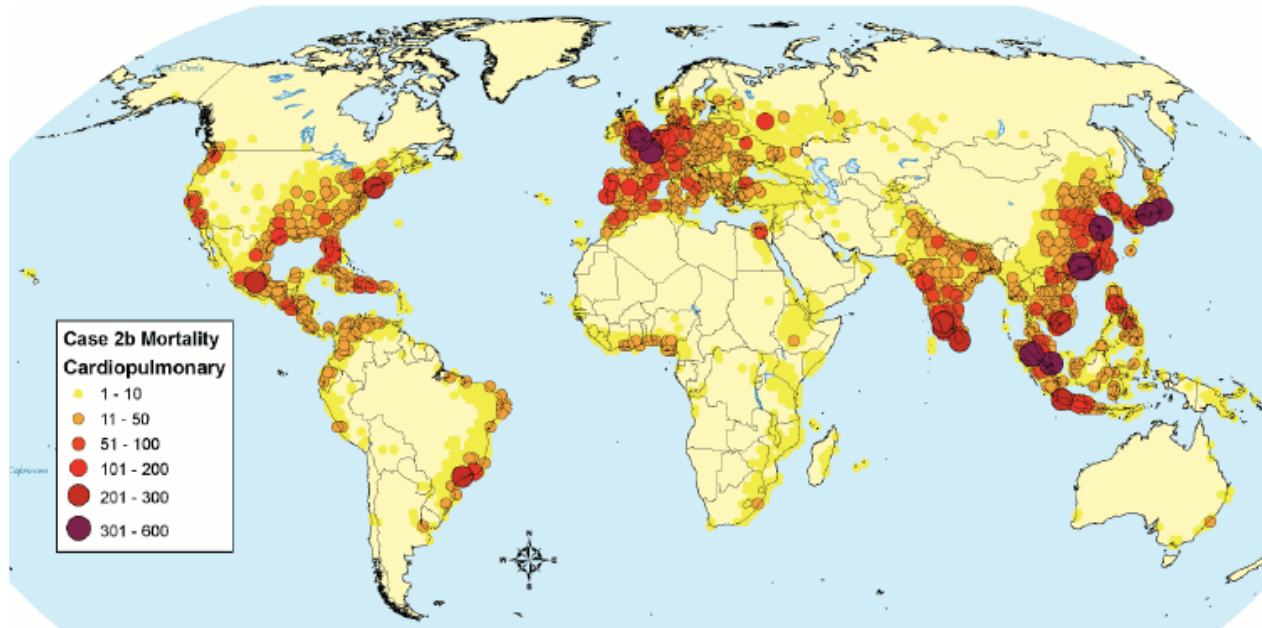
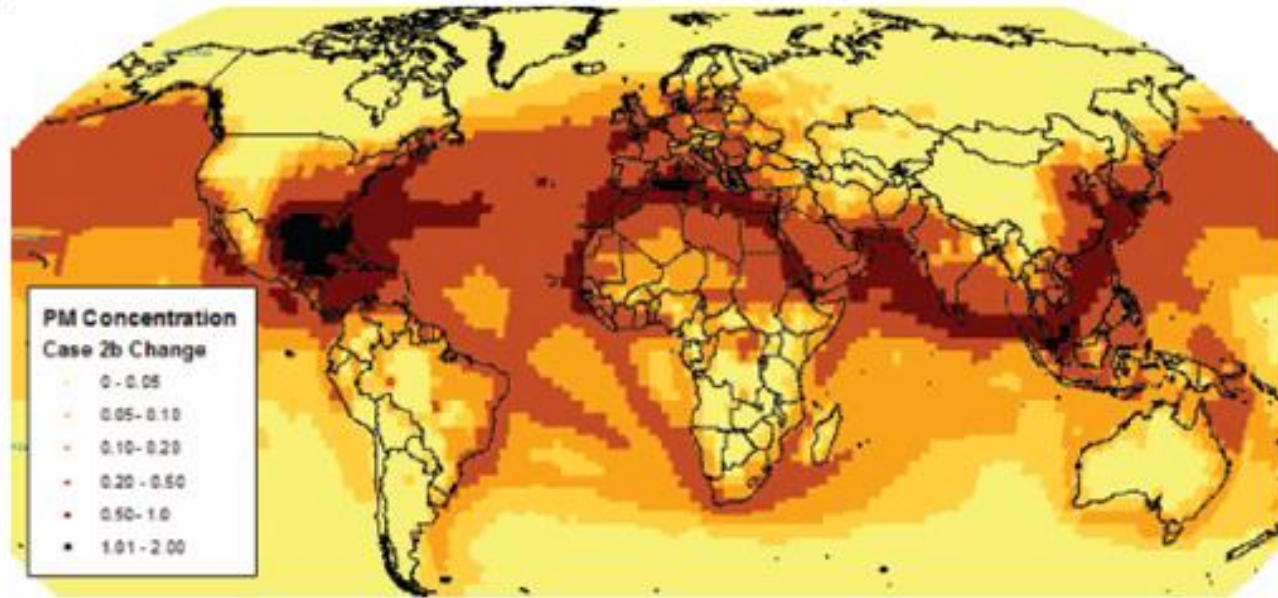
Public Health Impacts of Ship Emissions

Angela Bandemehr
U.S. EPA Office of Global Affairs and Policy

*Mexico City, Mexico
September 26, 2012*

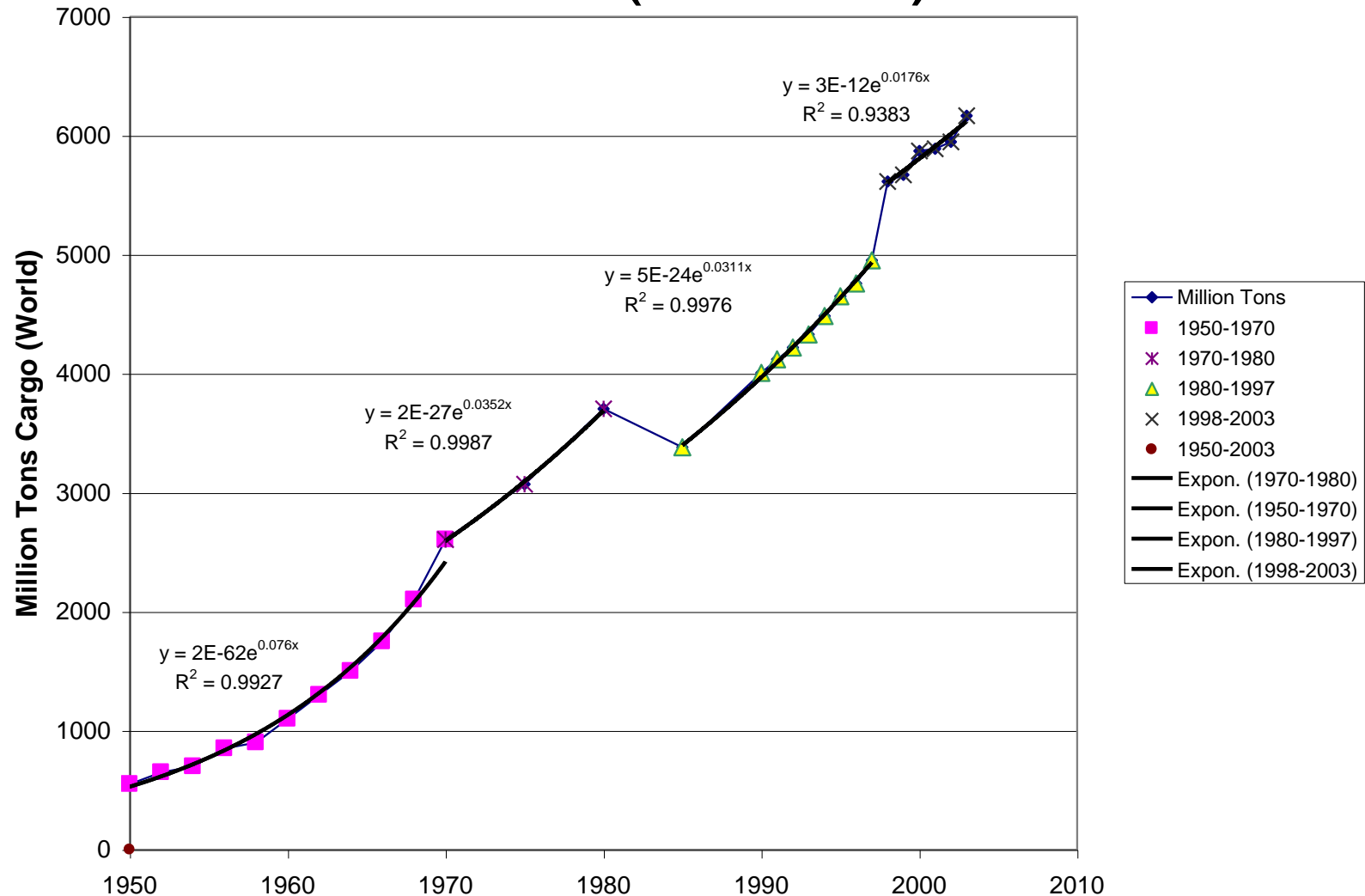
Impact of Shipping

Contribution of shipping to PM_{2.5} concentrations (in $\mu\text{g}/\text{m}^3$)

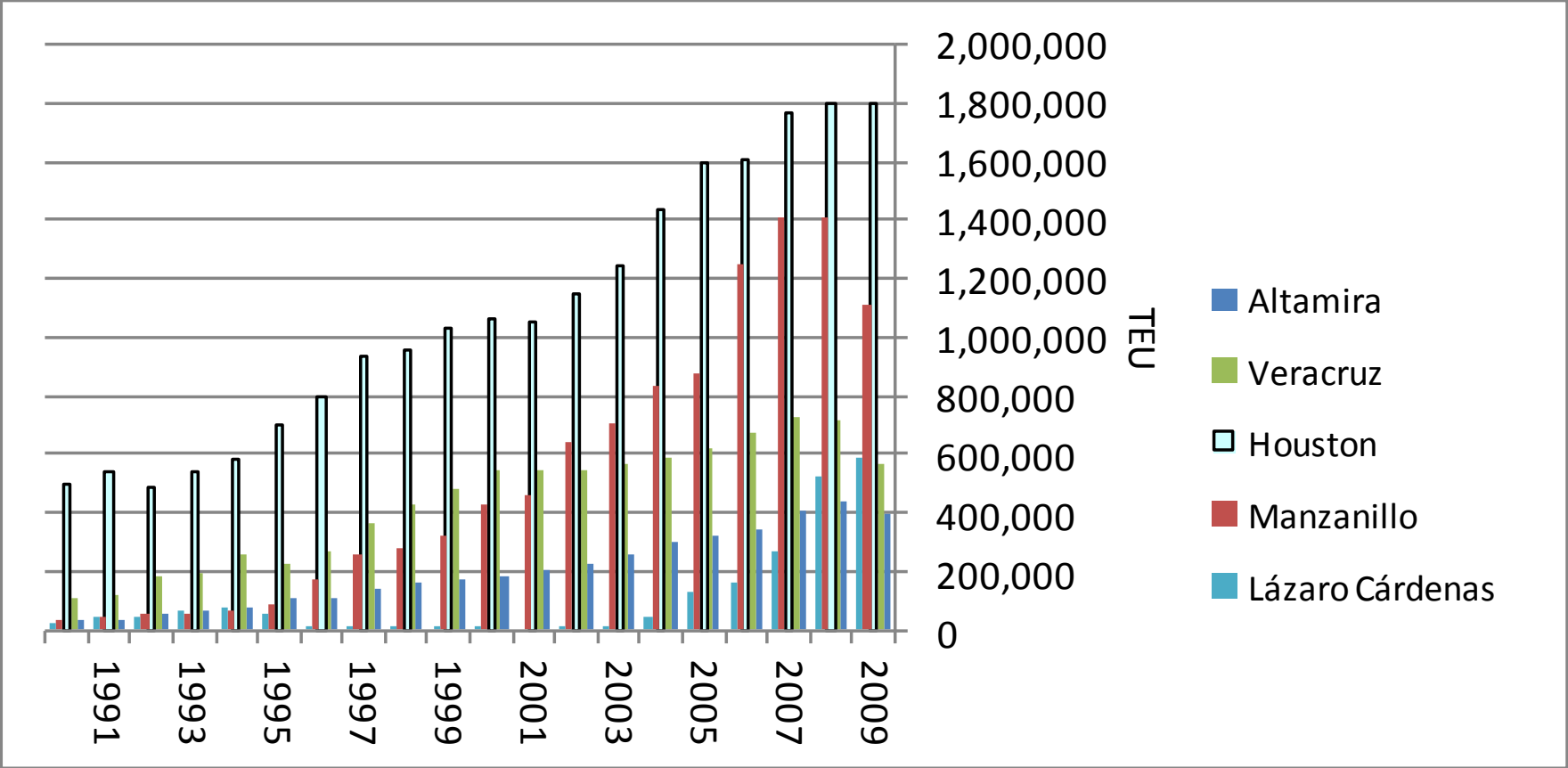


Worldwide Ship PM-Related Mortality

Cargo Movement Growth (Global)

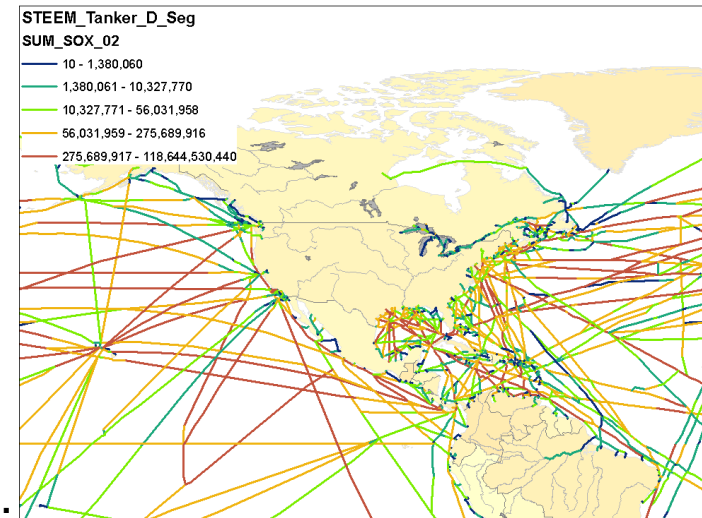
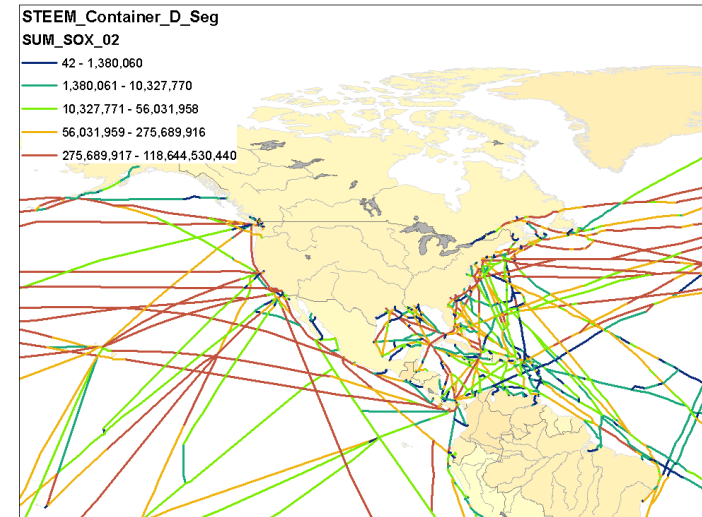
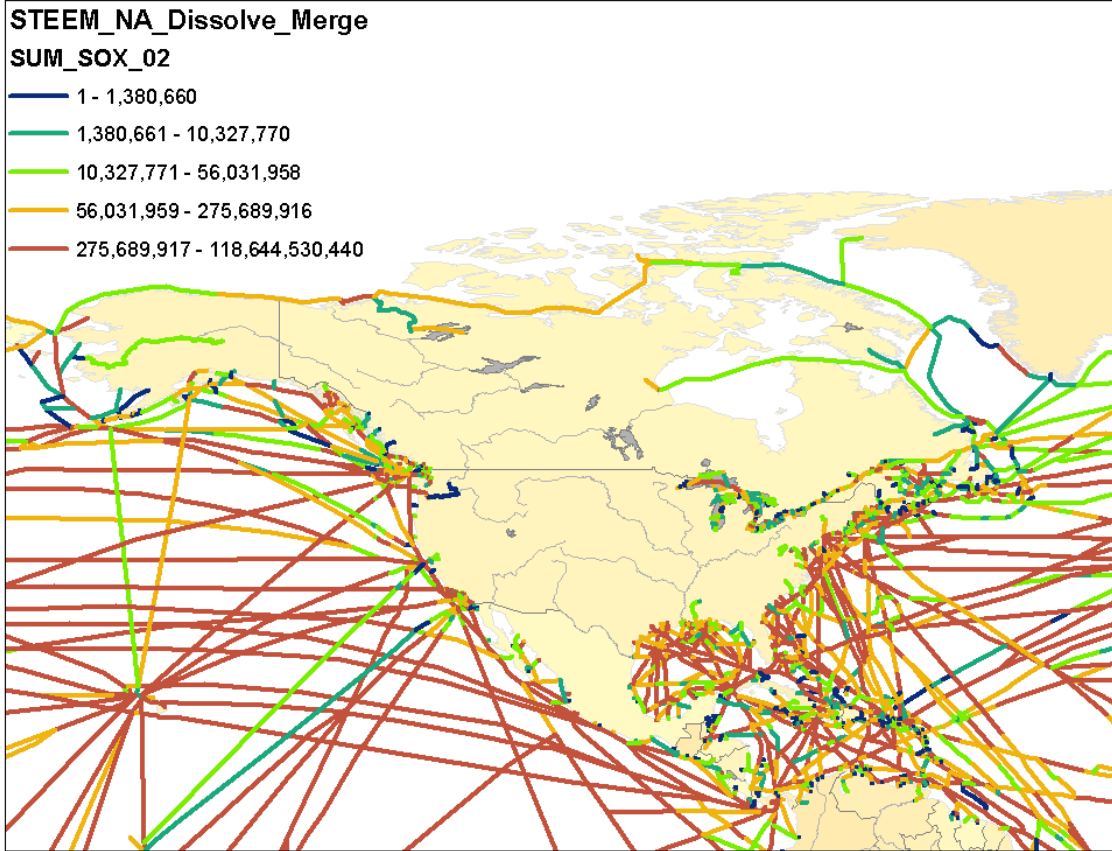


North American Port Container Traffic (1990 - 2009) by Container



Source: AAPA, North American Port Container Traffic 1990-2009

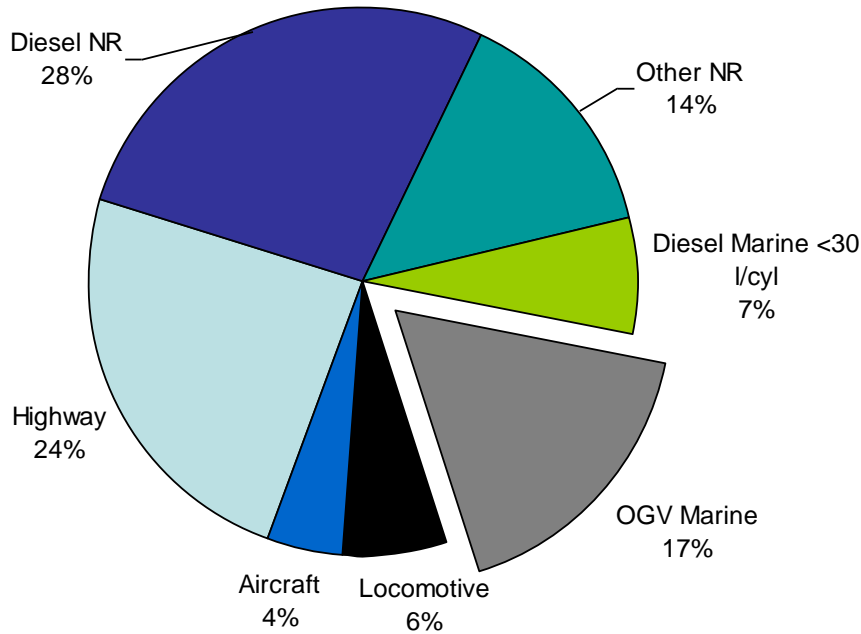
Ship Emissions by Ship Route



Units: grams/year by segment.

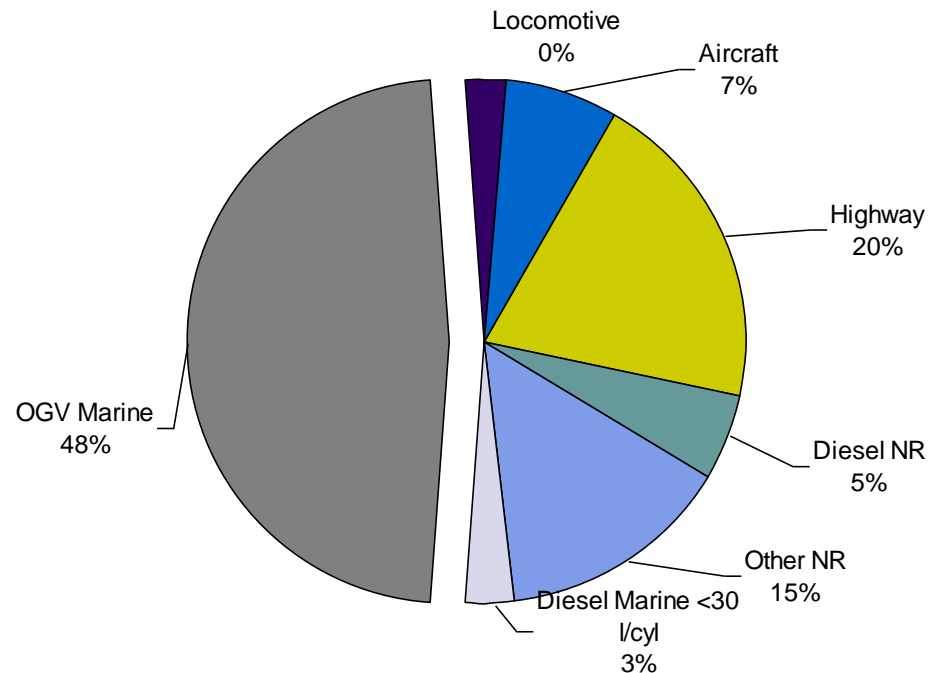
Ship Emissions in a No Action Scenario

2009 Mobile Source PM2.5 Inventory



Ship Emissions Relative to Other Transport Sources in U.S.

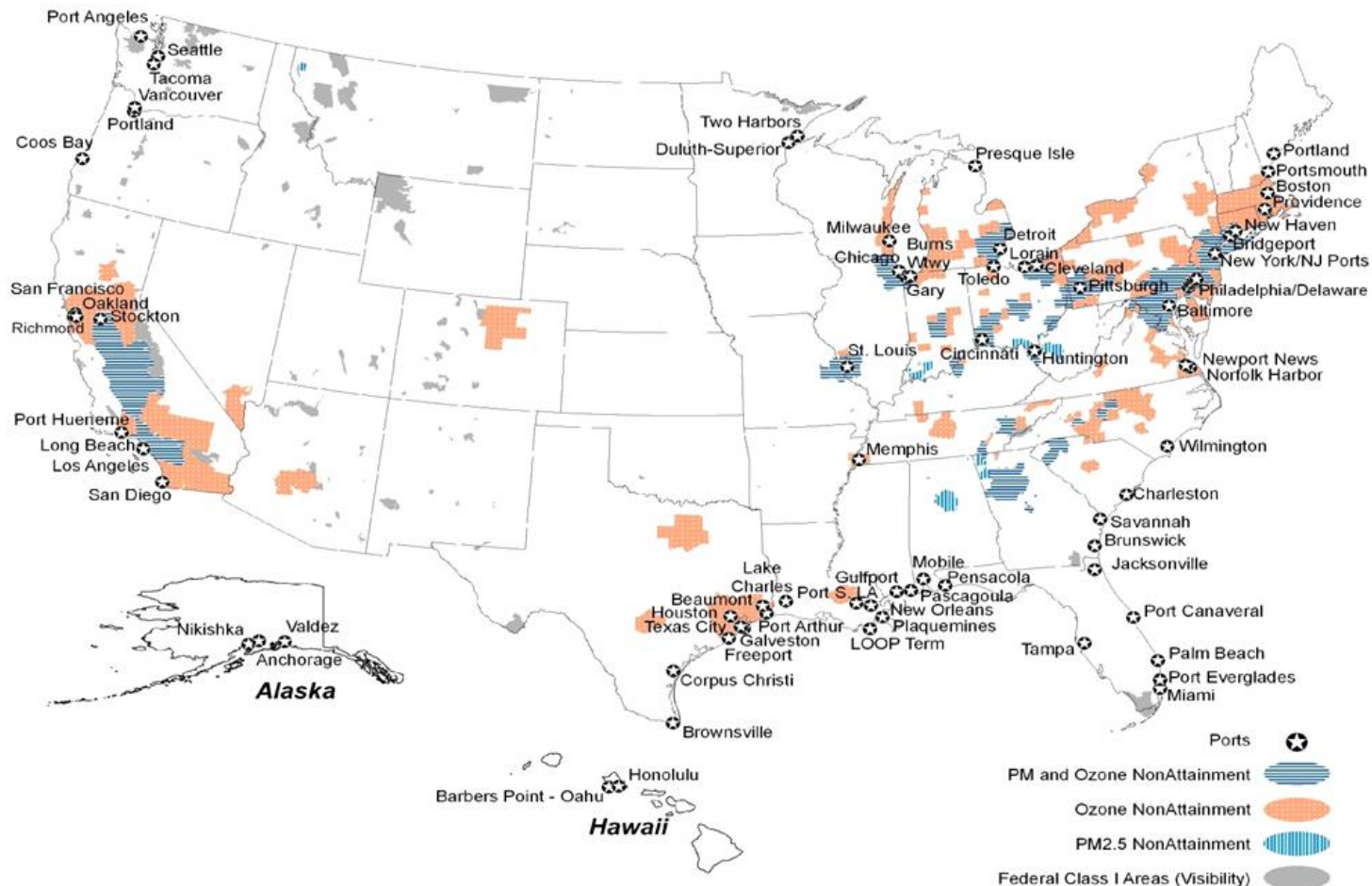
2030 Mobile Source PM2.5 Inventory



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

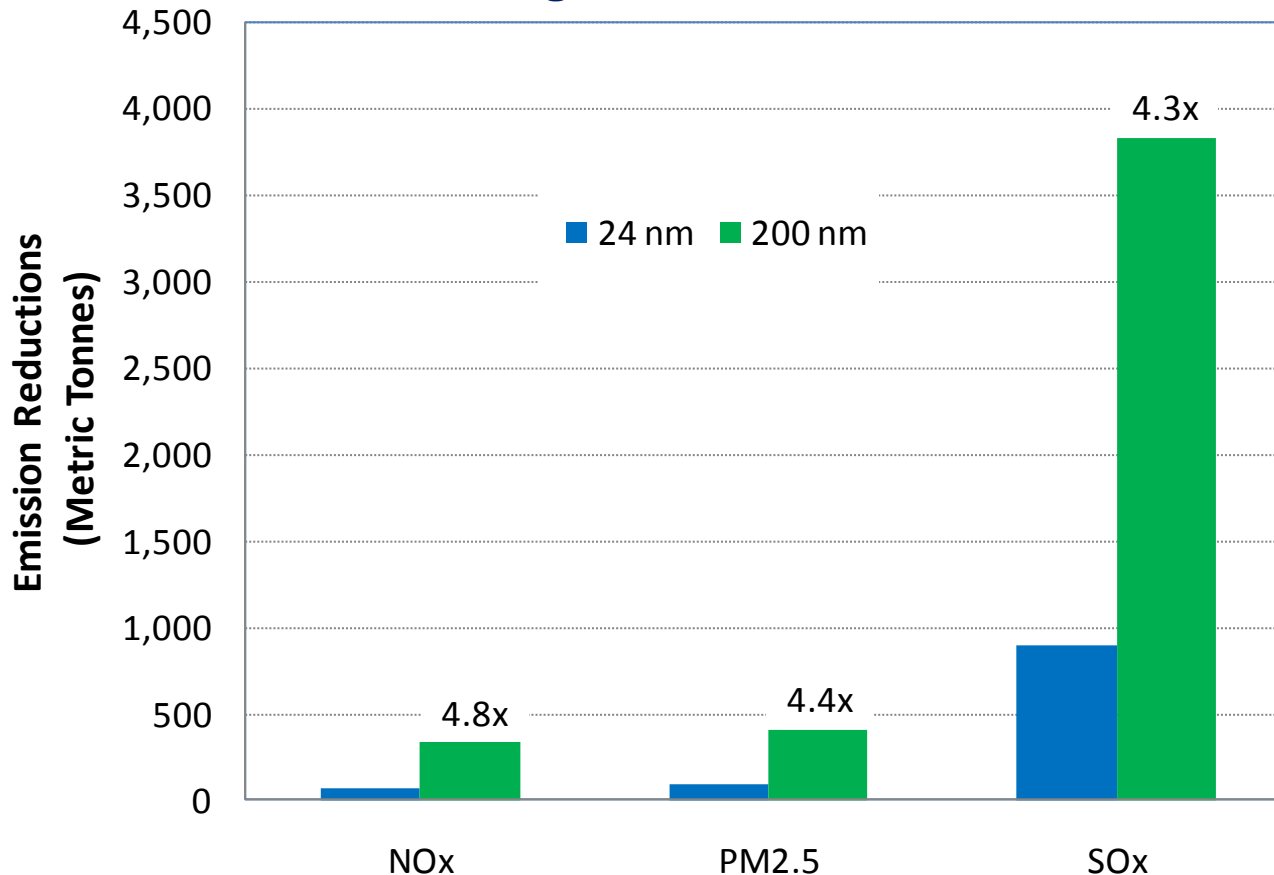
U.S. Ports and Nonattainment Areas

- More than 40 major ports are located in PM_{2.5} or ozone nonattainment areas
- About 88 million people live in 39 areas that do not meet the PM_{2.5} NAAQS or that contribute to violations in other counties



2009/2010 Fuel Switching Demonstrations

Modeling: Significant Benefit of 200 nm Fuel Switching Zone Size for Port of Veracruz



Fuel Switching



Documented pollutant reductions