

Freight Transportation Challenge

More Trucks, More Fuel, More GHGs?

presented to

Thirteenth Biennial Conference on Transportation Energy and Policy

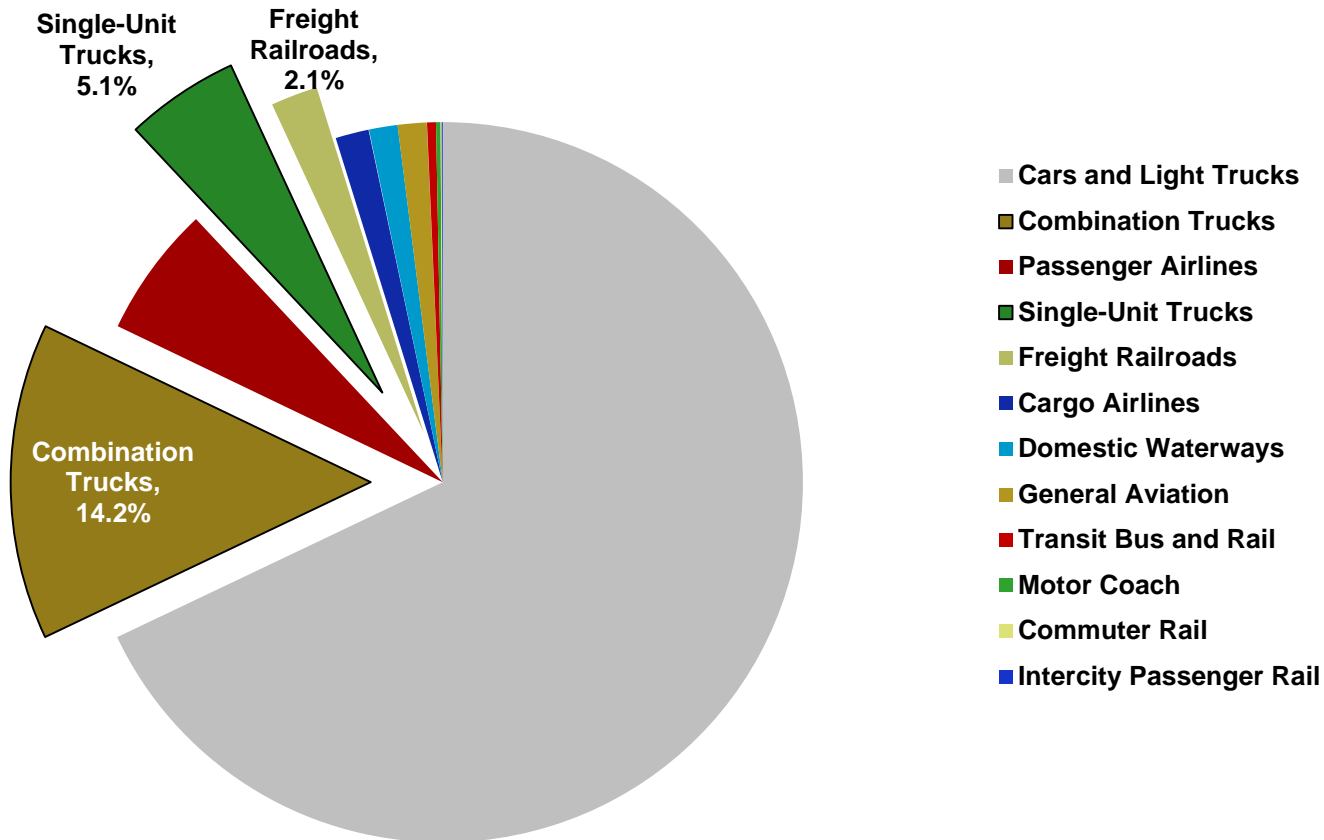
Asilomar Conference Center
Pacific Grove, California

presented by

**Lance R. Grenzeback
Cambridge Systematics, Inc.**

August 31, 2011

Petroleum Fuel Consumption by U.S. Domestic Transportation Mode



Source: *Policy Options for Reducing Energy Use and Greenhouse Gas Emissions from U.S. Transportation*, Special Report 307, Transportation Research Board, Washington DC. 2011. Figure 1-1: Modal shares of U.S. transportation consumption of fuel use, 2005 to 2007 (Note: The total represents consumed gallons of gasoline, diesel, and jet fuel, irrespective of energy density. Mode totals were calculated through various government and industry sources for the most recent year in the period covered. Fuel used by pipelines, international aviation, and international maritime are excluded).

Elements of the Freight Transportation System

Economic Structure
Type of Businesses, Number of Households

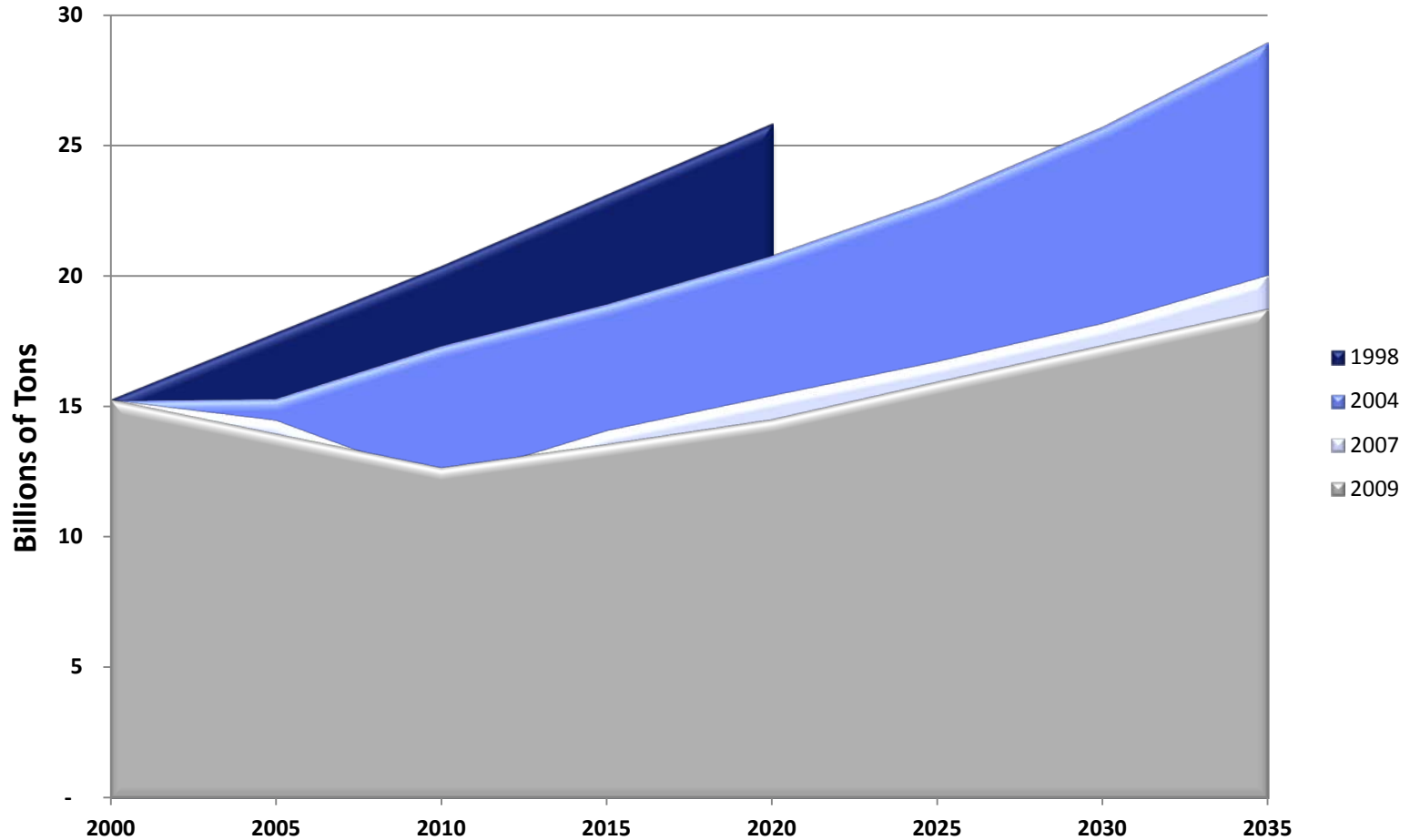
Industry Logistics Patterns
Supply Chains, Distribution Networks

Freight Infrastructure
Highways, Rail Lines, Ports, Airports...

Commodity/Vehicle Traffic Flows
Trucks, Planes, Rail Cars, Ships...

Organization and Public Policy
Ownership, Regulation, Pricing...

Freight Demand

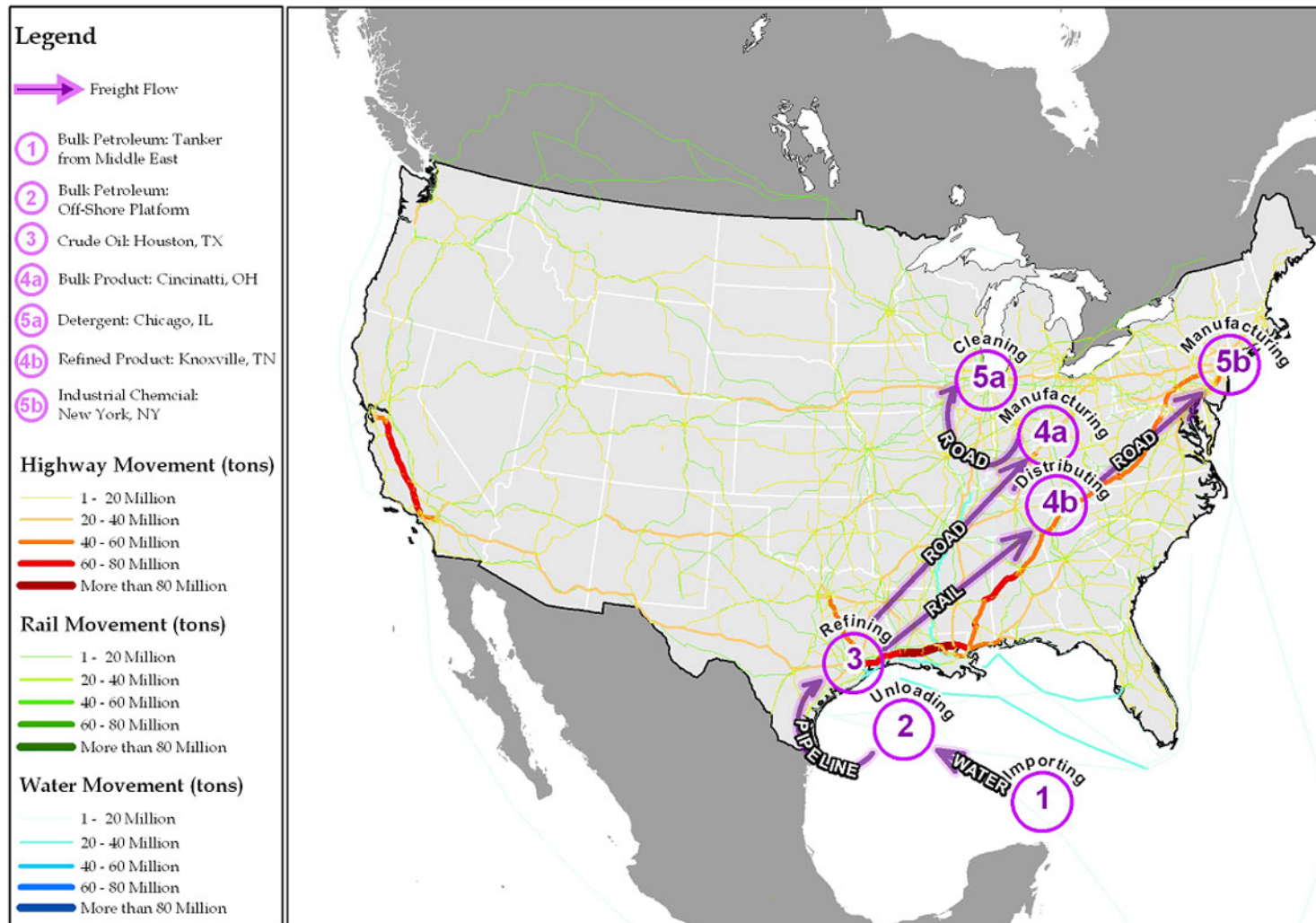


Source: Cambridge Systematics, Inc., based on IHS-Global Insight, Inc., TRANSEARCH data, multiple years 1998 to 2009.

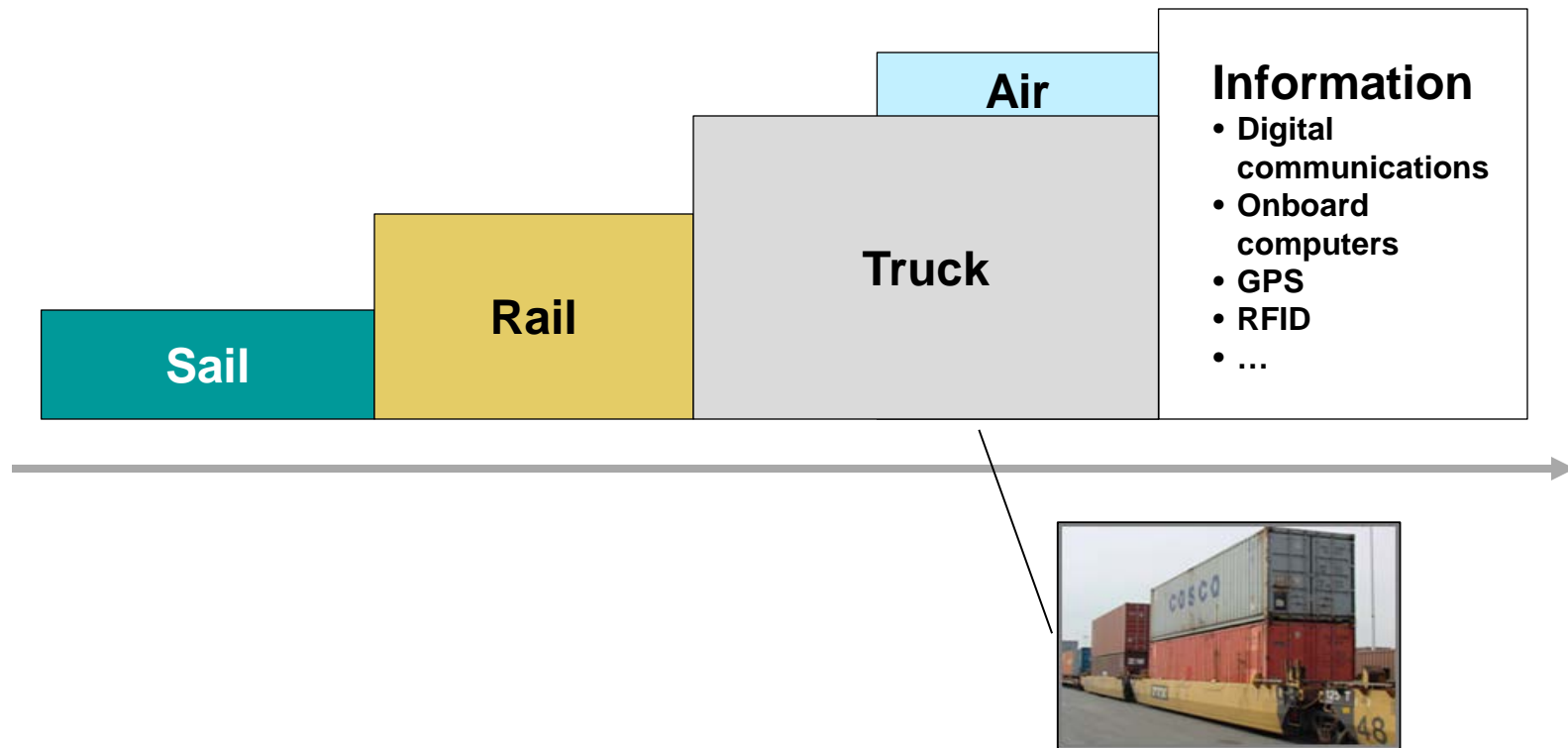
NAIC Industry Sectors

- **Agriculture, Forestry, Fishing and Hunting**
 - › Crop Production
 - › Animal Production and Aquaculture
 - › Forestry and Logging
 - › Fishing, Hunting and Trapping
 - › Support Activities for Agriculture and Forestry
- **Mining, Quarrying, and Oil and Gas Extraction**
 - › Oil and Gas Extraction
 - › Mining (except Oil and Gas)
 - › Support Activities for Mining
- **Utilities**
 - › Utilities
- **Construction**
 - › Construction of Buildings
 - › Heavy and Civil Engineering Construction
 - › Specialty Trade Contractors
- **Manufacturing**
 - › Food Manufacturing
 - › Beverage and Tobacco Product Manufacturing
 - › Textile Mills
 - › Textile Product Mills
 - › Apparel Manufacturing
 - › Leather and Allied Product Manufacturing
 - › Wood Product Manufacturing
 - › Paper Manufacturing
 - › Printing and Related Support Activities
 - › Petroleum and Coal Products Manufacturing
 - › Chemical Manufacturing
 - › Plastics and Rubber Products Manufacturing
 - › Nonmetallic Mineral Product Manufacturing
 - › Primary Metal Manufacturing
 - › Fabricated Metal Product Manufacturing
 - › Machinery Manufacturing
 - › Computer and Electronic Product Manufacturing
 - › Electrical Equipment, Appliance, and Component Manufacturing
 - › Transportation Equipment Manufacturing
 - › Furniture and Related Product Manufacturing
 - › Miscellaneous Manufacturing
- **Wholesale Trade**
 - › Merchant Wholesalers, Durable Goods
 - › Merchant Wholesalers, Nondurable Goods
 - › Wholesale Electronic Markets and Agents and Brokers
- **Retail Trade**
 - › Motor Vehicle and Parts Dealers
 - › Furniture and Home Furnishings Stores
 - › Electronics and Appliance Stores
 - › Building Material and Garden Equipment and Supplies Dealers
 - › Food and Beverage Stores
 - › Health and Personal Care Stores
 - › Gasoline Stations
 - › Clothing and Clothing Accessories Stores
 - › Sporting Goods, Hobby, Musical Instrument, and Book Stores
 - › General Merchandise Stores
 - › Miscellaneous Store Retailers
 - › Non-store Retailers
- **National Security and International Affairs**
- **Transportation and Warehousing**
 - › Air Transportation
 - › Rail Transportation
 - › Water Transportation
 - › Truck Transportation
 - › Transit and Ground Passenger Transportation
 - › Pipeline Transportation
 - › Scenic and Sightseeing Transportation
 - › Support Activities for Transportation
 - › Postal Service
 - › Couriers and Messengers
 - › Warehousing and Storage
- **Information**
 - › Publishing Industries (except Internet)
 - › Motion Picture and Sound Recording Industries
 - › Broadcasting (except Internet)
 - › Telecommunications
 - › Data Processing, Hosting, and Related Services
 - › Other Information Services
- **Finance and Insurance**
 - › Monetary Authorities-Central Bank
 - › Credit Intermediation and Related Activities
 - › Securities, Commodity Contracts, and Other Financial Investments and Related Activities
 - › Insurance Carriers and Related Activities
 - › Funds, Trusts, and Other Financial Vehicles
 - › Real Estate and Rental and Leasing
- **Real Estate**
 - › Rental and Leasing Services
 - › Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
- **Professional, Scientific, and Technical Services**
 - › Professional, Scientific, and Technical Services
 - › Management of Companies and Enterprises
 - › Management of Companies and Enterprises
- **Administrative and Support and Waste Management and Remediation Services**
 - › Administrative and Support Services
 - › Waste Management and Remediation Services
- **Educational Services**
 - › Educational Services
- **Health Care and Social Assistance**
 - › Ambulatory Health Care Services
 - › Hospitals
 - › Nursing and Residential Care Facilities
 - › Social Assistance
- **Arts, Entertainment, and Recreation**
 - › Performing Arts, Spectator Sports, and Related Industries
 - › Museums, Historical Sites, and Similar Institutions
 - › Amusement, Gambling, and Recreation Industries
- **Accommodation and Food Service**
 - › Accommodations
 - › Food Services and Drinking Places
- **Other Services (except Public Administration)**
 - › Repair and Maintenance
 - › Personal and Laundry Services
 - › Religious, Grantmaking, Civic, Professional, and Similar Organizations
 - › Private Households
- **Public Administration**

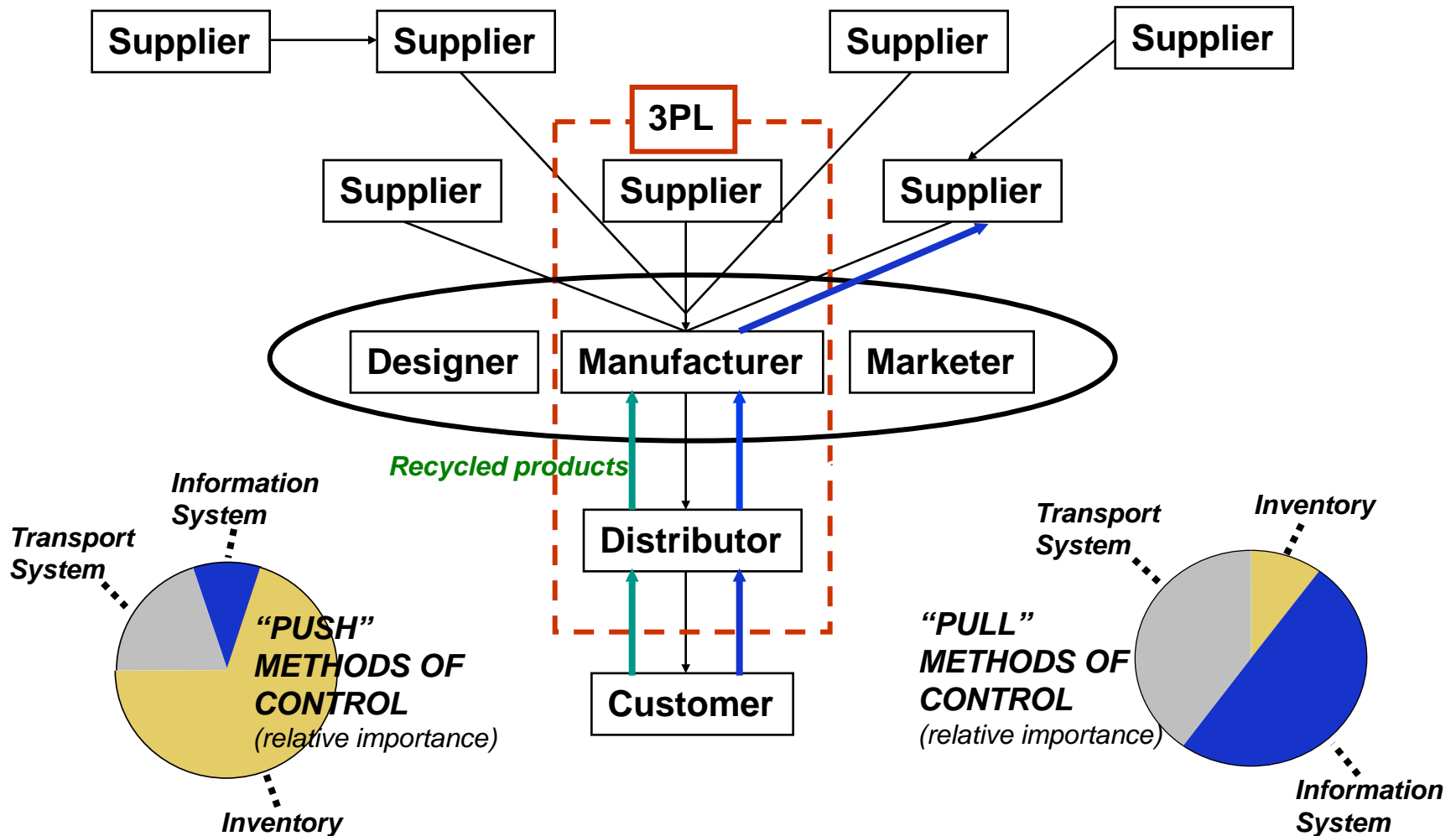
Example of Logistics Supply Chain for House Paint and Detergents



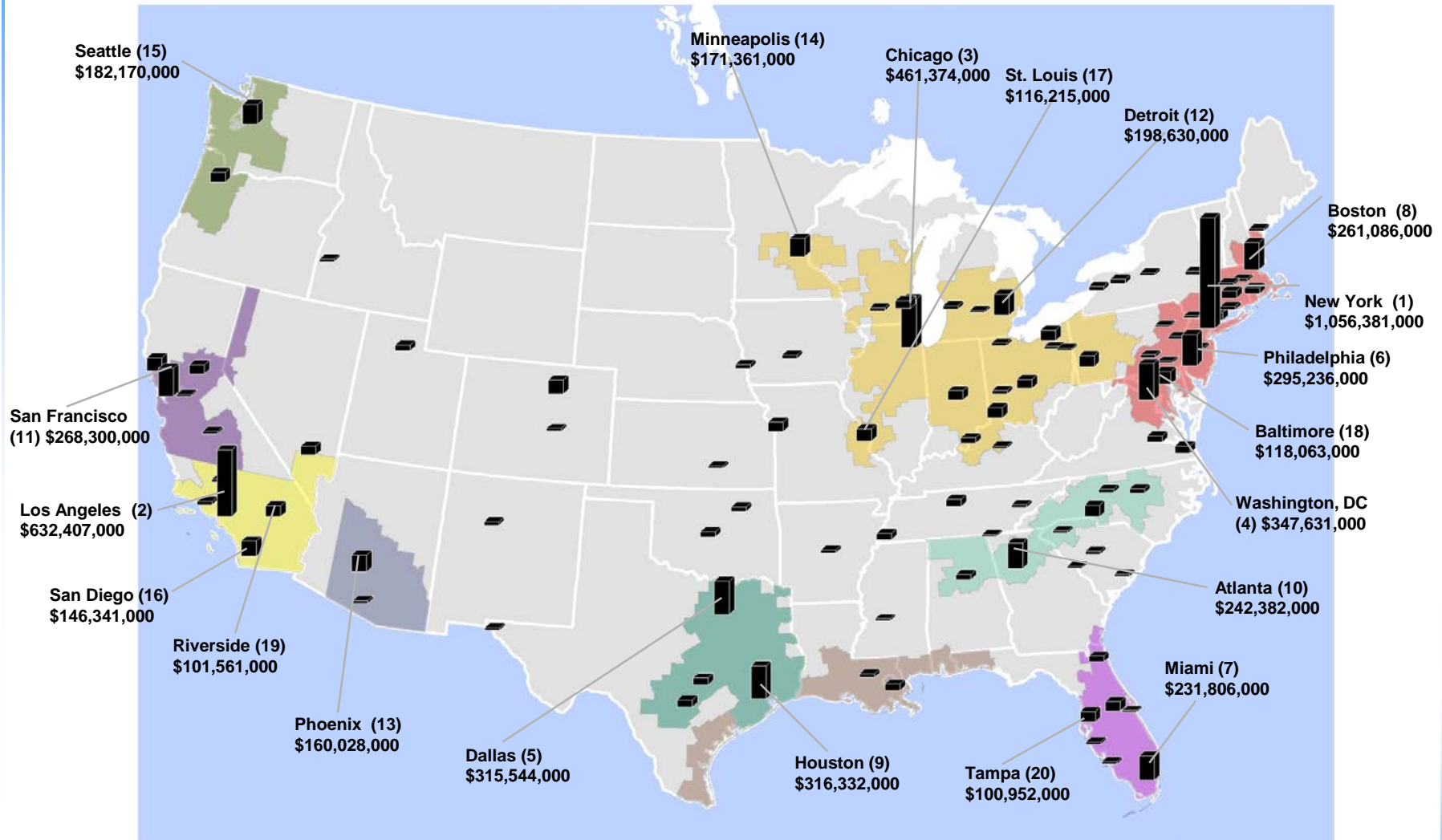
Freight Transportation Systems



From Push to Pull Logistics Systems

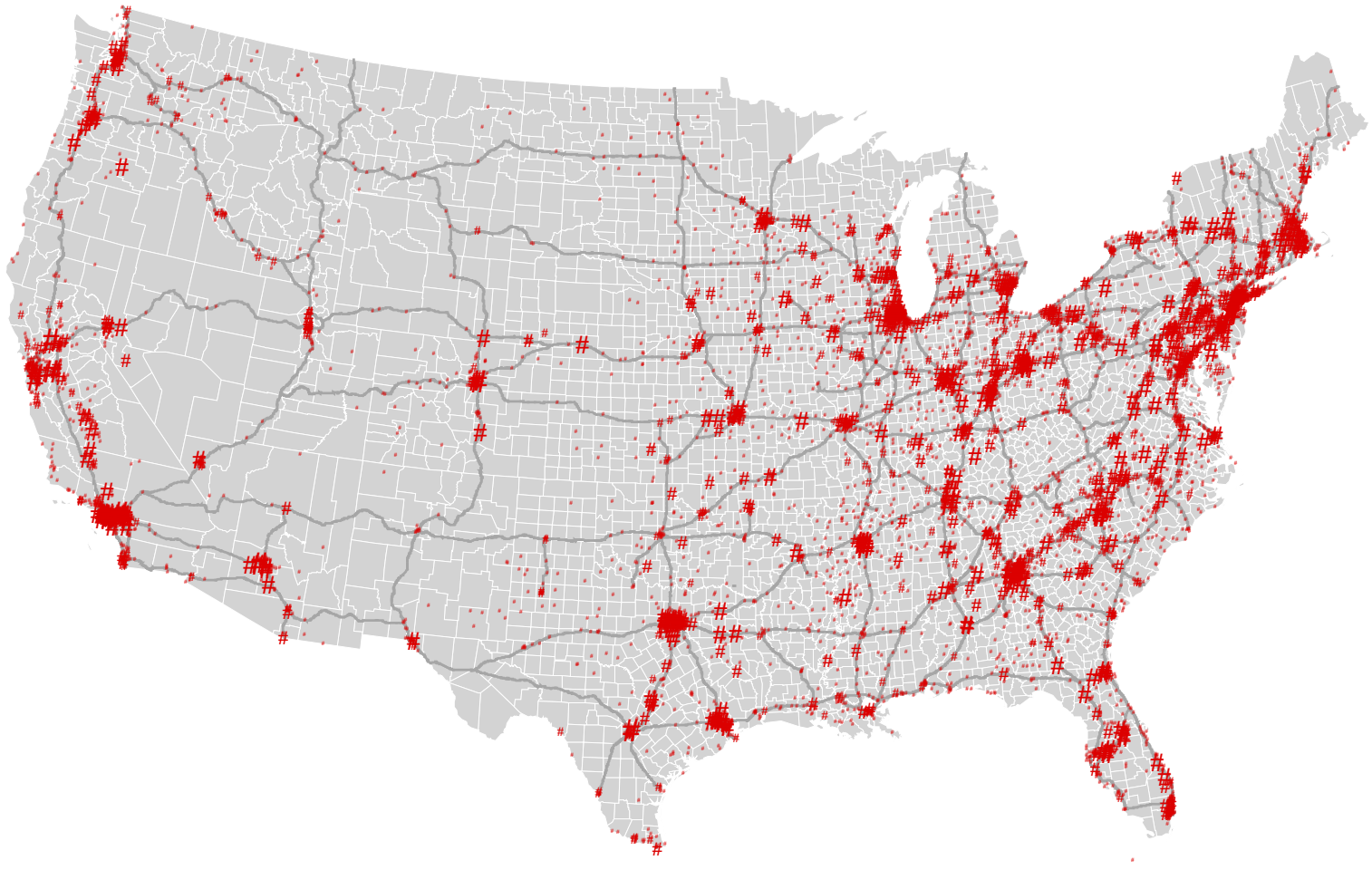


U.S. Metropolitan Areas and Megaregions



Source: *MetroNation: How U.S. Metropolitan Areas Fuel American Prosperity*. Metropolitan Policy Program at Brookings.

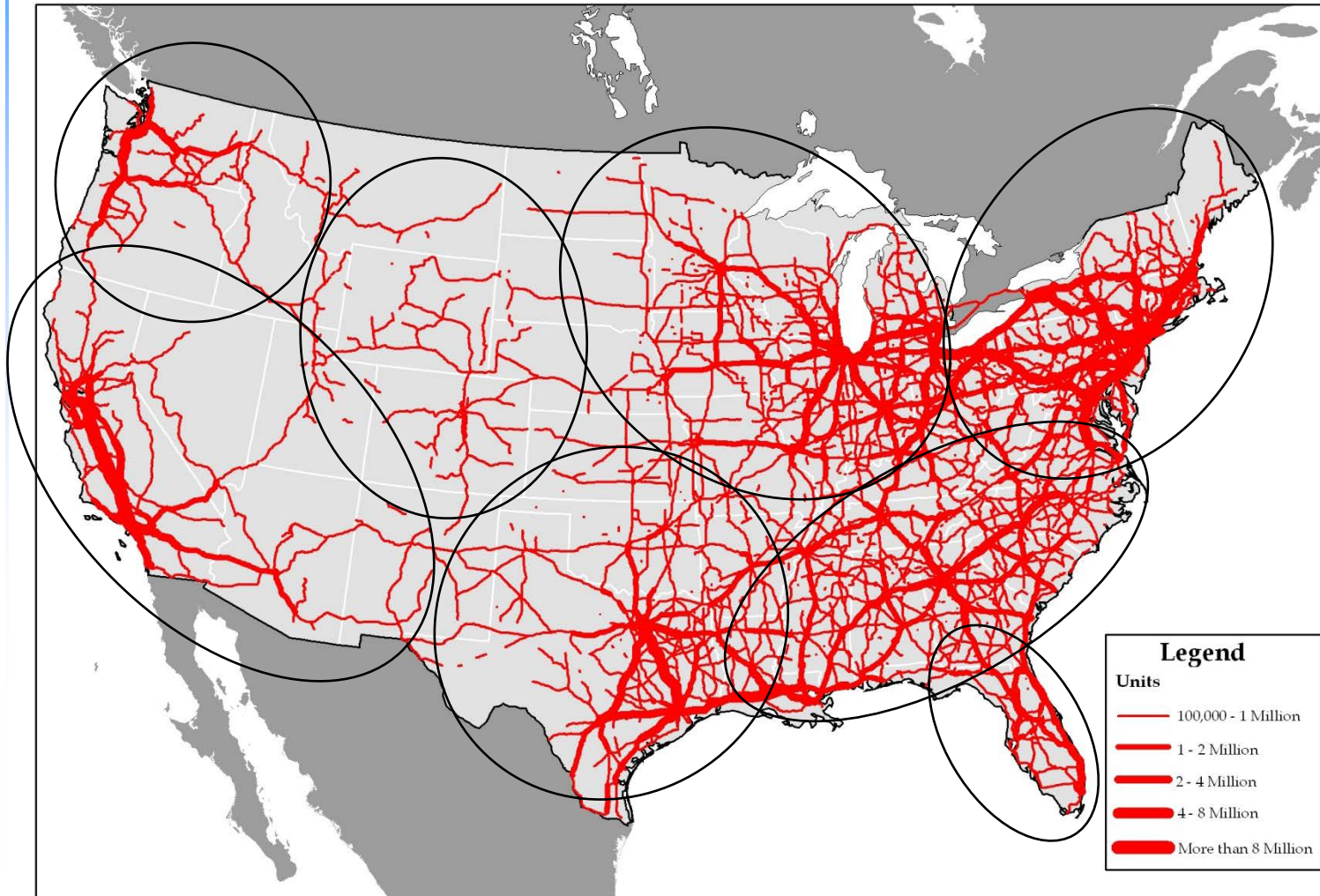
Warehousing Employment



Source: Cambridge Systematics, Inc., based on U.S. Census, County Business Patterns, 2005

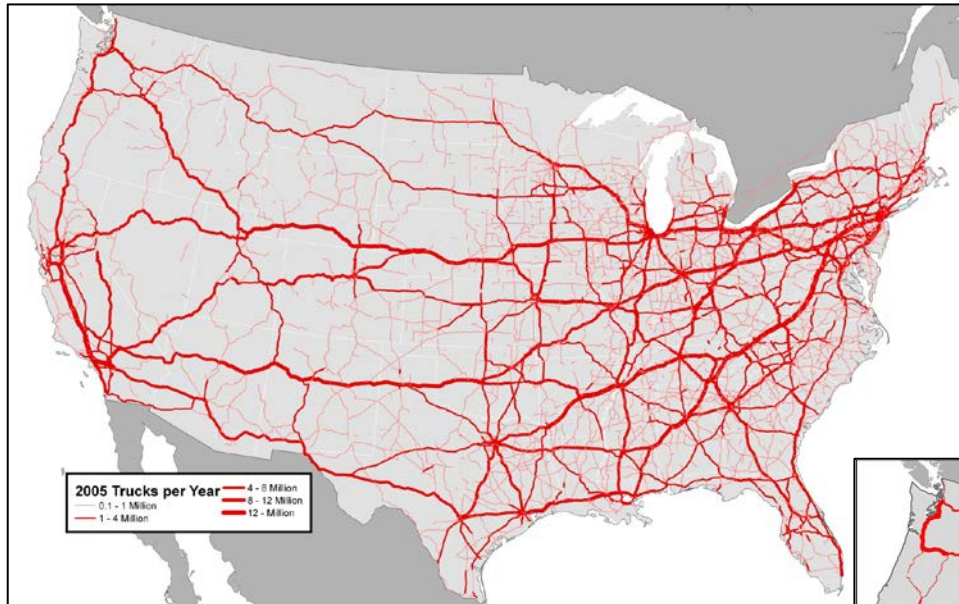
Freight Truck Trips Between 100 and 500 Miles

Megaregion Freightsheds

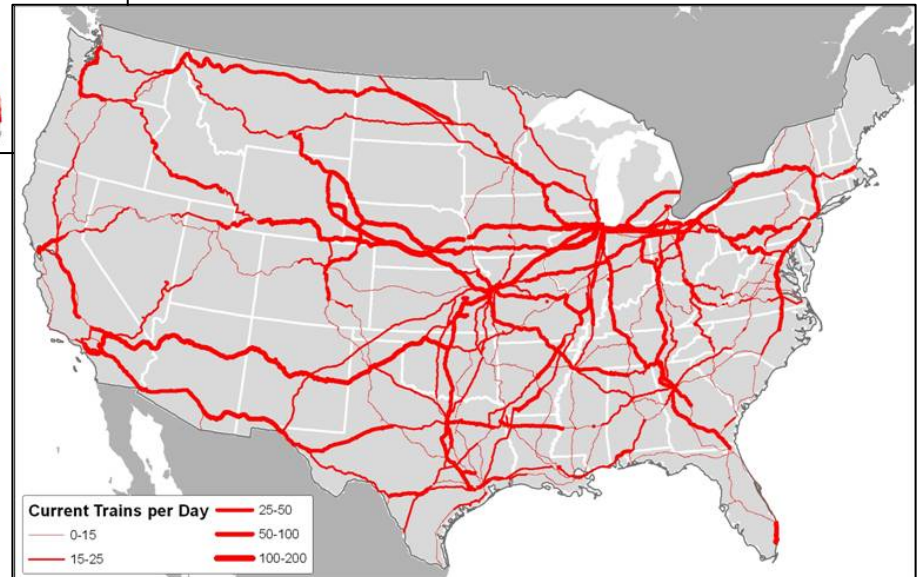


Source: Cambridge Systematics, Inc., based on Global Insight, Inc., 2004 TRANSEARCH data.

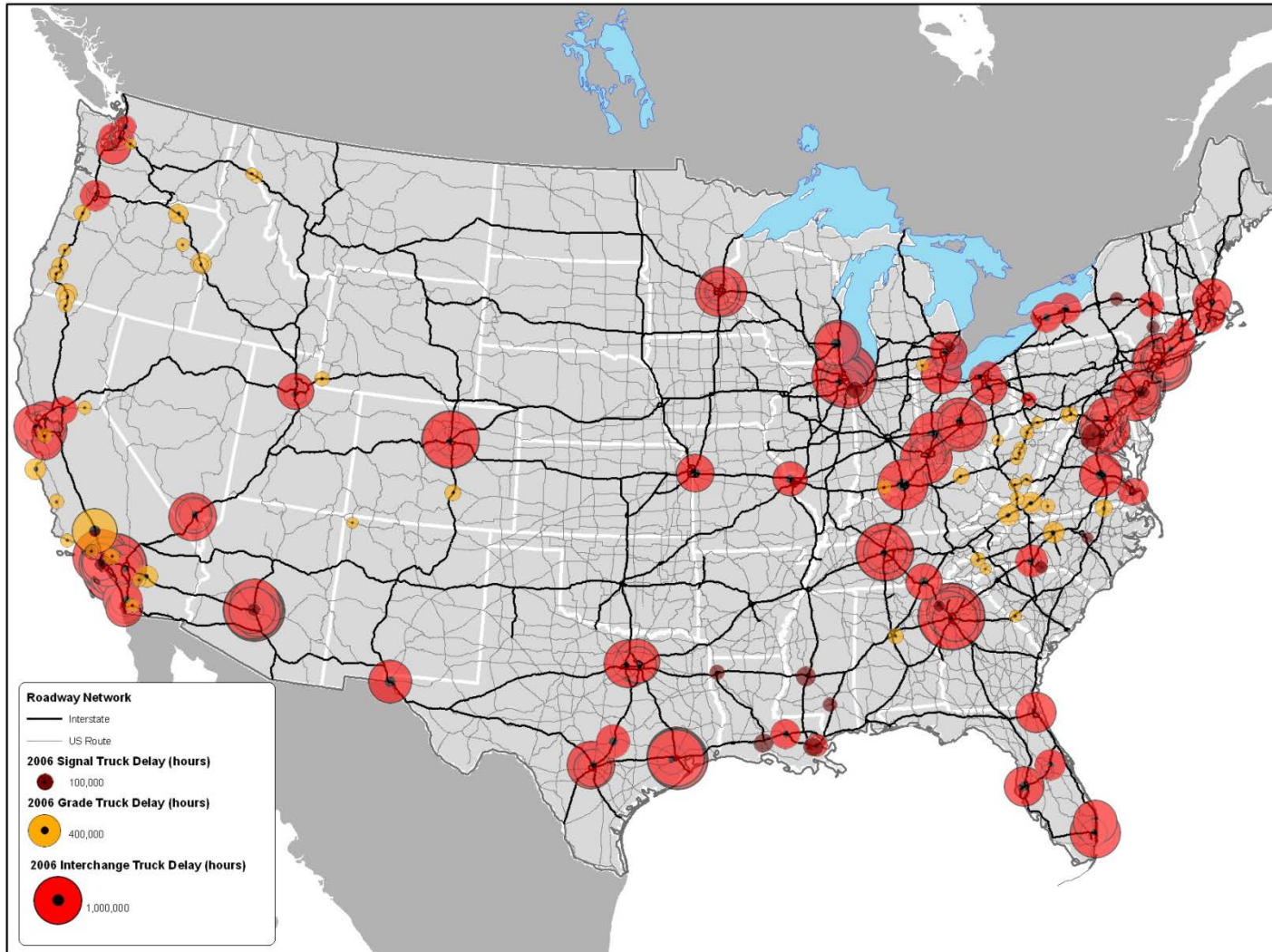
National Freight Truck and Freight Rail Flows



Source: Cambridge Systematics, Inc., based on IHS-Global Insight, Inc., TRANSEARCH data.



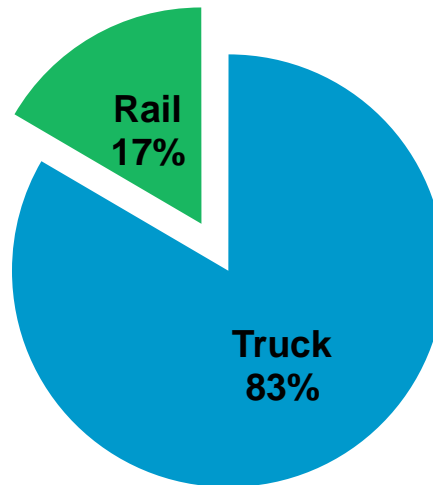
Highway Truck Bottlenecks



Source: Cambridge Systematics, Inc., *Estimated Cost to Freight Involved in Highway Bottlenecks*, prepared for the Federal Highway Administration, Washington, DC. November 2008.

Truck and Rail Mode Shares by Tonnage, 2008

Rail	Miles	Tons (millions)
	>2000	130
1500-2000	310	
1000-1500	450	
500-1000	400	
250-500	330	
0-250	420	



Truck	Miles	Tons (millions)
	>2000	100
1500-2000	250	
1000-1500	740	
500-1000	1,380	
250-500	7,670	
0-250		

Source: Cambridge Systematics, Inc., based on IHS-Global Insight, Inc., TRANSEARCH data.

Truck Freight Tons, Vehicle-Miles of Travel, and Ton-Miles, 2010 and 2030

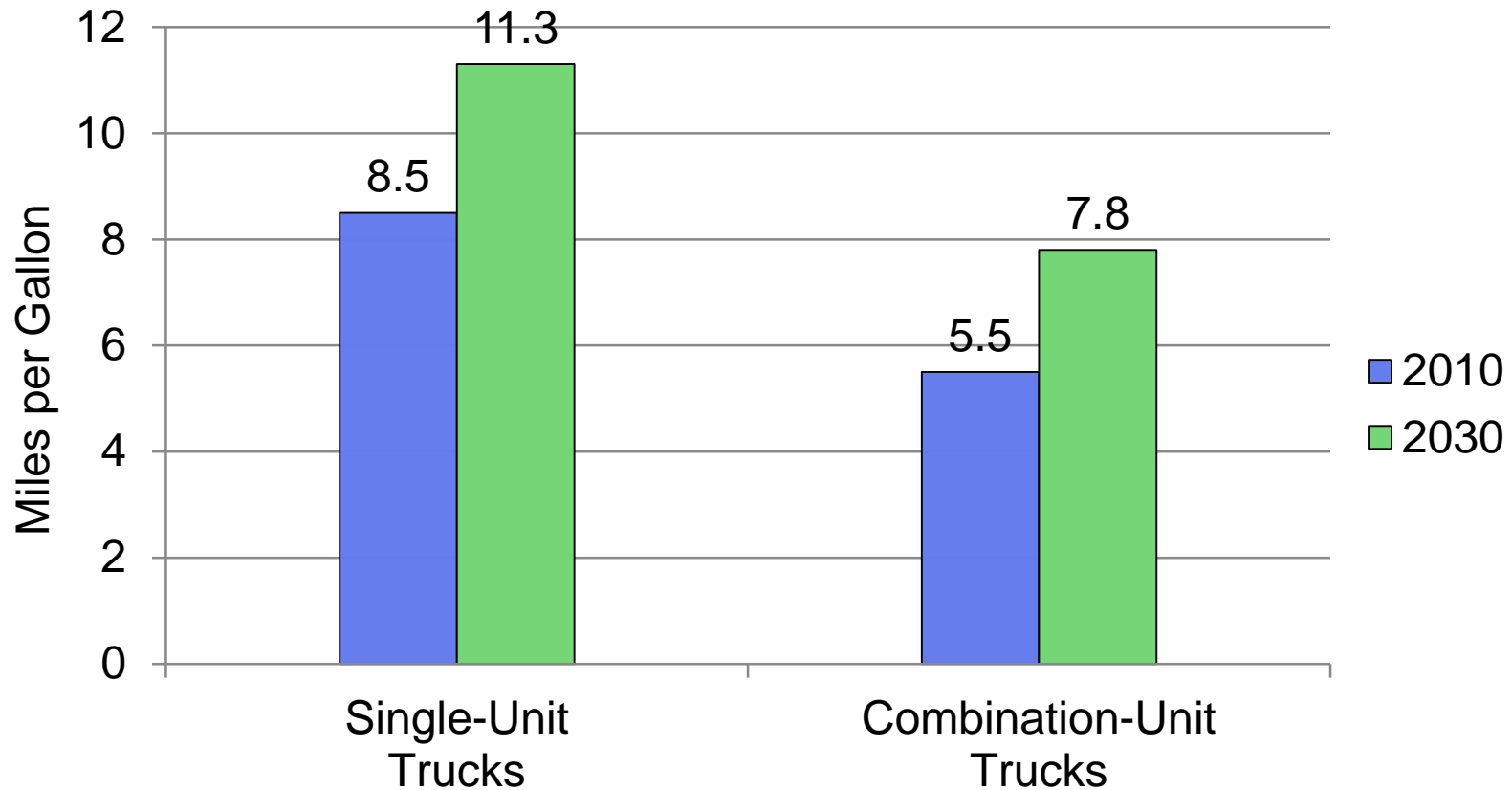
Tons (billions)	2010	Percent	2030	Percent Tons	Annual Growth Rate
Metropolitan hauls	4.7	36%	6.9	35%	1.9%
Intrastate hauls	5.5	42%	7.9	40%	1.8%
Interstate hauls	3.0	22%	5.0	25%	2.6%
Total	13.2	100%	19.7	100%	2.0%

Vehicle-Miles of Travel (billions)	2010	Percent	2030	Percent VMT	Annual Growth Rate
Metropolitan hauls	39.3	17%	57.2	16%	1.9%
Intrastate hauls	92.1	39%	131.5	36%	1.8%
Interstate hauls	105.7	45%	177.2	48%	2.6%
Total	237.1	100%	365.9	100%	2.2%

Ton-Miles (billions)	2010	Percent	2030	Percent Ton-Miles	Annual Growth Rate
Metropolitan hauls	118	5%	172	5%	1.9%
Intrastate hauls	553	26%	789	23%	1.8%
Interstate hauls	1,480	69%	2,480	72%	2.6%
Total	2,151	100%	3,441	100%	2.4%

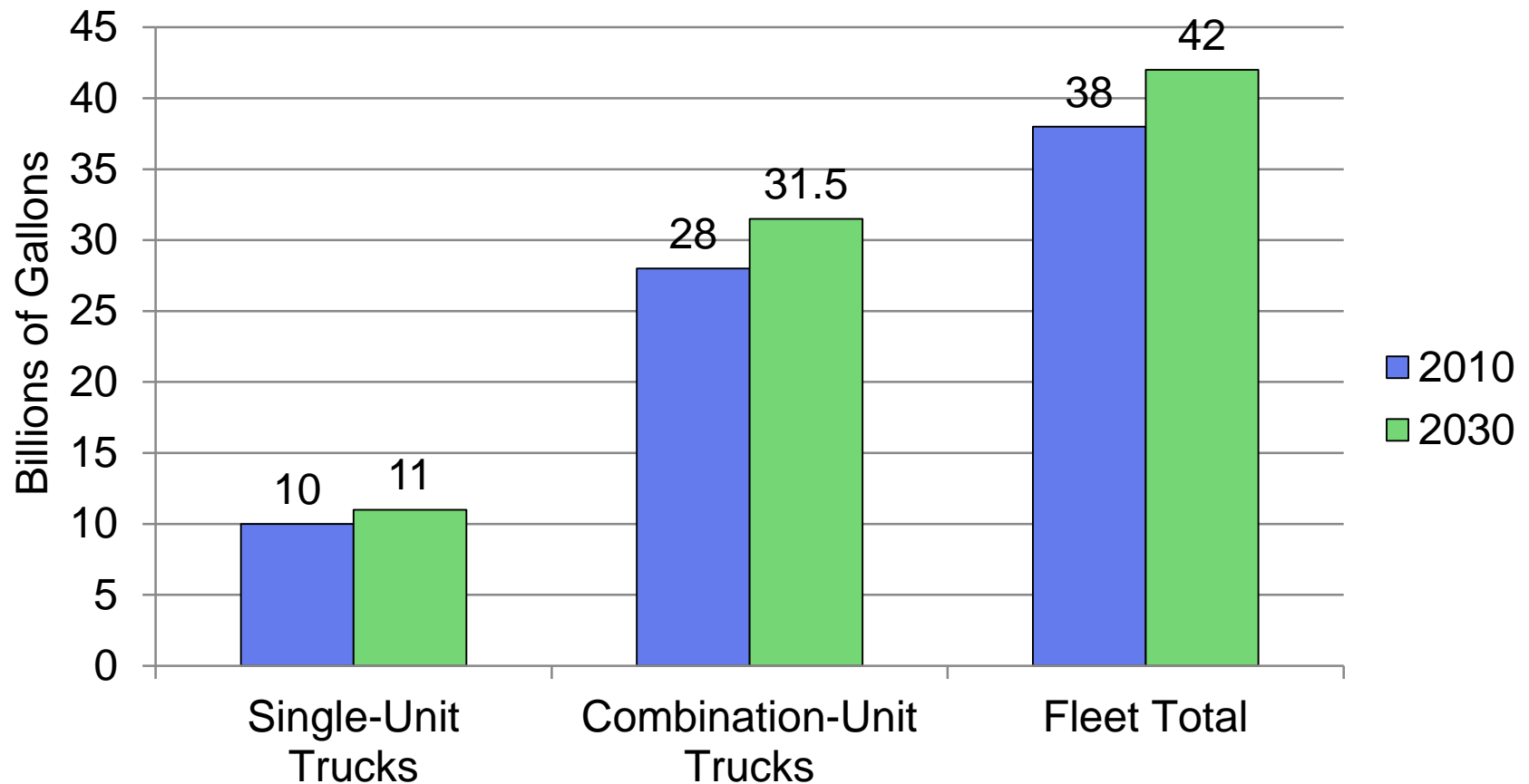
Source: *Policy Options for Reducing Energy Use and Greenhouse Gas Emissions from U.S. Transportation*, Special Report 307, Transportation Research Board, Washington DC. 2011. Table 4-6: Reference Projections of Truck Freight, VMT, and Ton-Miles, 2010-2030.

Projected Miles per Gallon for Freight Trucks, 2010 and 2030



Source: *Policy Options for Reducing Energy Use and Greenhouse Gas Emissions from U.S. Transportation*, Figure 4-8: Projected Growth in MPG, for New Trucks and Overall Fleet, Single-Unit and Combination Trucks, 2010 to 2030. Special Report 307, Transportation Research Board, Washington DC. 2011.

Projected Diesel Fuel Consumption by Freight Trucks, 2010 and 2030



Source: *Policy Options for Reducing Energy Use and Greenhouse Gas Emissions from U.S. Transportation*, Figure 4-9: Projected Growth in MPG, for New Trucks and Overall Fleet, Single-Unit and Combination Trucks, 2010 to 2030. Special Report 307, Transportation Research Board, Washington DC. 2011.

Elements of the Freight Transportation System

Economic Structure
Type of Businesses, Number

- Increase near-sourcing and in-sourcing
- Change commodity demand through substitution of goods, additive manufacturing, etc.

Industry Logistics Practices
Supply Chains, Distribution

- Shift longer-haul freight from road to rail
- Relocate distribution centers closer to markets

Freight Infrastructure
Highways, Rail Lines, Ports, Airports

- Reduce bottlenecks and congestion
- Add/relocate freight networks
- Introduce VMT fees for LDVs

Commodity/Vehicle Traffic Flows
Trucks, Planes, Rail Cars, Ships

- Optimize routing and dispatching
- Improve engine/powertrain efficiencies
- Increase and optimize cargo capacity
- Introduce cleaner fuels

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