Connecticut Department of Energy and Environmental Protection

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

Freight Movement and Air Quality

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SIPRAC

August 9, 2012

Connecticut Department of Energy and Environmental Protection

Connecticut's Freight Movement Study

- Goal is to develop a strategy to reduce emissions associated with freight movement in Connecticut
- de la Torre Klausmeier Consulting, Inc.
- Collect information on vehicles and practices
- Establish 2009 baseline of emissions from freight movement in the state
- Project emissions for 2020 and 2040
- Critically evaluate and identify options that could be implemented in CT
- Project the cost and environmental benefits of identified options
- Draft Report comments taken until September 6
- Finalize strategy in September

Executive Summary

- Freight movement is critical to the economy (3% of CT's jobs)
- Emissions from freight movement are a significant air pollution concern
- Current system is 92% truck based
  - Congestion issues and road maintenance costs are big
- Business as usual will result in cleaner trucks, but problems and challenges remain
- Short term win
  - Idling reductions
- Lower emissions from transportation needed:
  - Well maintained trucks, rail and port equipment
  - Idling reductions
  - Value added freight shifted to lowest emitting freight movement mode
- Regional coordination is essential and occurring

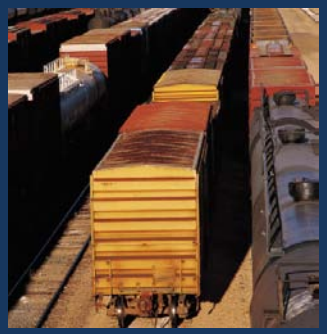
Freight Movement Impacts Air Quality

VOC
GHG
NO_x

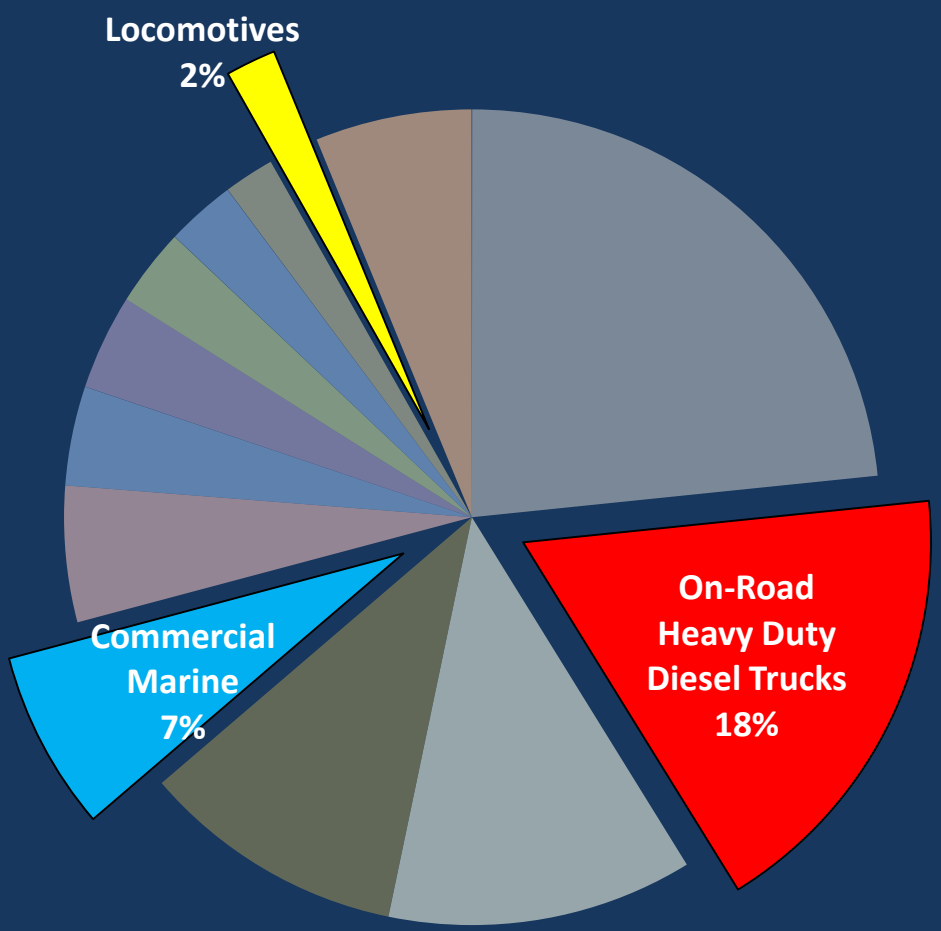
VOC
SO_2
PM
NOx
GHG

VOC
PM
GHG
NO_x

VOC
SO_2
PM
NOx
GHG



Connecticut's Freight-Related NOx Emissions are Significant*



2008 Total NOx: 91822 tons/year

- Mobile - On-Road Gasoline Light Duty Vehicles
- ***Mobile - On-Road Diesel Heavy Duty Vehicles***
- Mobile - On-Road Diesel Light Duty Vehicles
- Mobile - Non-Road Equipment - Diesel
- ***Mobile - Commercial Marine Vessels***
- Fuel Comb - Residential - Oil
- Waste Disposal
- Mobile - Non-Road Equipment - Gasoline
- Mobile - Non-Road Equipment - Other
- Fuel Comb - Electric Generation - Coal
- Fuel Comb - Residential - Natural Gas
- ***Mobile - Locomotives***
- Other

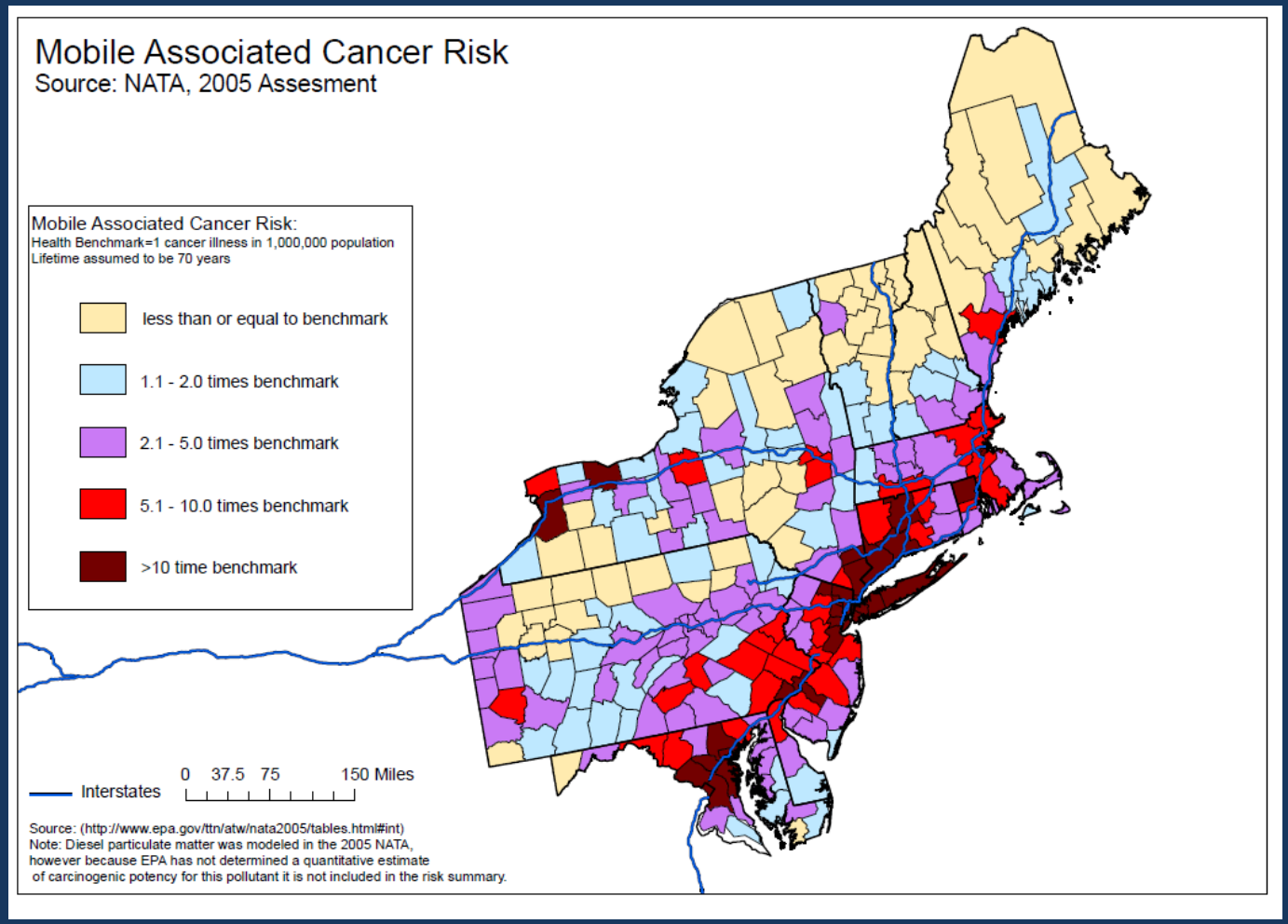
Source: EPA 2008 National Emissions Inventory (version 2; released April 10, 2012)

*** Most emissions from the heavy duty diesel truck, commercial marine and locomotive categories are freight-related.**

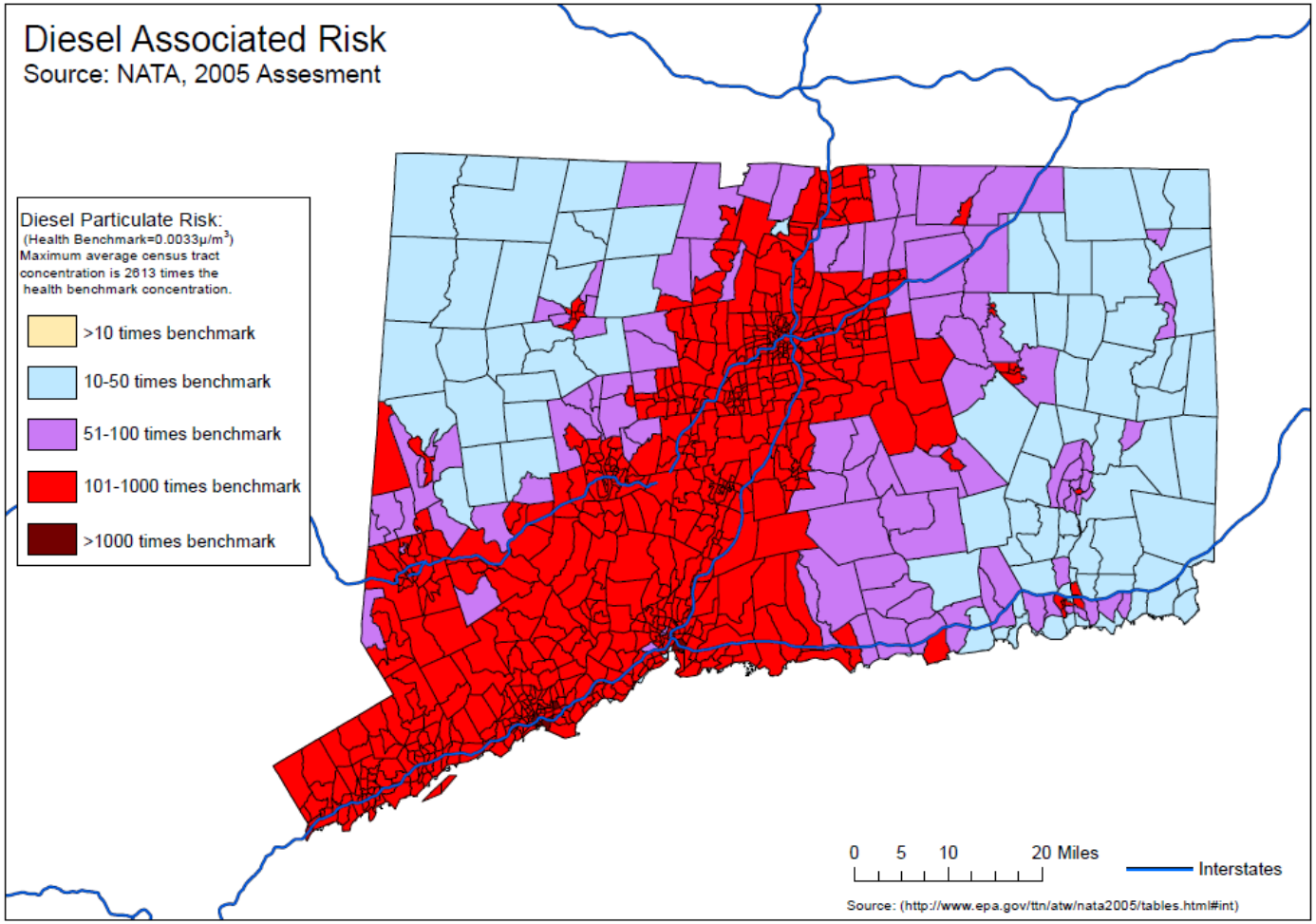
Health Effects of Ozone and $PM_{2.5}$

- **Ozone & $PM_{2.5}$:** airway irritation; reduced lung capacity; asthma aggravation; permanent lung damage
- **$PM_{2.5}$:** irregular heartbeat; heart attacks; premature death in those with heart or lung disease
- **Benefits of Attainment:** EPA estimates $2-17 billion for ozone and $17-35 billion for $PM_{2.5}$

Health Risks-Cancer

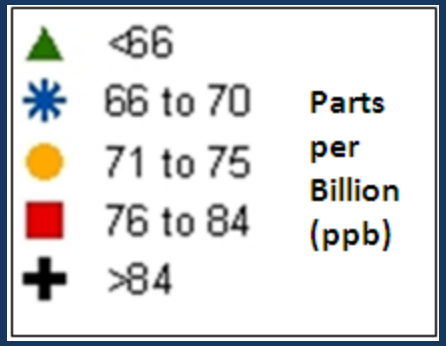


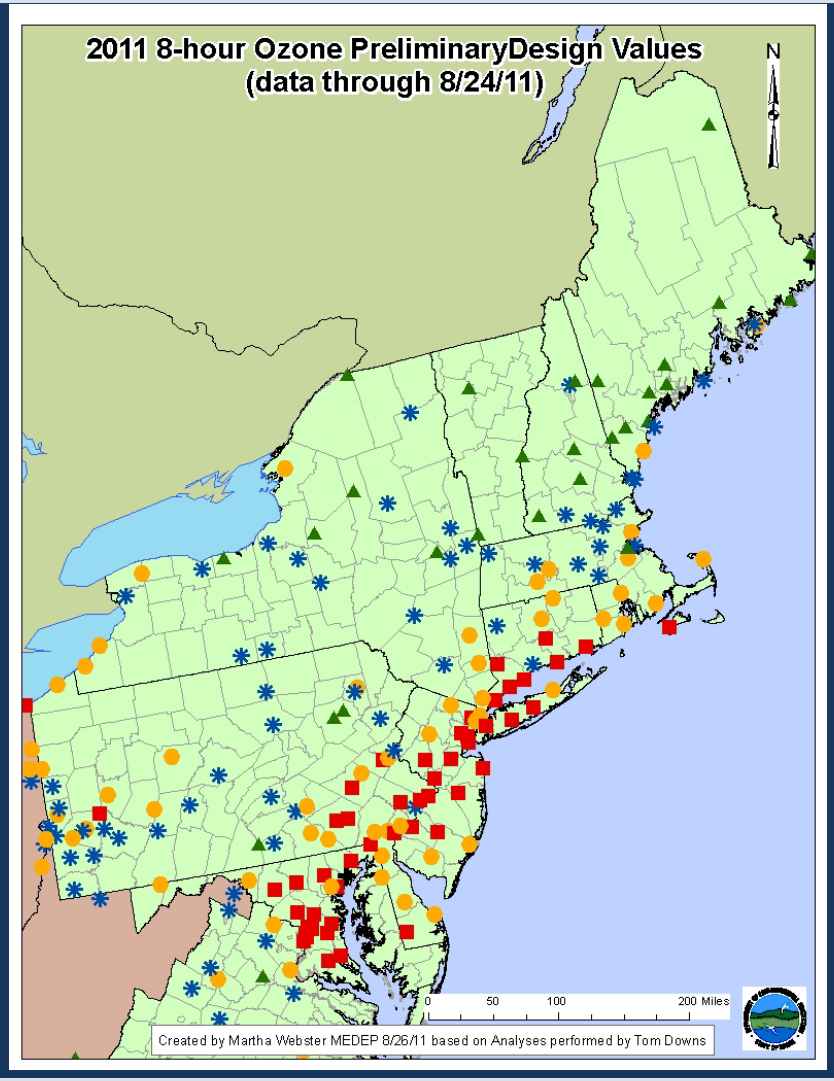
Health Risks-Diesel Associated



Air Quality in CT and throughout the I-95

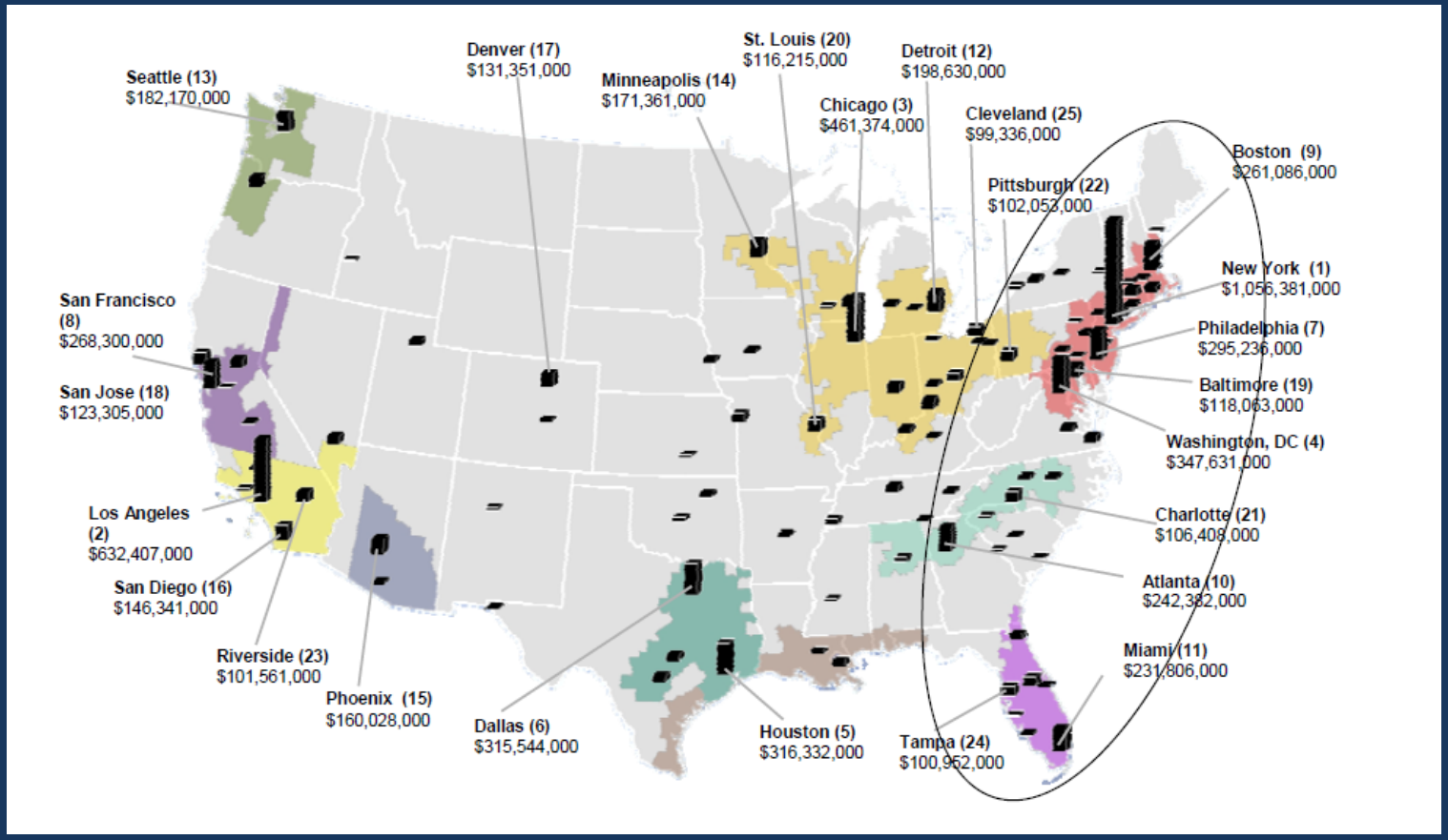
Corridor Fails to Meet Health-Based Ozone Standard (75 ppb)





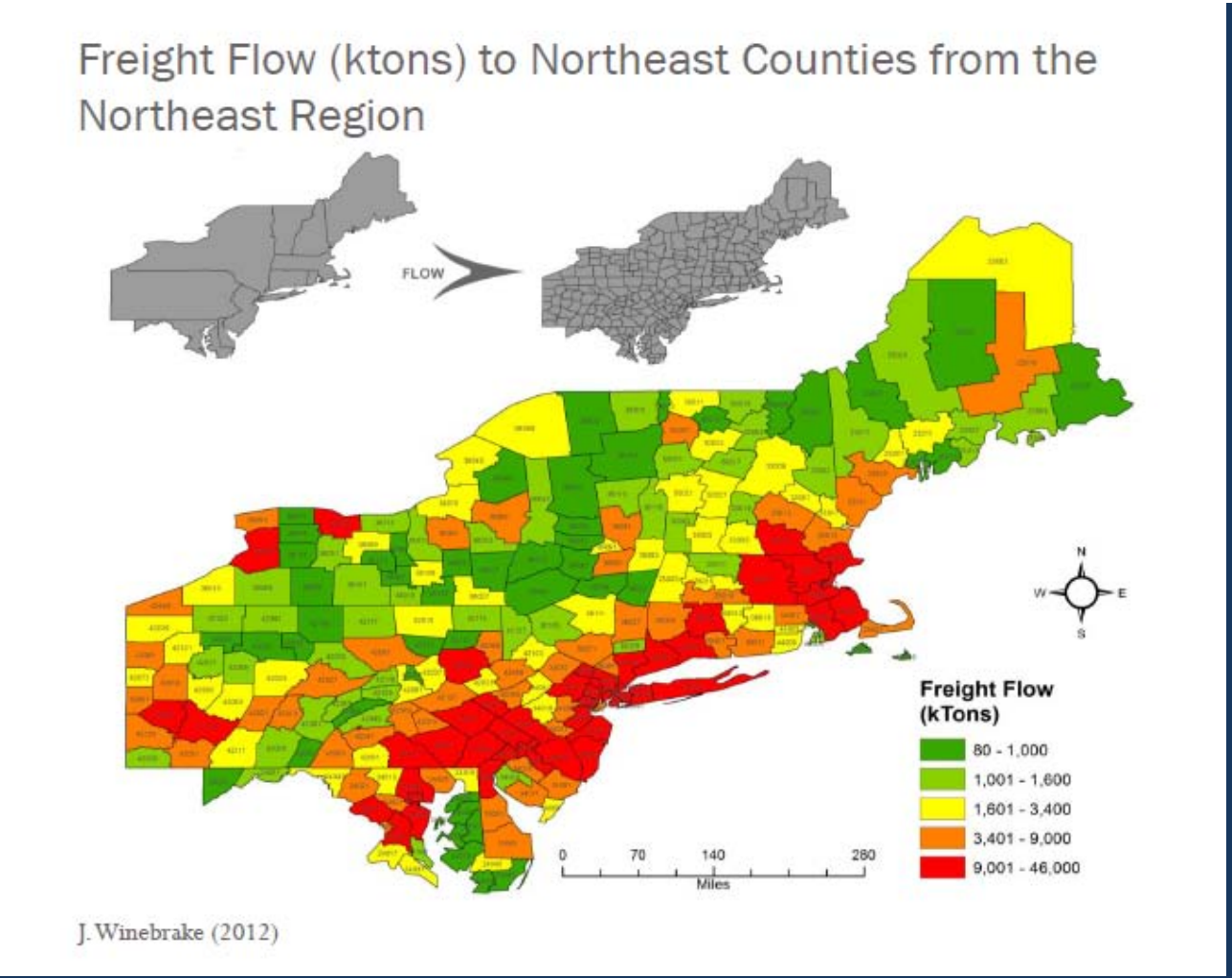
Trade and Freight are Regional Issues

Megaregion Trade Areas and GDP of Major U.S. Cities

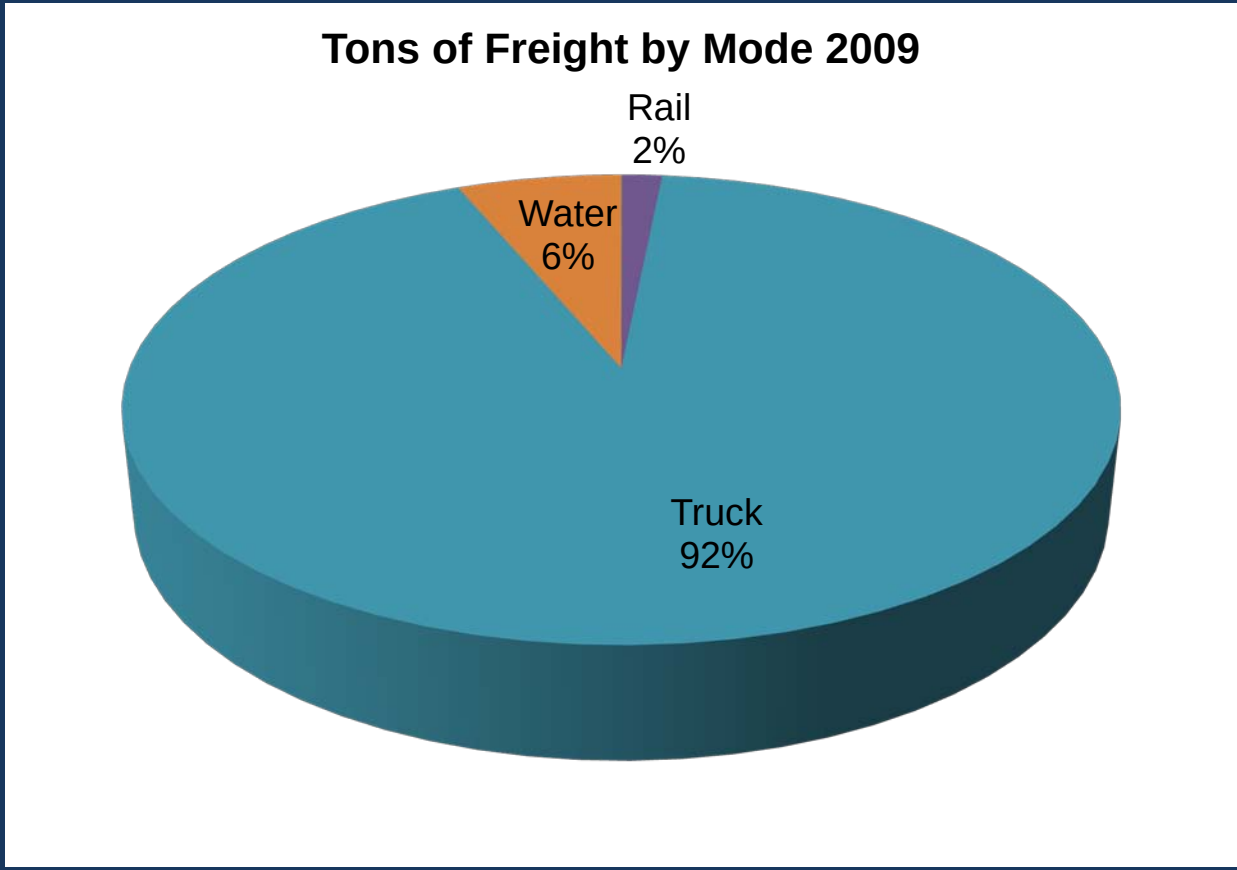


I-95 Corridor Coalition, 2008, A 2040 Vision for the I-95 Coalition Region *Supporting Economic Growth in a Carbon-Constrained Environment*

Freight Flows throughout the Northeast

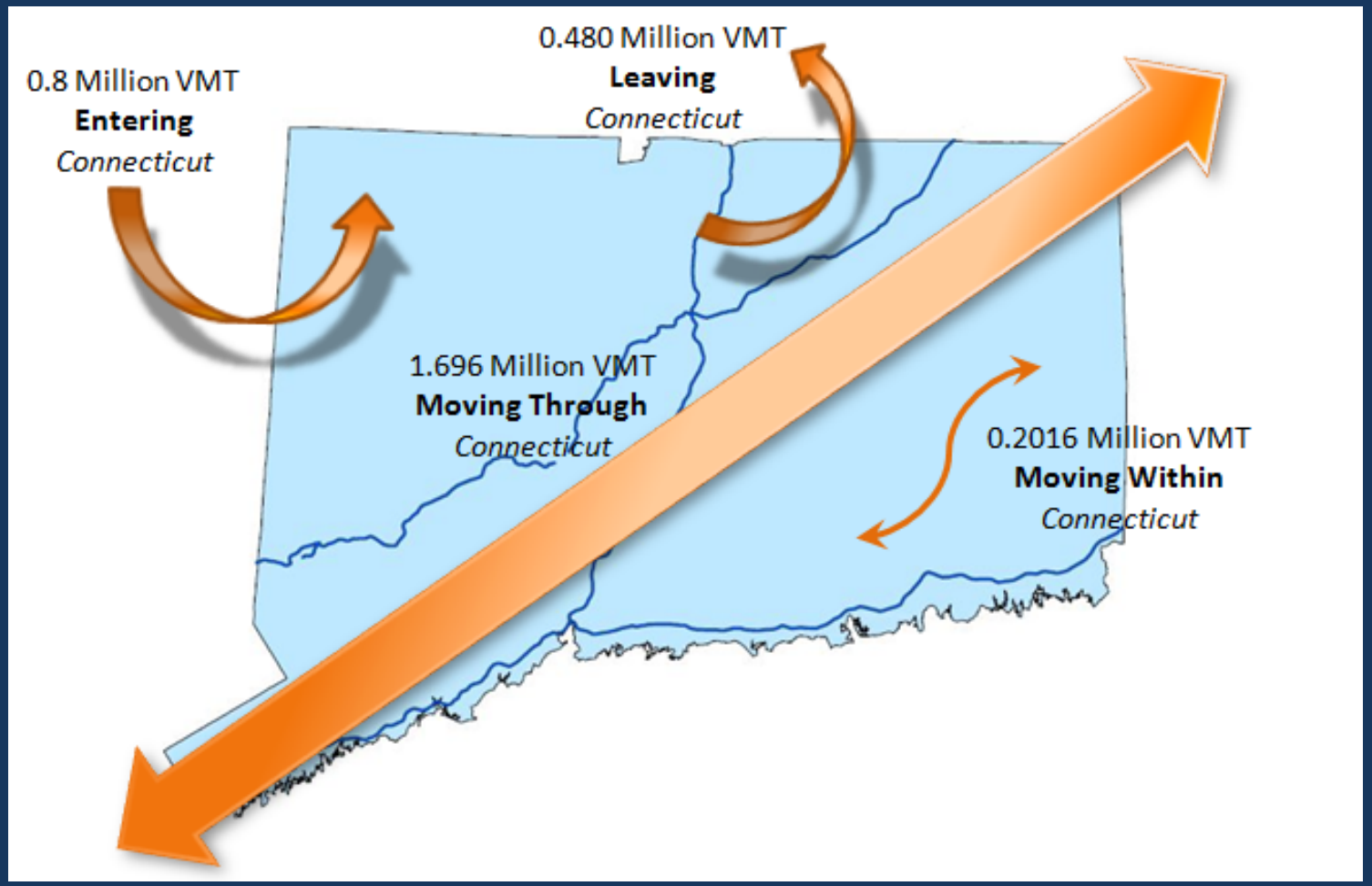


Modes of Transported Freight in CT

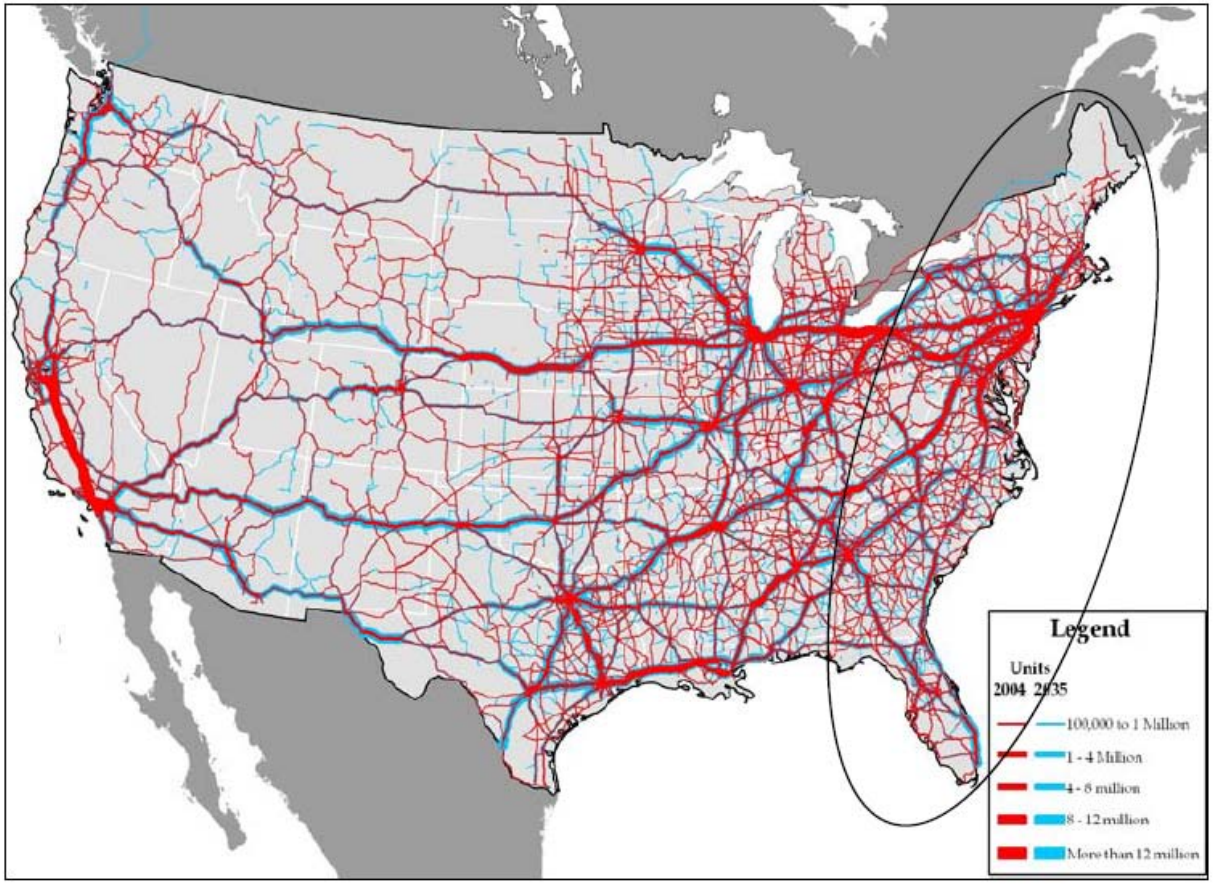


de la Torre Klausmeier Consulting, Inc, *"SUMMARY OF TRUCK FREIGHT MOVEMENT IN CONNECTICUT"* , April 2012

3.2 million VMT per day is attributed to freight movement in Connecticut (2009):

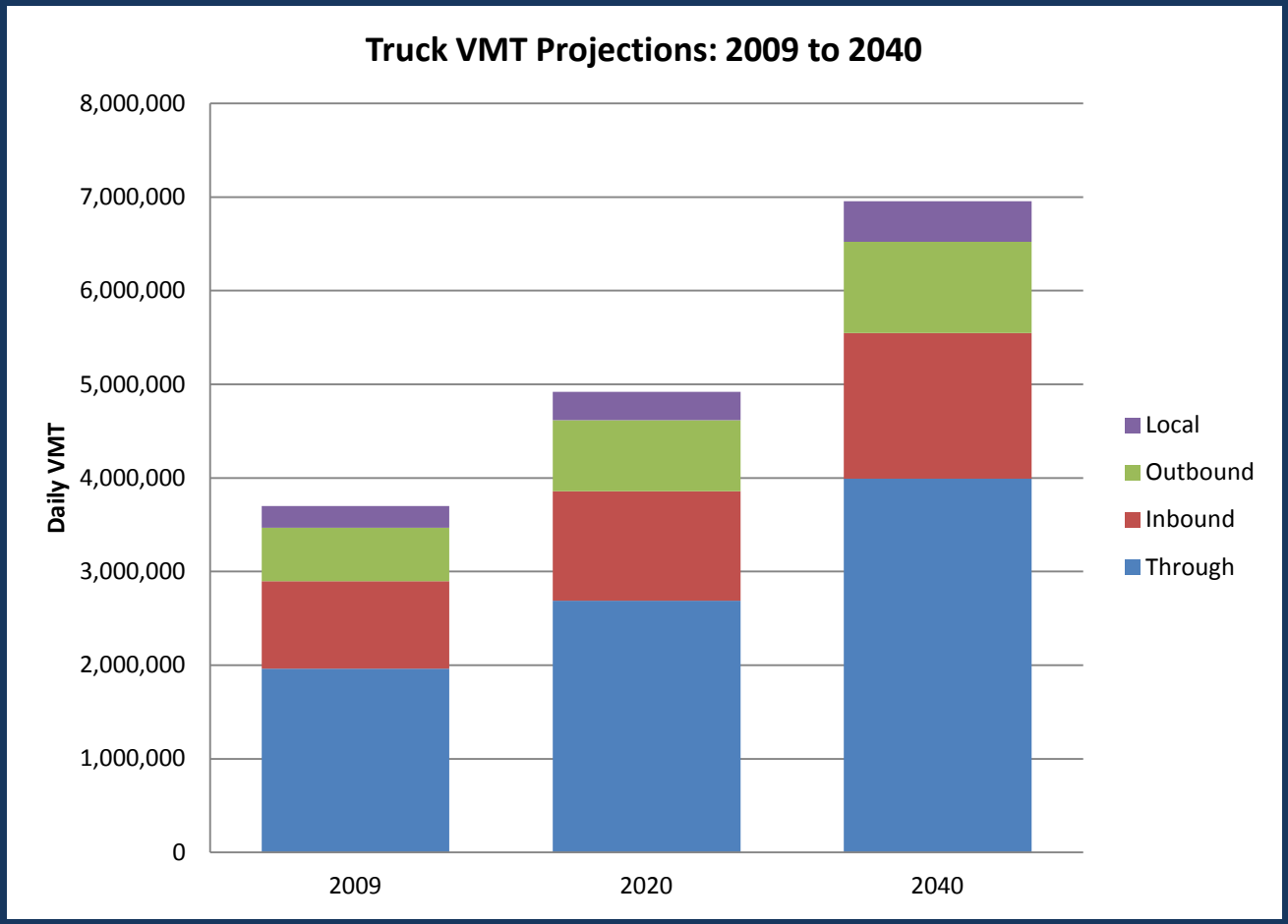


Projected Truck Volumes Nearly Double by 2035



Source: Global Insight 2004 TRANSEARCH for AASHTO Freight Bottom Line Reports.

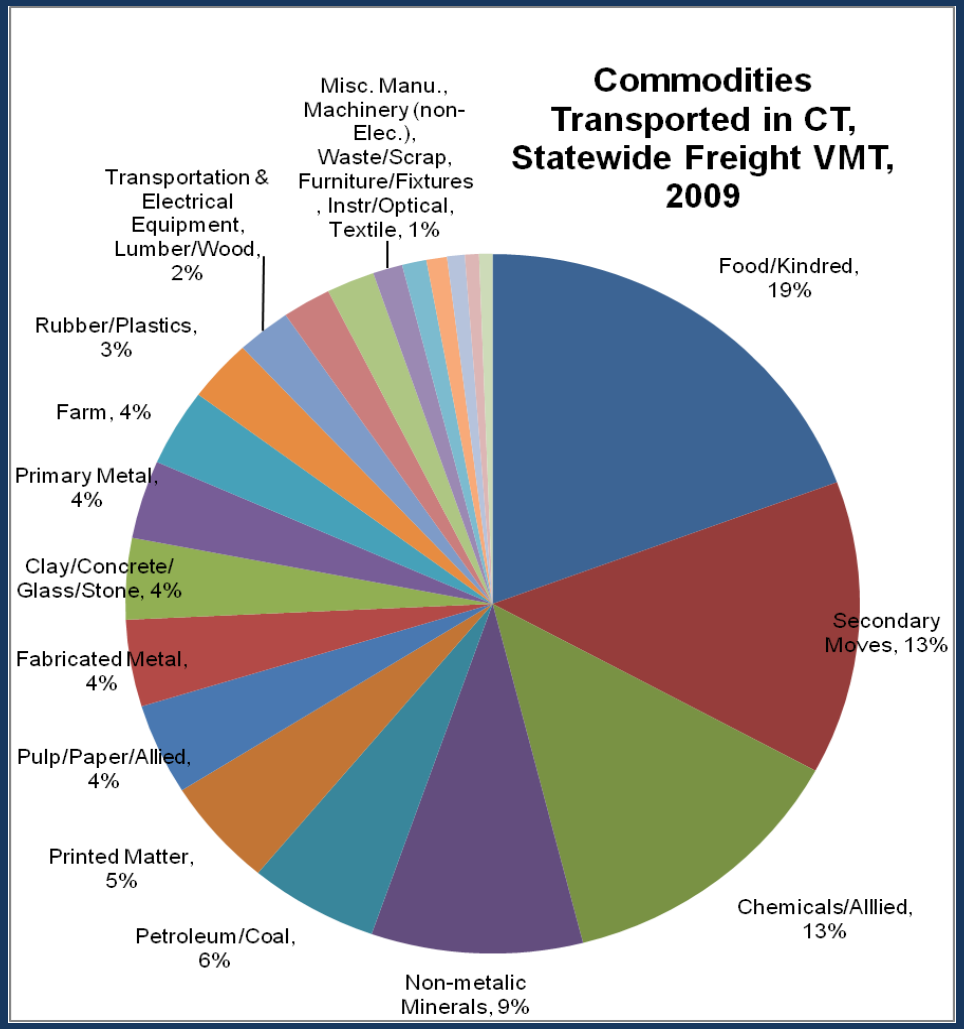
Connecticut Freight VMT Growth



More Freight Will Come through Port of NY

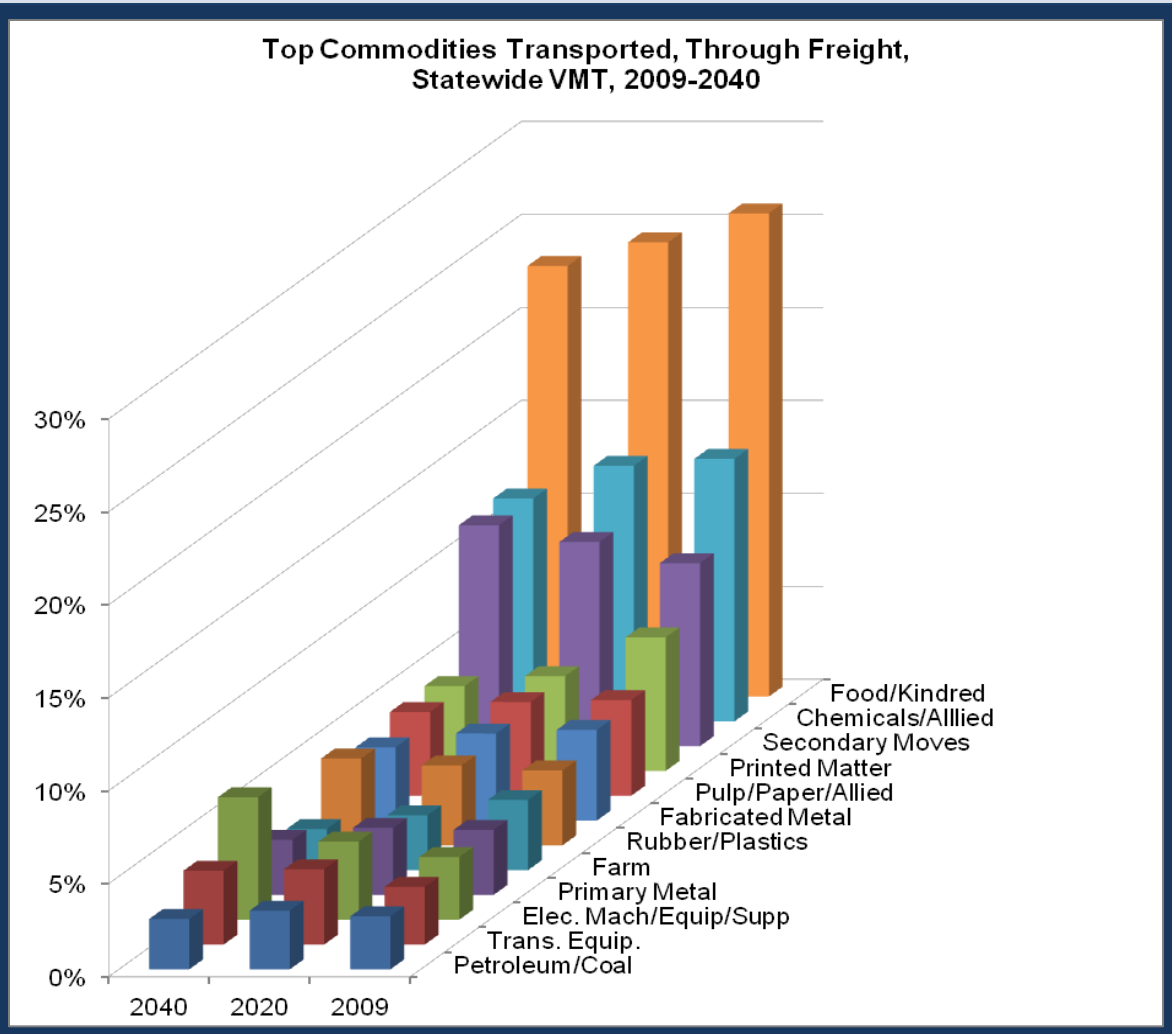
(Source: Worley Parsons, Richard West)

Categories of Transported Freight in CT



de la Torre Klausmeier Consulting, Inc, *"SUMMARY OF TRUCK FREIGHT MOVEMENT IN CONNECTICUT"* , April 2012

Predicted Freight Trends through 2040



de la Torre Klausmeier Consulting, Inc, *"SUMMARY OF TRUCK FREIGHT MOVEMENT IN CONNECTICUT"* , April 2012

Congestion Will Get Worse

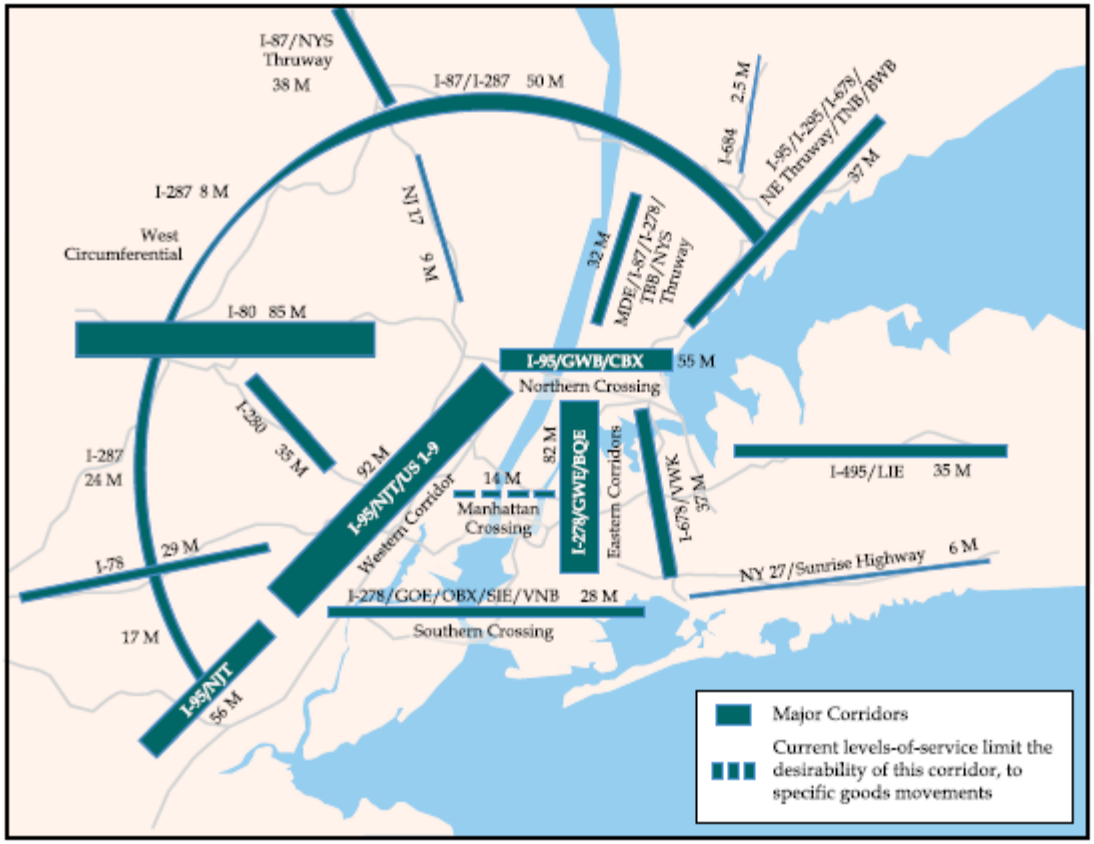
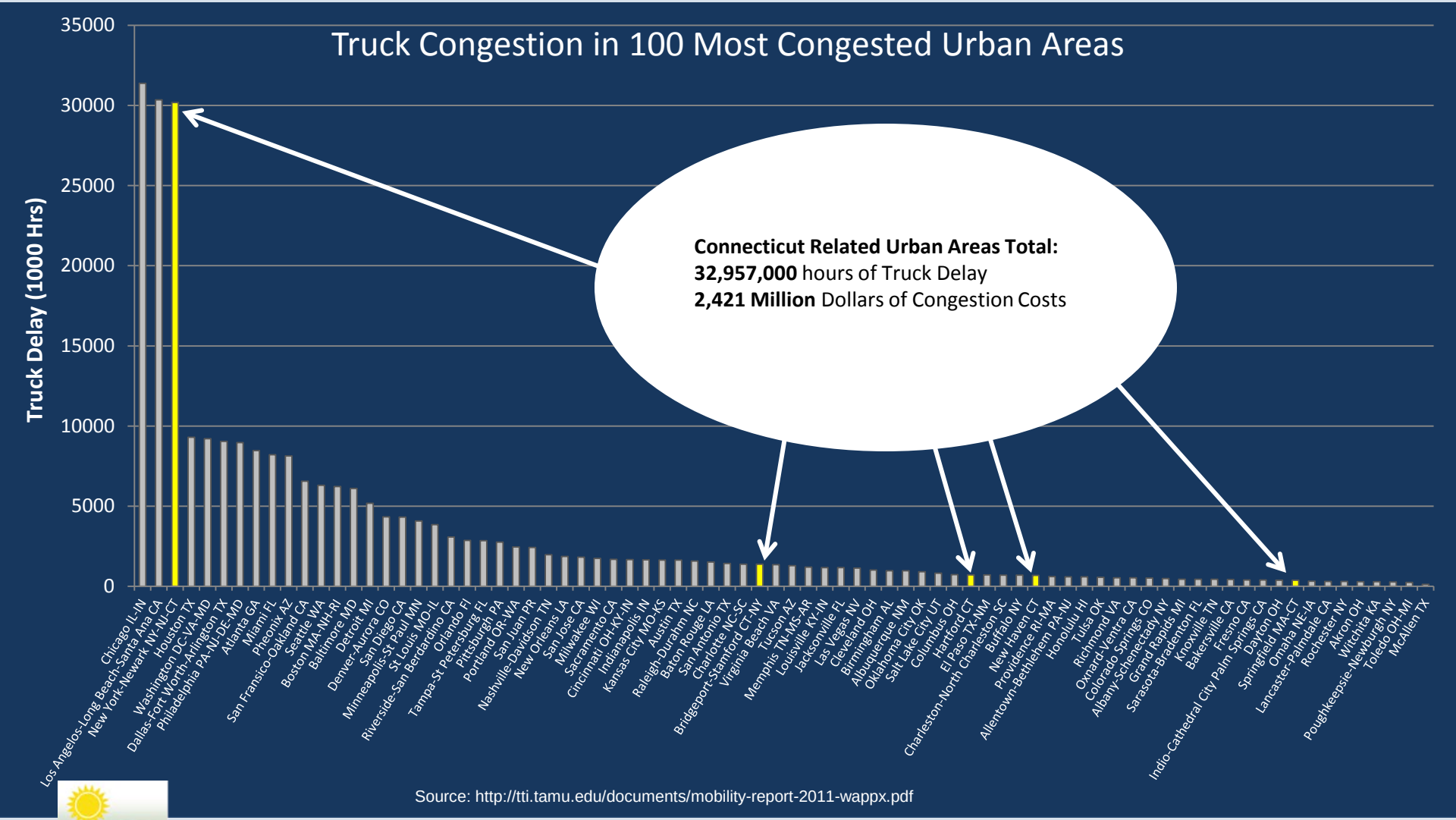


Figure 7: In this figure, the width of each line represents the volume of truck freight that moves along the indicated corridor. This means that the wider the line, the higher the volume of freight traveling along the corridor.

Reference: NYMTC, The Basics of Freight Transportation in the New York Region

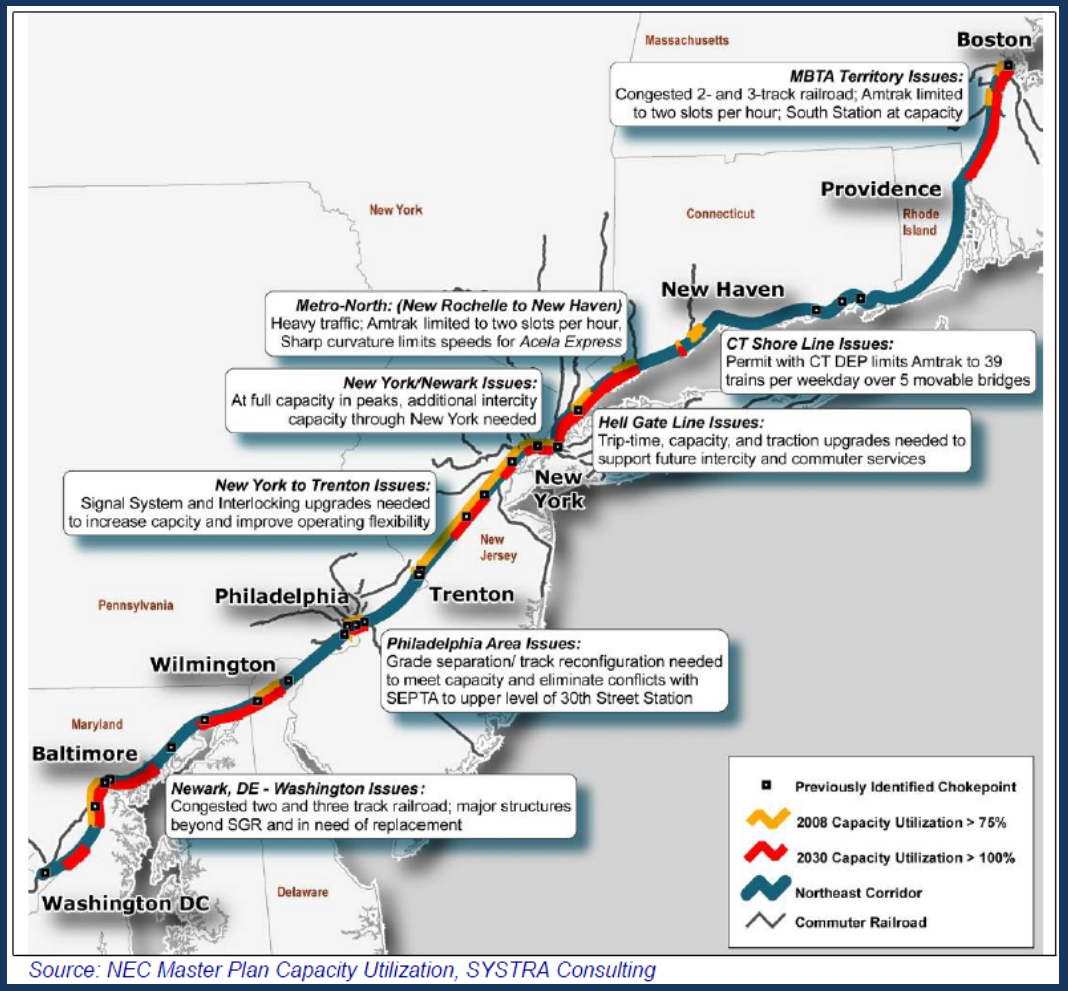
Congestion Delay Costs $ and Increases Emissions



Source: http://tti.tamu.edu/documents/mobility-report-2011-wappx.pdf

Rail Constraints

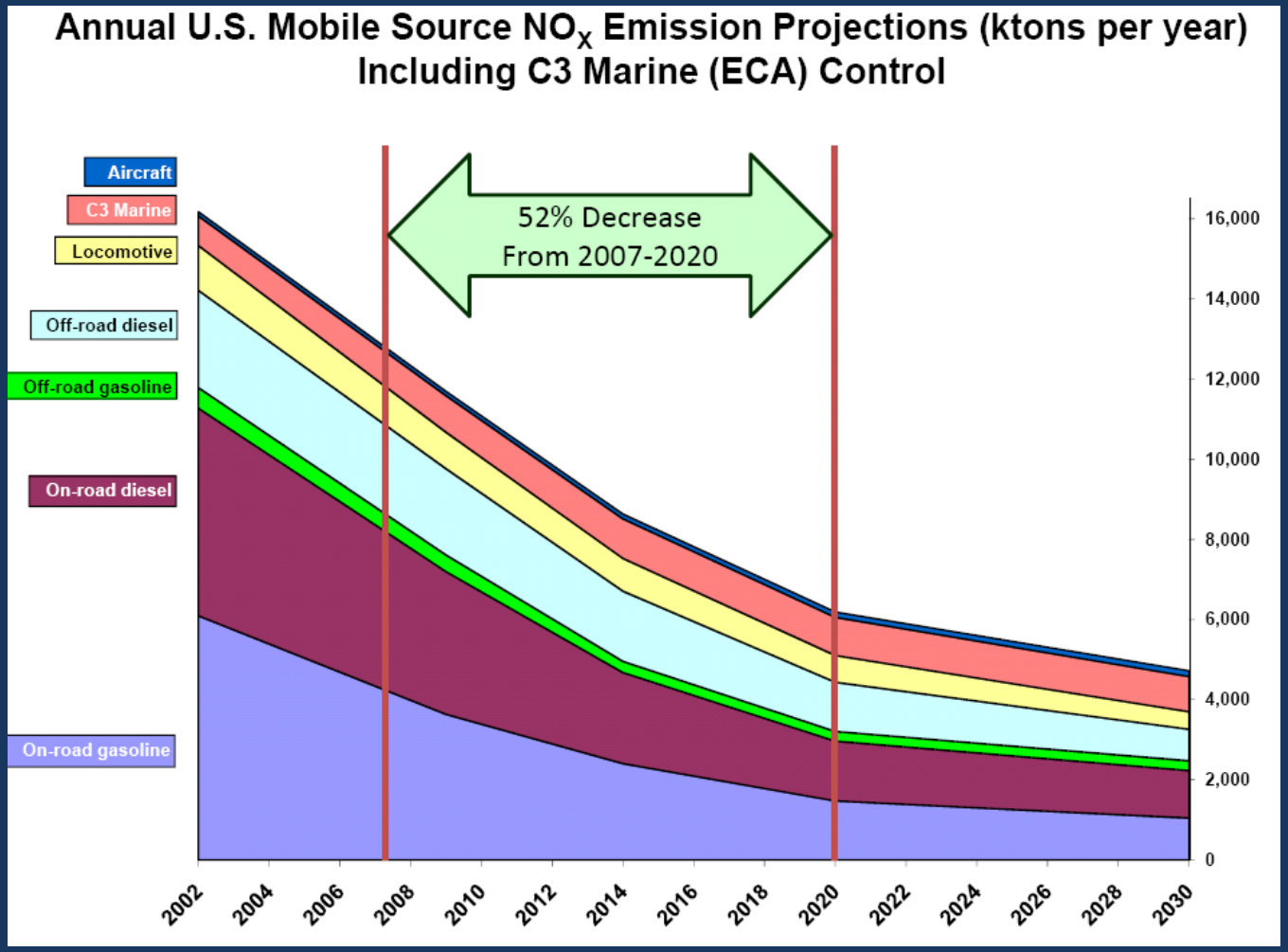
Capacity Constraints on the NEC



Source: NEC Master Plan Capacity Utilization, SYSTRA Consulting

NEC, 2009, Northeast Corridor Infrastructure Plan

EPA Actions Will Reduce Freight Emissions



EPA Initiatives - Highway

Regulation

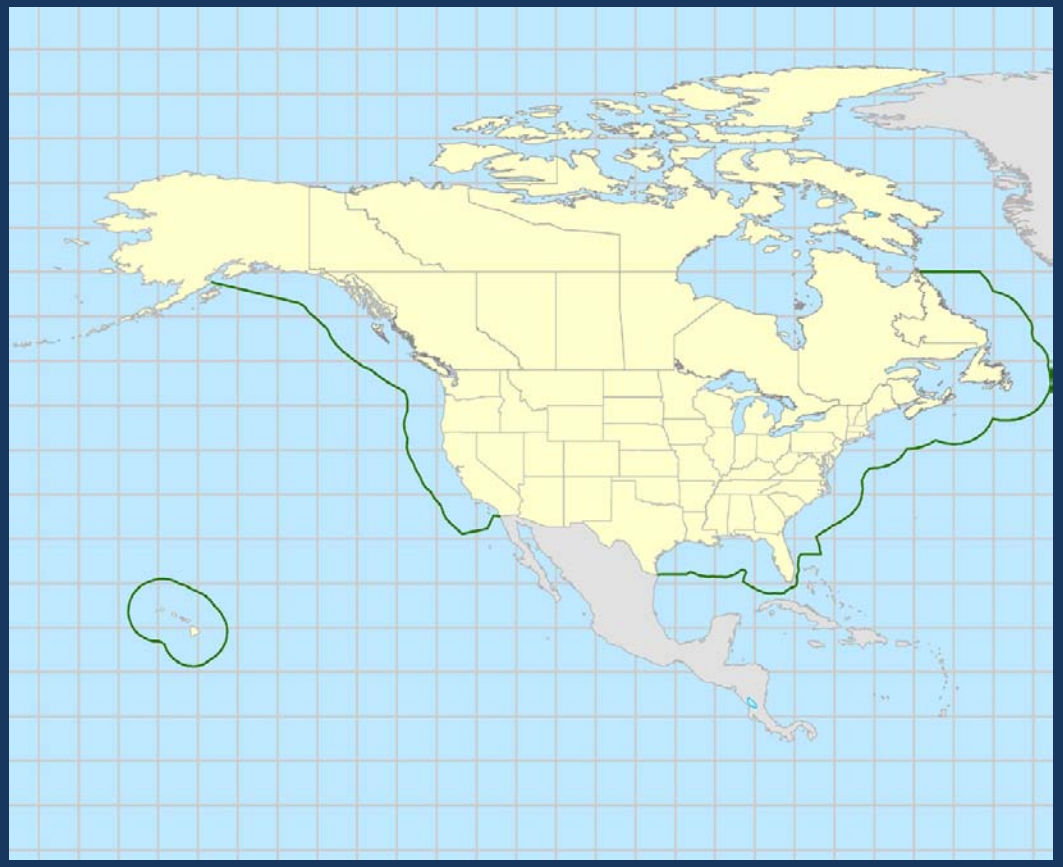
- **2006:** Low Sulfur Diesel Fuel (< 15 ppm)
- **2007:** Heavy Duty Highway Engines and Vehicles
- **2010:** NO_x and Non-Methane Hydrocarbons
- **2011:** Program to Reduce Greenhouse Gas Emissions and Improve Fuel Efficiency of Medium- and Heavy-Duty Vehicles

Voluntary

- **2003:** SmartWay program

EPA Initiatives- Ships

- IMO North American Emission Control Area
  - Reduces emissions by fuel switching (2012-2016)
- EPA Marine Diesel Engine Standards
  - Varies with size
  - Phased in 2012 to 2017



EPA Initiatives- Rail

Regulatory: EPA Rules

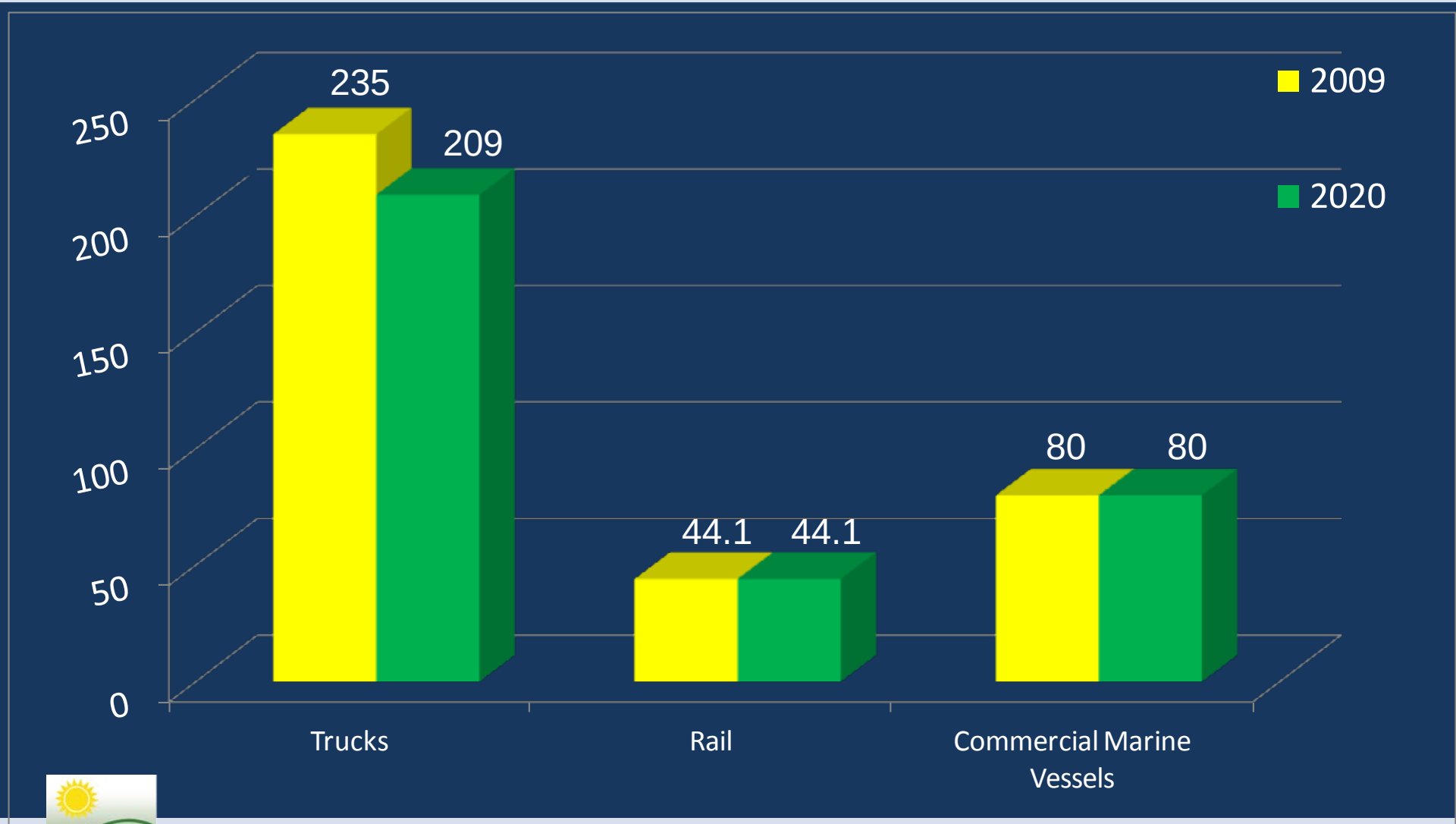
- 2008 Locomotive and Marine Emission Standards
- 2008 Locomotive Idle Emissions Standards (new & rebuilt)

Voluntary:

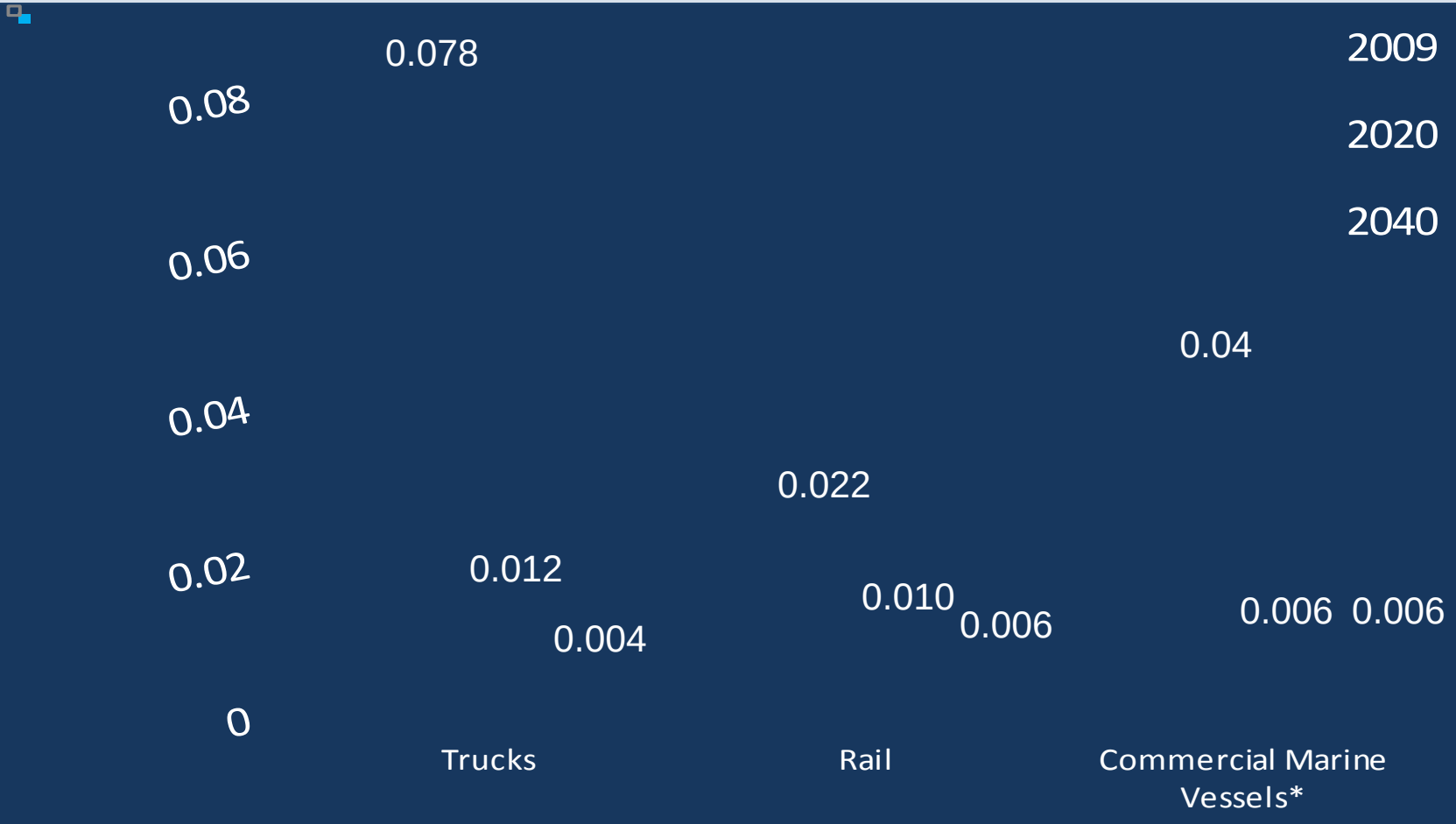
- Low emission switch engines (Gen-set, battery)
- Electric cranes
- EPA best practices tool under development

Benchmarking

Modal Average (g/ton-mile) CO_2 Emissions



Modal Average (g/ton-mile) PM_{10} Emissions

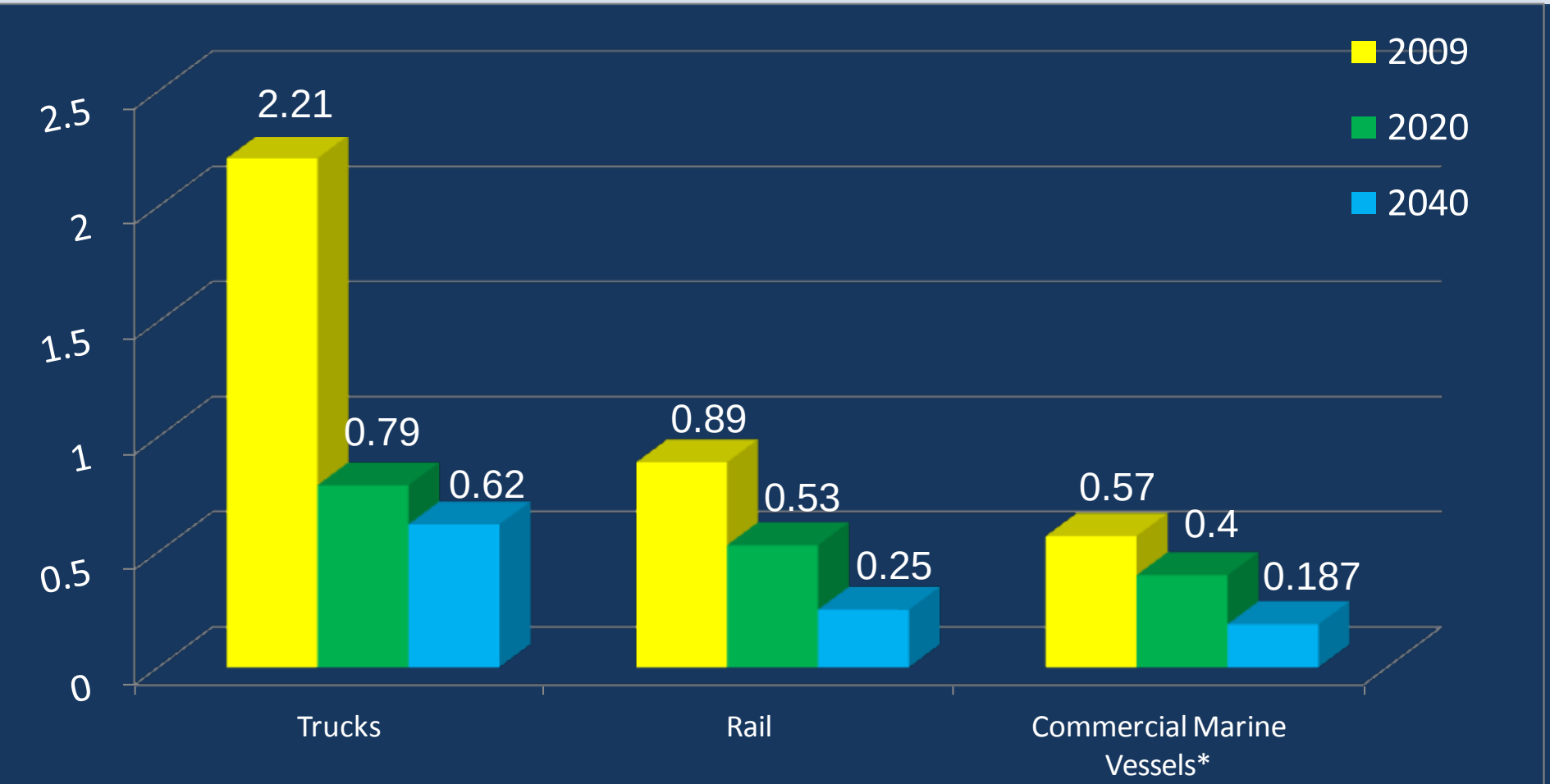


*Commercial Marine Vehicles values are representative of National Average while other modes are CT specific values.

NOTE: Projected emissions reductions will only occur if older truck, rail & marine engines are replaced with engines meeting the newer standards.

Reference: ***dKC* de la Torre Klausmeier Consulting**, Draft 2012

Modal Average (g/ton-mile) NO_x Emissions



*Commercial Marine Vehicles values are representative of National Average while other modes are CT specific values.

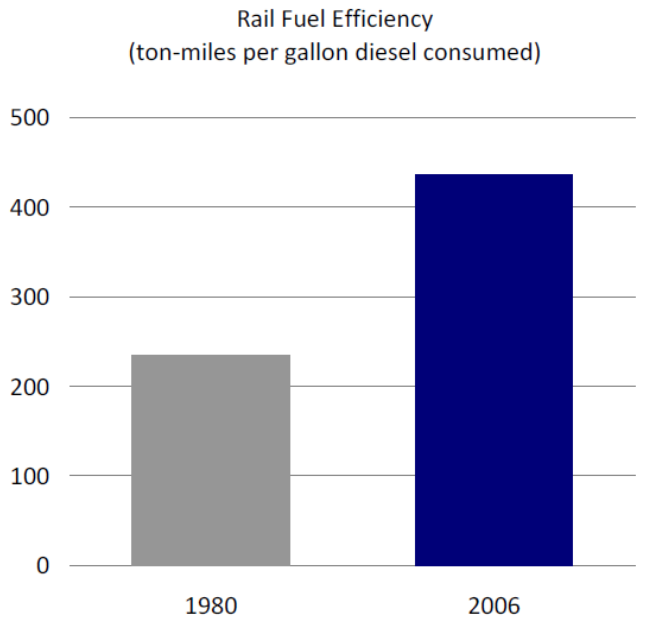
NOTE: Projected emissions reductions will only occur if older truck, rail & marine engines are replaced with engines meeting the newer standards.

Reference: ***dKC*** **de la Torre Klausmeier Consulting**, Draft 2012

Every ton-mile of Freight that Moves by Rail Instead of Truck Reduces GHG Emissions by Two-Thirds or More

- 3X more fuel efficient than trucks
- 35% more fuel efficient than marine
- Railroads reduce congestion: a single train can take 280 trucks off the highway

86% fuel improvement over 16 years

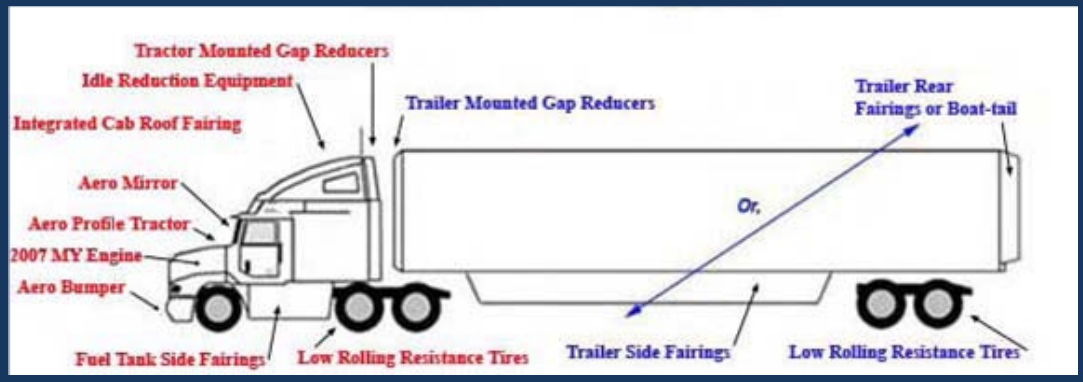


Schmid et al. *Freight Locomotive Emissions Overview*. Chicago Area Locomotive and Railyard Meeting. Midwest Clean Diesel Initiative. July 13, 2010.

Best Freight Practices- Trucks

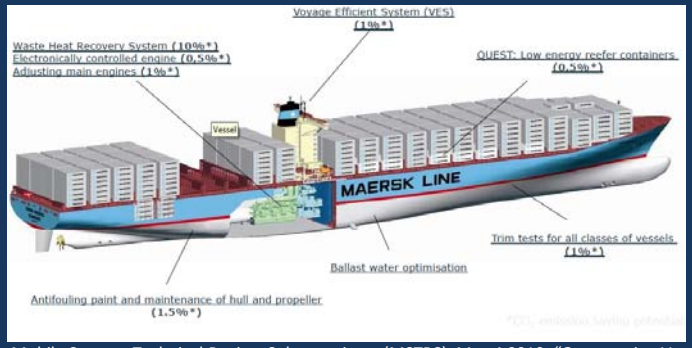
- Idle Reduction Technology
  - —APUs
  - —Auto Shut-Off
  - —Air Brake Maintenance

- Alternate Fuels (CNG,LNG) and Hybrids
- Aerodynamics
- Double Wide Tires
- Retrofits



Best Freight Practices-Ports

- Shore Power & Idle Reduction
- Dredging Using Best Available Technology
- Gate Management
- Infrastructure for CNG & LNG
- Fuel Leakage, Evaporation & Emissions Control
- Clean Freight Handling Equipment (e.g. cranes & forklifts)
- Extension of Rail Spurs
- Harbor Speed Reduction



Mobile Sources Technical Review Subcommittee (MSTRS), May 4 2010, "Ocean-going Vessel Standards – The Carrier's Perspective"

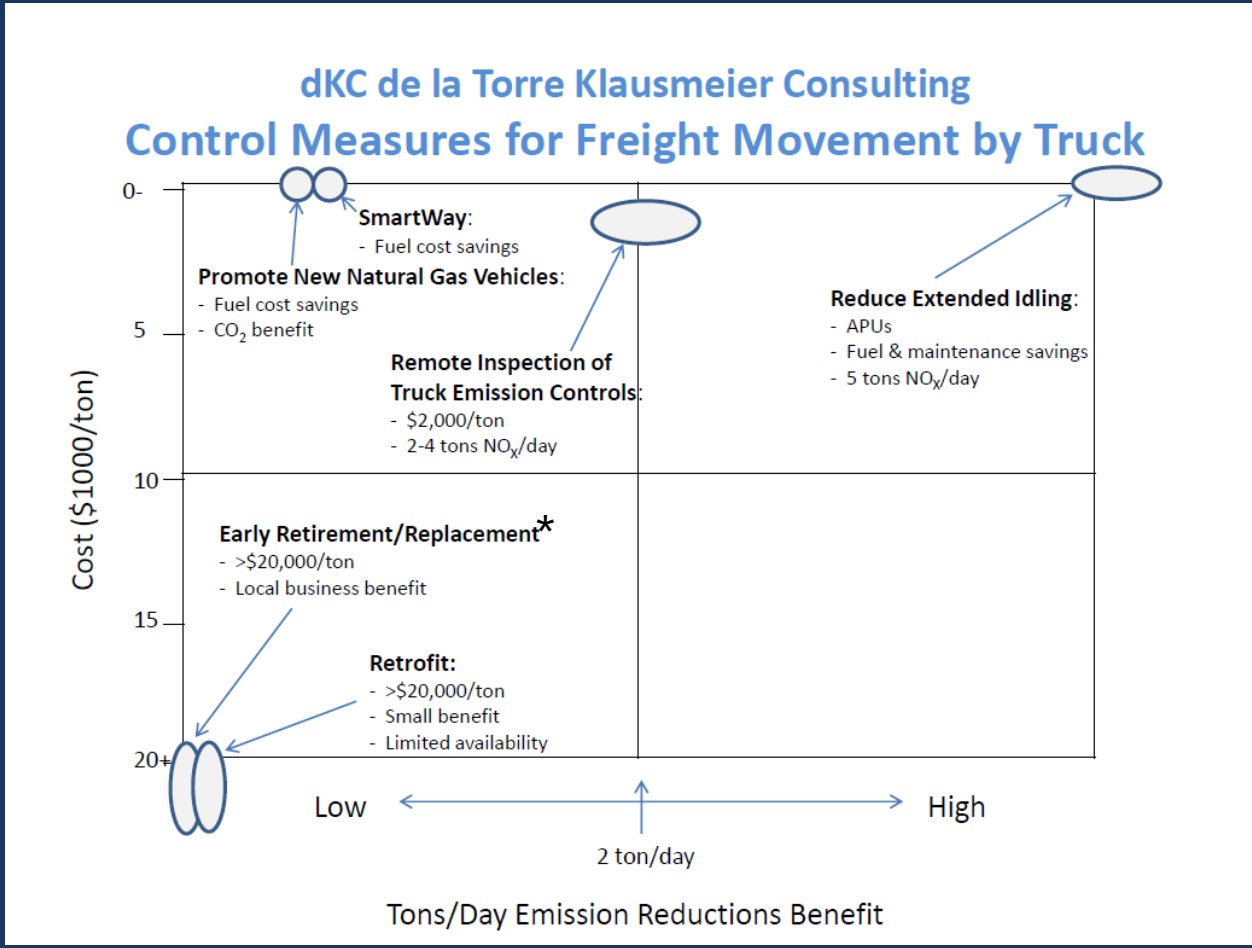
Best Freight Practices- Rail

- Early fleet turnover -> use best technology
- Idle reduction
- Low emission switch engines (Gen-set, battery)
- Electric cranes
- EPA best practices tool under development

Strategic Wins

- Decreased Idling
- Clean Trucks
- Remote Inspection of Truck Emission Controls
- Clean Marine Impacts
- Value Added Freight

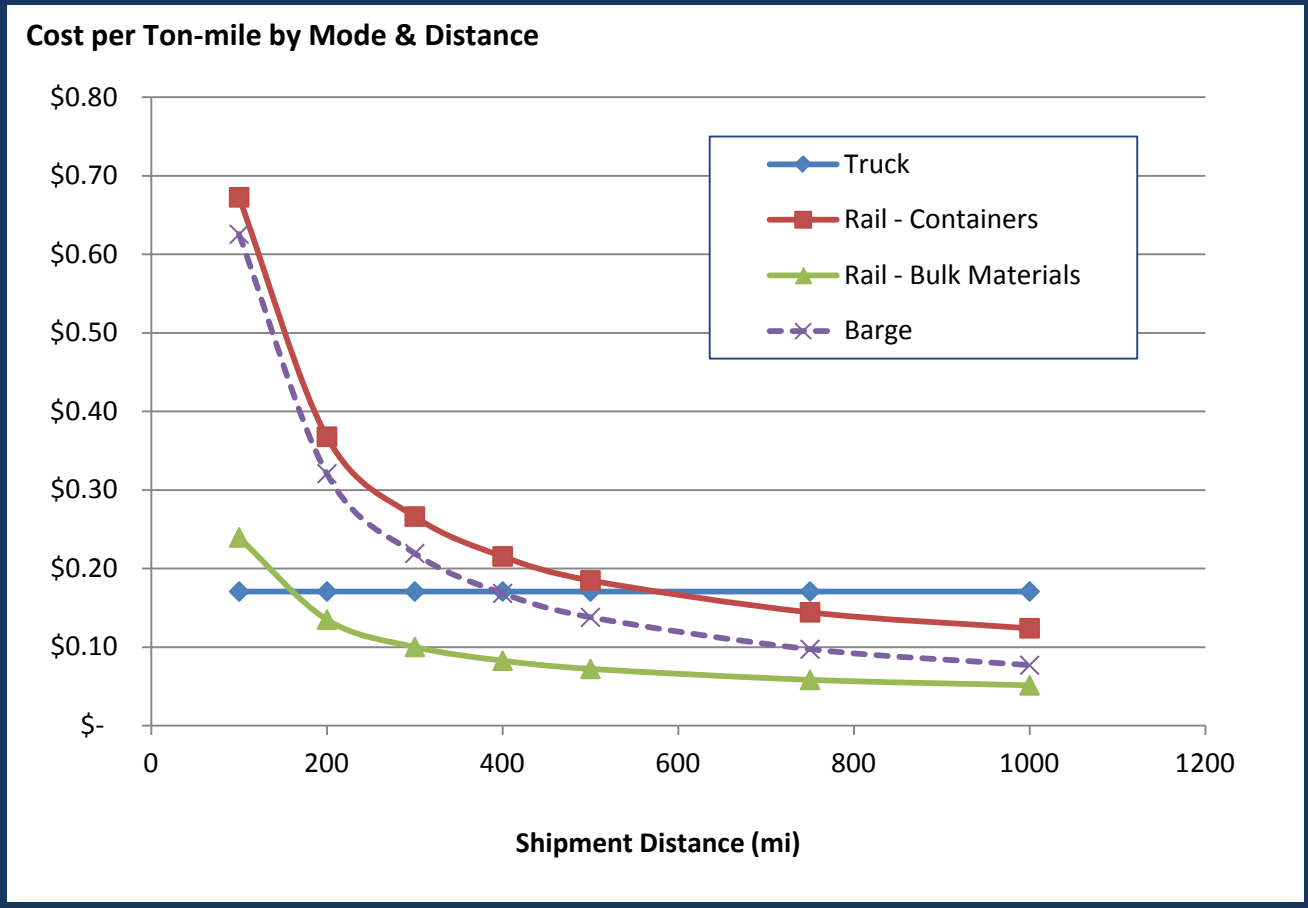
Control Measures for Freight Movement by Truck



dKC de la Torre Klausmeier Consulting, 2012 Draft

*Replacement is only cost effective with older trucks, the use of which is concentrated at ports.

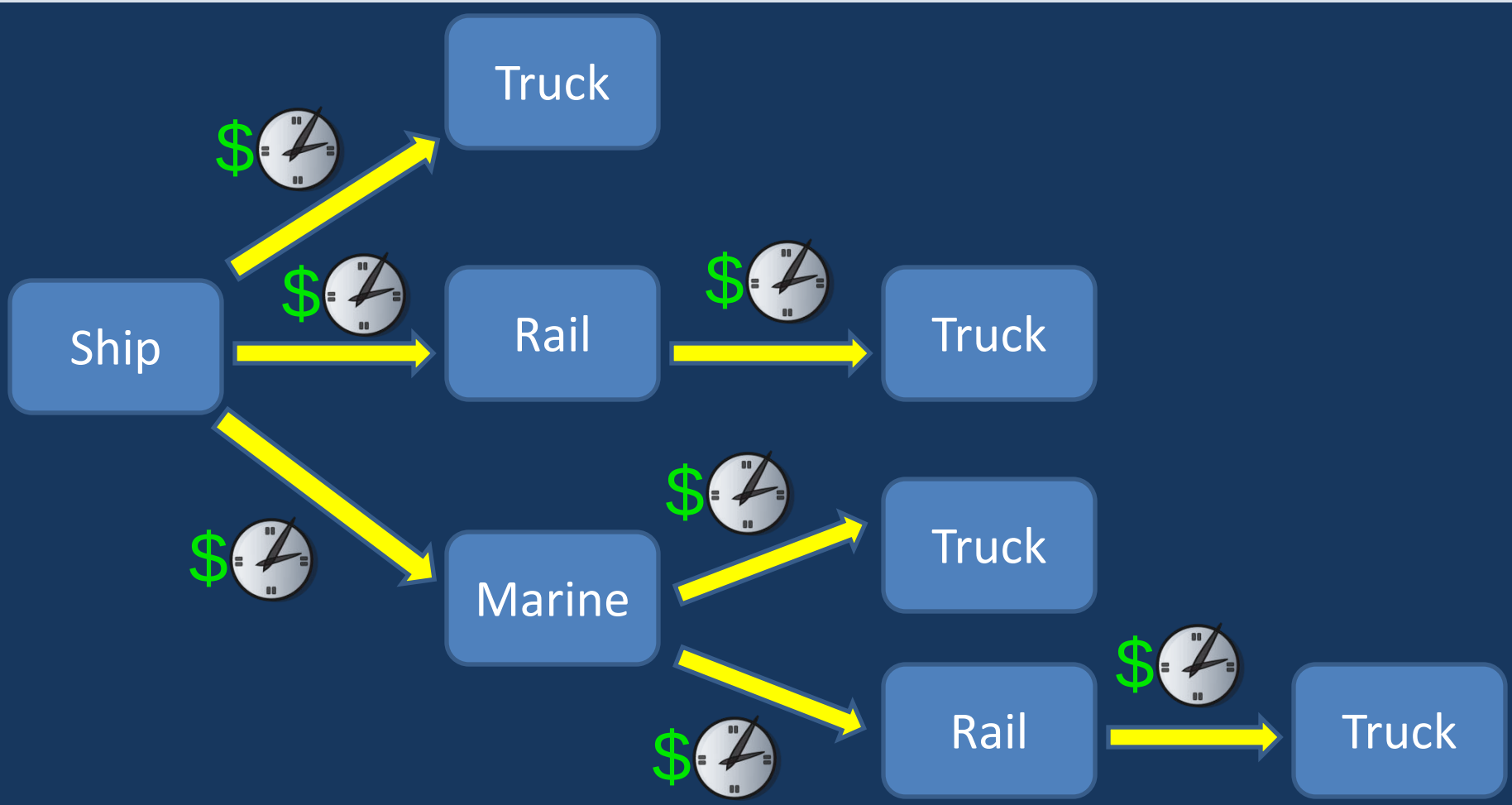
Freight Movement Costs



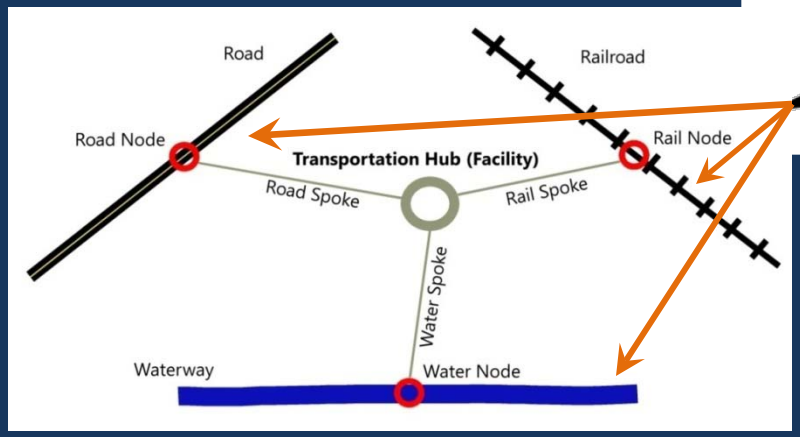
Preliminary Conclusions

1. Greatest emission reduction potential is from 2006 and earlier model trucks.
2. Reduced idling and congestion benefit both the environment and the economy.
3. Air pollution as well as freight movement are an I-95 corridor issue and strategy development should be coordinated.
4. Heavy duty truck I/M and clean port strategies should be analyzed.

Cost of Handling



Costs (Time, Energy, Environmental Impact) Are Associated with Each Segment



Truck Segment "Costs"

Distance	Time	Operating Cost	Energy	CO_2	NOx	…

Ship Inputs — Use Ship Calculator

3071	Engine HP	0.86	Carbon Content	5.4	gm/hp-hr Out NOx
221	TEU's per Ship	128450	Energy Dens btu/gal	0	NOx Control Efficiency
7	Tons per TEU	3167	Mass Dens gm/gal	0.15	gm/hp-hr Out PM10
0.4	Engine Efficiency	13.5	MPH	0	PM10 Control Efficiency
0.8	Load factor (Engine %)	15	Sulfur Content PPM		
		0	SOx Control Efficiency		

-- Predefined Ship --

Load Values | Save Values | Done | Cancel | Reset to Defaults

Ship Outputs

gm CO2 / TEU Mile:	**408**
btu (in) / TEU Mile:	**5237**
gm SOX / TEU Mile:	**0.004**
gm NOx / TEU Mile:	**4.447**
gm PM10 / TEU Mile:	**0.124**
gm CO2 / Ton Mile:	58
btu (in) / Ton Mile:	748
gm SOX / Ton Mile:	0.001
gm NOx / Ton Mile:	0.635
gm PM10 /Ton Mile:	0.018

NOTE: Percentage inputs are entered with a leading zero. Example: 20.5% would be entered 0.205

Multi-Modal System Requires Systems Analysis

Questions and Comments

Comments by September 6 to:

Ellen.Pierce@ct.gov