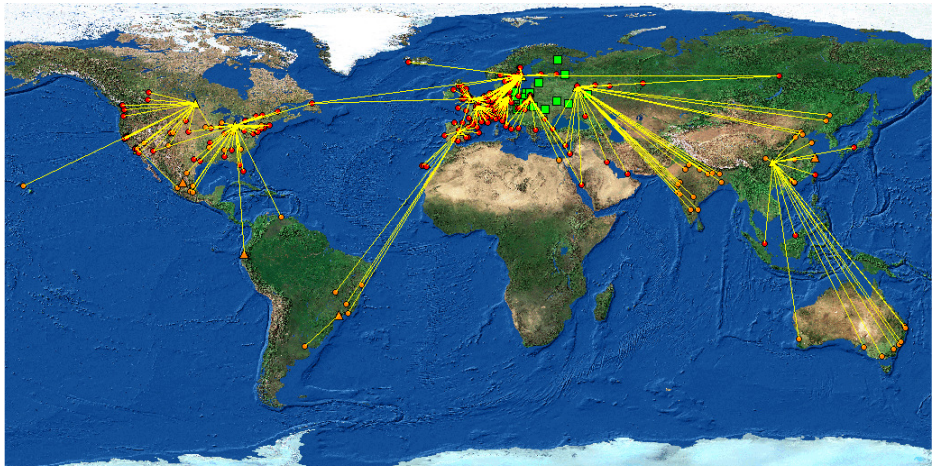
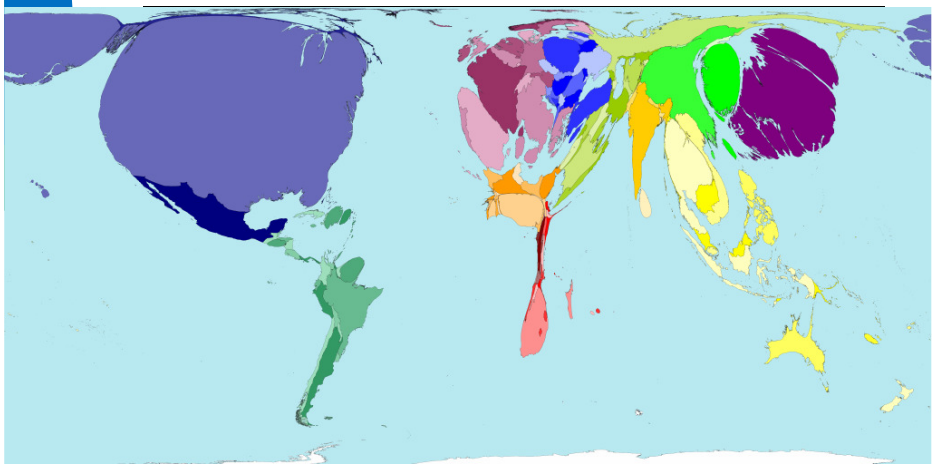
SmartWay 2.0 – Quantifying The Transportation Supply Chain

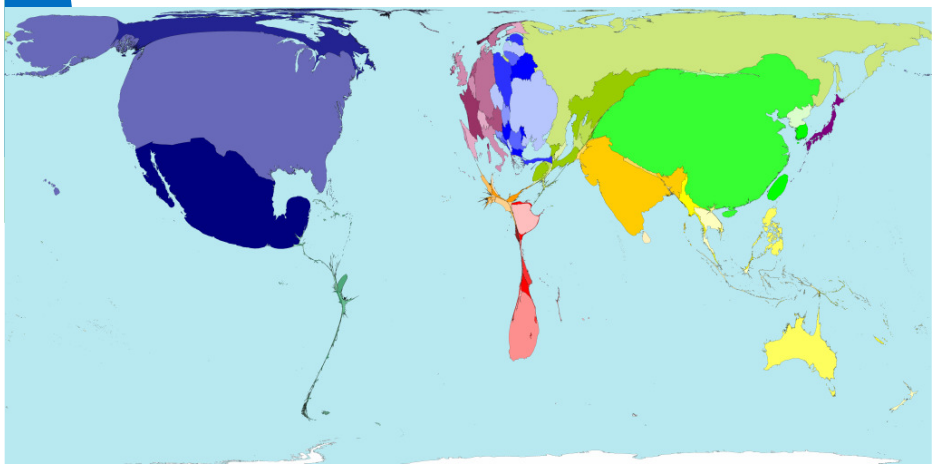


Vehicle Freight Miles



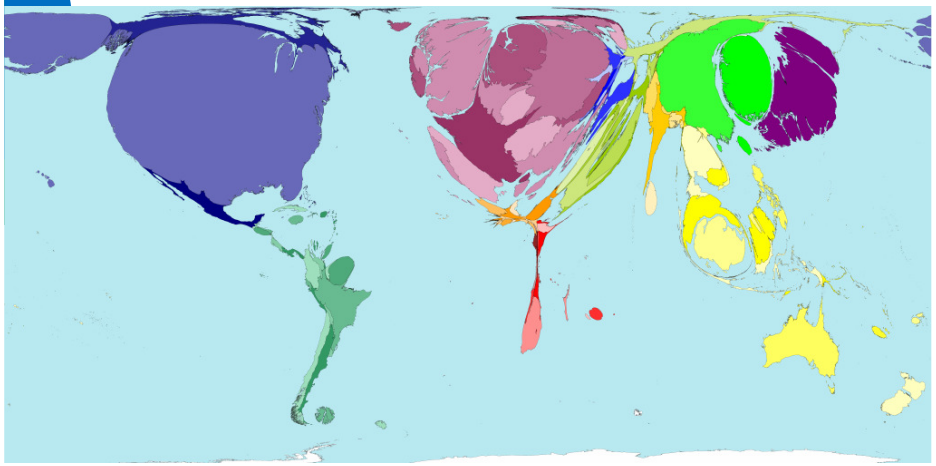
http://www.worldmapper.org/
University of Michigan

Rail Freight Miles



http://www.worldmapper.org/
University of Michigan

Air Freight Ton-Miles



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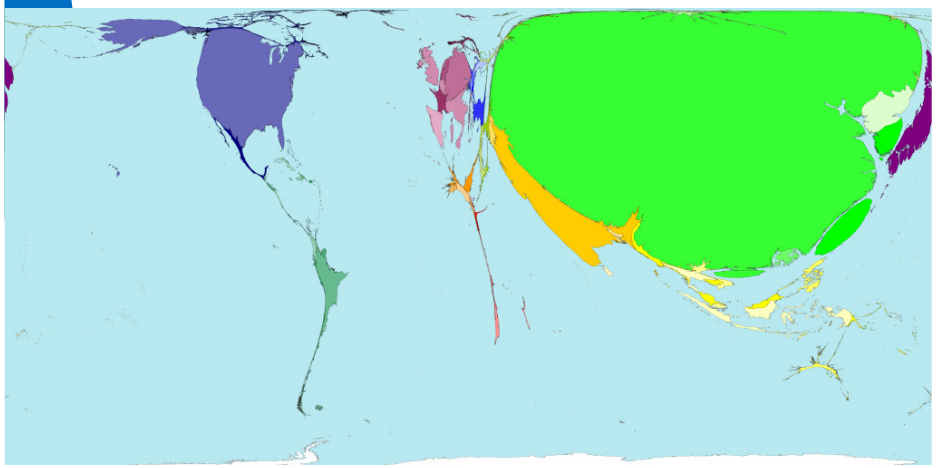
University of Michigan

Freight Containers Shipped



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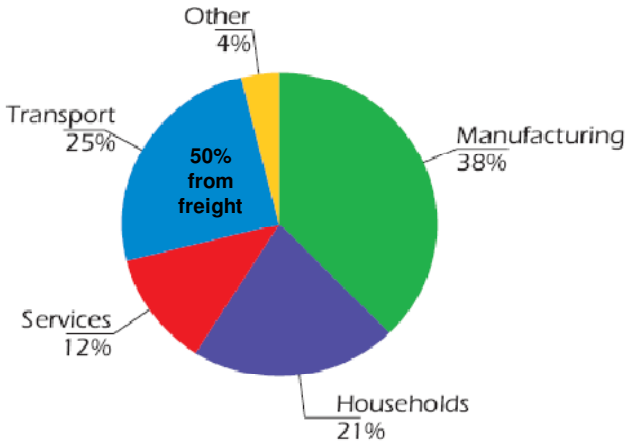
Share of Global CO_2 by Sector



Total direct and indirect CO_2 emissions: 21 Gt CO_2

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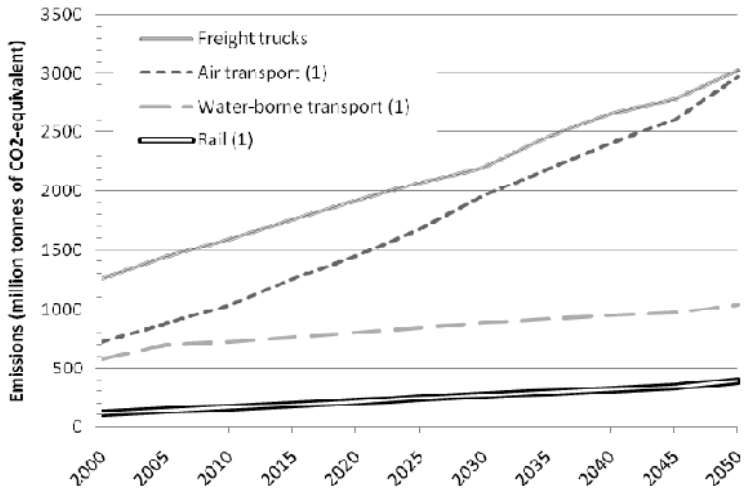
Source: Worldwide Trends in Energy Use, International Energy Agency, 2008

World CO_2 Emissions by Transport Mode



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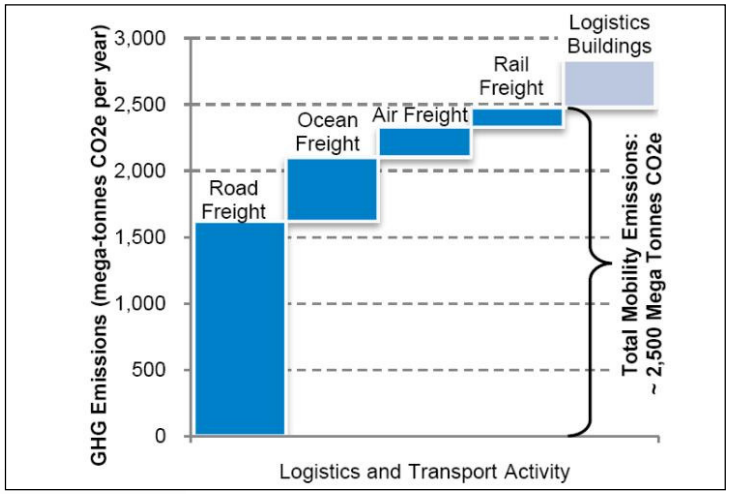
1. Including the transport of passengers.
Source: Adapted from JTRC (2008); ITF calculations using the IEA MoMo Model Version 2008.
OECD Joint Working Party on Trade & Environment: Interim Report, Nov. 2008

Global Transportation CO2 Emissions by Mode



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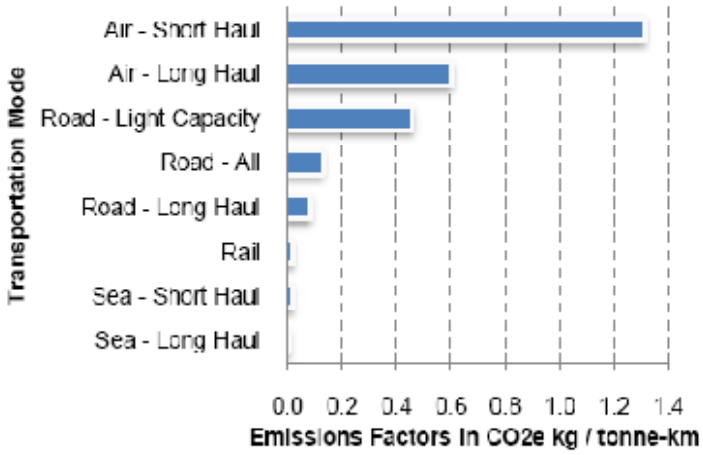
World Economic Forum: Supply Chain Decarbonization, February, 2009
http://www.weforum.org/pdf/ip/SupplyChainDecarbonization.pdf

CO2 Emission Factors by Mode



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World Economic Forum: Supply Chain Decarbonization, February, 2009
http://www.weforum.org/pdf/ip/SupplyChainDecarbonization.pdf

A "Smarter" SmartWay

SmartWay 1.0	SmartWay 2.0
Domestic ground freight, i.e., trucking and rail	Multimodal, global operations, including maritime, short sea, air cargo, drayage, port, etc.
Qualitative, non-dimensional partner scoring process	Quantitative (g/mile, g/ton-mile, etc.) transparent and granular carbon-based scoring for companies
Detailed technology survey for carrier scoring	Streamlined, performance based scoring based on actual miles, fuel, volume
Carbon footprints limited to default national averages	Carbon footprint based on provider and modal choices
US-based, outbound operations covered	Globalized SmartWay program quantifies supply chain emissions

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Carbon Based Carrier Scoring Systems

SmartWay 1.0

SmartWay FLEET Model Score	Shipper SIF Score
0	0
.01 - .74	0.75
.75 - .99	1
1.00+	1.25

SmartWay 2.0

10 Bin System	
Grade	CO2 g/mile
1	1,271.72
2	1,522.03
3	1,593.60
4	1,651.06
5	1,688.79
6	1,722.27
7	1,771.09
8	1,823.70
9	1,932.25
10	2,160.86

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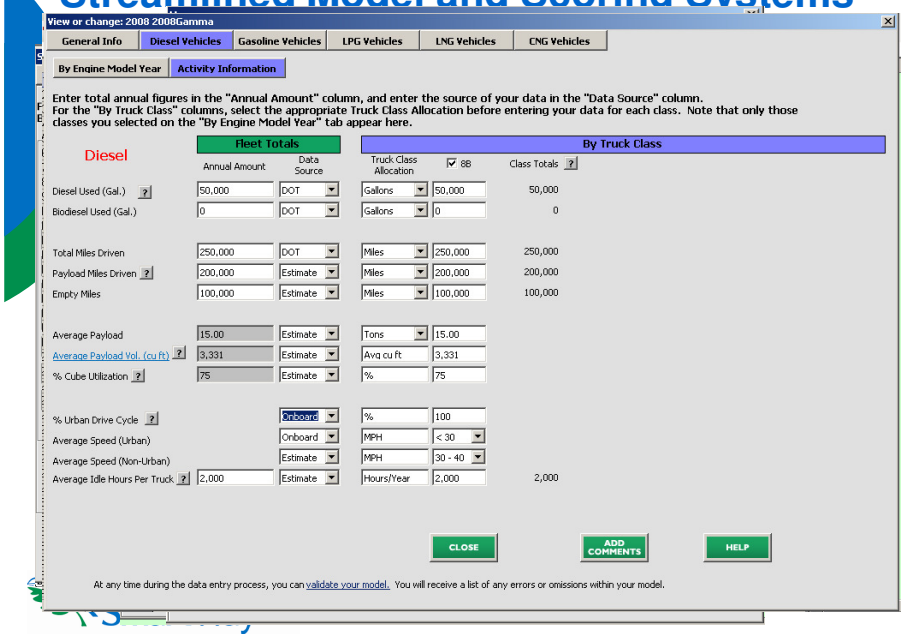
Streamlined Model and Scoring Systems



SmartWay Supply Chain Strategies

- Many companies, countries, trade groups, NGOs and other stakeholders looking for ways to reduce GHG emissions from the supply chain.
- World Economic Forum estimates potential Mt CO_2e savings from:
  - Clean Vehicle Strategies 175
  - De-speeding supply chain 171
  - Optimized networks 124
  - Packaging improvements 132
  - Low Carbon Sourcing 152
  - Modal Switches 115
  - Reverse Logistics 84
  - Near-shoring 5

= 958 mega-tonnes CO_2e

Emissions reductions potential

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Air Cargo GHG Reduction Strategies

- Carrier operational:
  - Vectoring w/GPS (better routing)
  - Better air traffic control to reduce vertical separation minimum
  - Continuous descent approach
  - Reduce congestion (i.e. time waiting to land)
  - Pay to advance position in landing queue
  - Reduce or eliminate engine use during taxiing
  - Reduce or eliminate engine/APU use at the gate
  - Reduce "tankering" (i.e. buying fuel in one place for multiple trips)
  - Reduce weight of onboard components e.g. duty-free, water tanks, etc.
  - Reduce back-haul (empty aircraft space)
  - Reduced speed
- Technologies:
  - Increase engine efficiency
  - Improve aerodynamics, adding winglets/spiroids at tip of wings, using less paint, adding film or other materials to surface of planes, etc.
  - Reduce aircraft frame weight
- Biofuels
- Shipper operational – reduced packaging

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Maritime GHG Reduction Strategies

- Carrier Operational:
  - Routing and logistics improvements
  - Reduced speed
  - Reduced docking times
- Vessel Design:
  - Hull design and coatings
  - Improved propulsion systems
  - Improved propellers
  - Improved engines and rebuilds
  - Slide valves
- Energy Supply
  - Supplemental power by wind and solar
  - Alternative fuels
  - Hybrid propulsion systems
  - Fuel cells
  - Cold ironing, in port
- Shipper Operational
  - Reduced packaging
  - Optimized palletization and cube

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Potential Global CO_2 Savings* from Modal Shifts

	2020		2030		2050	
	Projected Emissions	20% intermodal shift	Projected Emissions	20% intermodal shift	Projected Emissions	20% intermodal shift
Air Cargo	200 million	160 million	286 million	229 million	429 million	343 million
Truck	1.90 billion	1.50 billion	2.20 billion	1.80 billion	3 billion	2.40 billion
Rail	250 million	288 million	300 million	344 million	400 million	460 million
Ship	700 million	701 million	900 million	901 million	1 billion	1.002 billion
Total	3.05 billion	2.67 billion	3.69 billion	3.23 billion	4.83 billion	4.20 billion
Total	Savings = 380 million		Savings = 450 million		Savings = 620 million	

*All numbers in metric tons CO_2 equivalent

*Assumes modal shifts: 20% air to ship and 20% truck to rail

*Data from OECD Joint Working Party on Trade & Environment: Interim Report, Nov. 2008

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Case Studies on Modal Shift

REI www.rei.com

- Implemented aggressive shift from air to sea cargo Between 2005 - 2008
  - Saving about 290,000 tons CO_2 per year

IBM

- Air Cargo footprint = 20,000 tons CO_2
  - Included 250,000 shipment records from six product families
  - 18% total ton-miles (71% total carbon footprint)

hp

- Shifted notebooks from air to sea and truck to rail on domestic shipments
  - Saved 7,500 tonnes of CO_2

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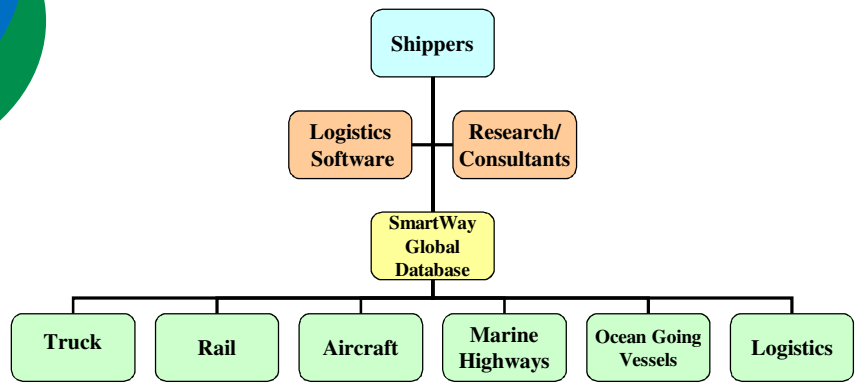
SmartWay 2.0 Architecture



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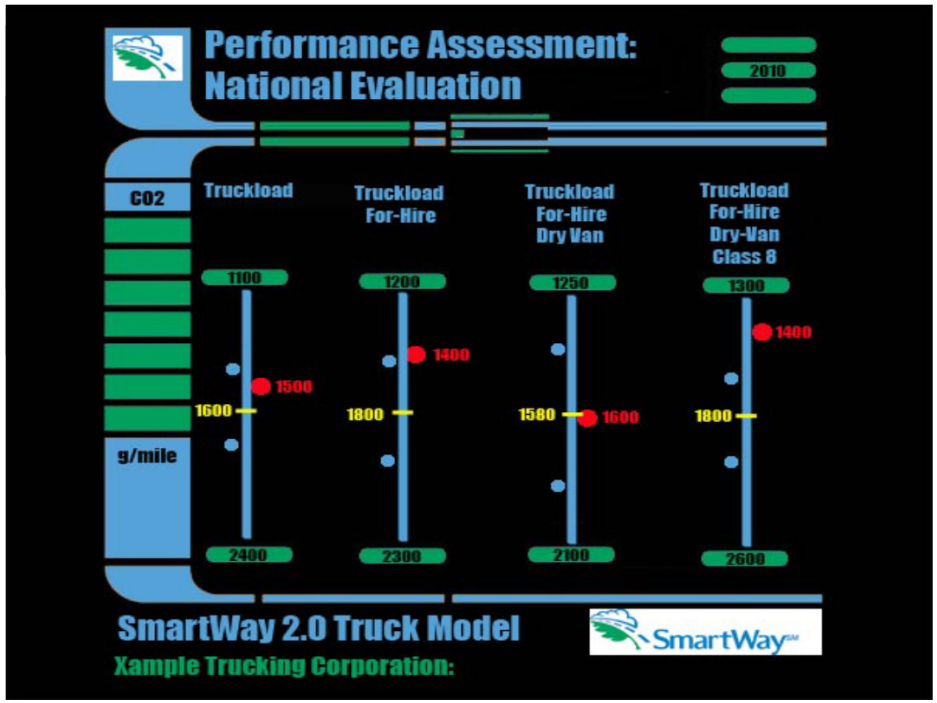

SmartWay International Deployment Opportunities

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What Have We Learned from Our SmartWay Program

- Strong business case for more sustainable supply chains
  - Transportation is a significant piece of the corporate emissions footprint
  - Transportation becoming greater portion of operating costs
  - Energy savings save costs and reduce emissions
- Globalization introduces new challenges and opportunities
  - Multinational corporations linking operations across more world ports & borders
  - Longer, multimodal supply chains can also mean more emissions from trade
  - Increased pressure to reduce embedded carbon emissions
  - International community must work together for global solutions
- Government/Industry Partnerships can move the marketplace
  - EPA's SmartWay Transport Partnership is a business friendly mechanism to reduce GHG emissions from supply chains, by saving fuel and $

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The Demand for SmartWay 2.0

- Demand for Multimodal CO_2 Model from Industry
  - Demand for CO_2 inventory (footprint)
  - Some interest in NOx and PM
  - Also demand for efficiency measurement & optimization
- Stakeholders are asking EPA to take lead role
  - Desire for a global program
  - Desire for multi-modal program
  - Desire for a consistent, global methodology
- Carbon disclosure demands accelerating
  - Industry needs to quickly inventory, benchmark, and track efficiency improvements
  - Energy security and energy prices underscore urgency

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The U.S. EPA Role in SmartWay

- EPA provides technical expertise, data analysis, emissions factors for modeling benefits of technologies & strategies
  - As regulatory authority, Office of Transportation and Air Quality has teams of experts on heavy duty trucks, rail, maritime, ports
- EPA levels the playing field with industry as neutral third-party
  - EPA credibility facilitated getting nation's largest carriers and shippers to work together to address goods movement
  - EPA protects confidentiality of Partner data
- EPA promotes SmartWay brand, marketing, public education
  - SmartWay certified light duty vehicles and PSA campaign inform the public of cleaner, more sustainable transportation options
  - Maintains program and brand value for Partners

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The SmartWay International Summit

- December 2008
- Hosted by EPA and U of M in response to countries asking for guidance to develop and launch their own "SmartWay" programs
- Representatives from 12 countries
  - Belgium, France, Netherlands, Sweden, Switzerland, UK, Australia, New Zealand, Canada, Mexico, India, Japan
- Other key organizations included:
  - World Resources Institute, Environmental Defense Fund, Carbon Trust, MIT, US Maritime Administration, EPA OIA
- Goals:
  - Training countries to set up SmartWay sister programs
  - Sharing best practices from other countries' programs
  - Harmonizing supply chain GHG accounting methods
  - Developing an international SmartWay Exchange Network
- Most international inquiries on SmartWay from developed economies
  - EPA believes SmartWay has potential for developing economies

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SmartWay as Platform for International Freight Sustainability Efforts

- "SmartWay" sister programs based on US EPA SmartWay:
  - France, Australia, Mexico
- EU launching SmartWay platform to harmonize multinational freight sustainability efforts, and share data with US
- Clean Air Initiative – Asia
  - SmartWay technologies used for Green Trucks Project in Guangzhou, China

Asia-Pacific Economic Cooperation

APEC and Alliance to Save Energy
- Highlighting SmartWay as model for Asia
- Promoting SmartWay model to Asian Development Bank

- Commission for Environmental Cooperation
  - Eyeing SmartWay for CAN-US-MEX trade corridor
  - Considering North American SmartWay Supply Chain demonstration project

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SmartWay Projects Considered for Asia

- SmartWay Workshop and Leader Summit:
  - Train Asian countries to set up their own SmartWay "sister" programs
  - Share best practices from other countries' freight sustainability programs
  - Explore the means to harmonize and align efforts across global supply chains
  - Develop a SmartWay Exchange Network, to share data and best practices
  - Singapore, Asian Development Bank, CAI-Asia have expressed interest

- SmartWay Supply Chain study:
  - Assess GHG emissions reductions achieved by a large shipper, with a complex global supply chain from:
    - Modal shift
    - Carrier optimization
    - Supply chain sustainability practices
  - The study will demonstrate how shippers can reduce operating costs, while also saving GHGs and improving energy security

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Can SmartWay Work in China?

- China's domestic freight and energy demands are accelerating:
  - Diesel vehicles expected to increase to 60 million by 2035
    - Compared to 10 million in 2005
  - 72% of domestic freight is carried on highways
    - Freight volume increased 67% from 60 million ton km in 2002 to over 100 million ton km in 2007
  - International Energy Agency estimates passenger and freight transport in China will be 10% of global energy demand by 2035
- China's fuel costs are significant
  - Fuel subsidies of 1.79 billion USD for 2008
    - Global fuel prices doubled from 2004 – 2008
    - China was able to keep prices fairly stable with subsidies
  - Fuel is largest part of operational cost for commercial truck fleets
    - Fuel cost is 40% to over 50% of operational costs for many fleets
- China's freight operations have potential for significant efficiency gains
  - Advanced technologies and strategies
  - Majority of private truck owners report:
    - Empty loads 30% of time and less than 60% load factors

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SmartWay℠
Transport Partnership
U.S. Environmental Protection Agency

www.epa.gov/smartway

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APPENDIX

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SmartWay Technologies and Strategies

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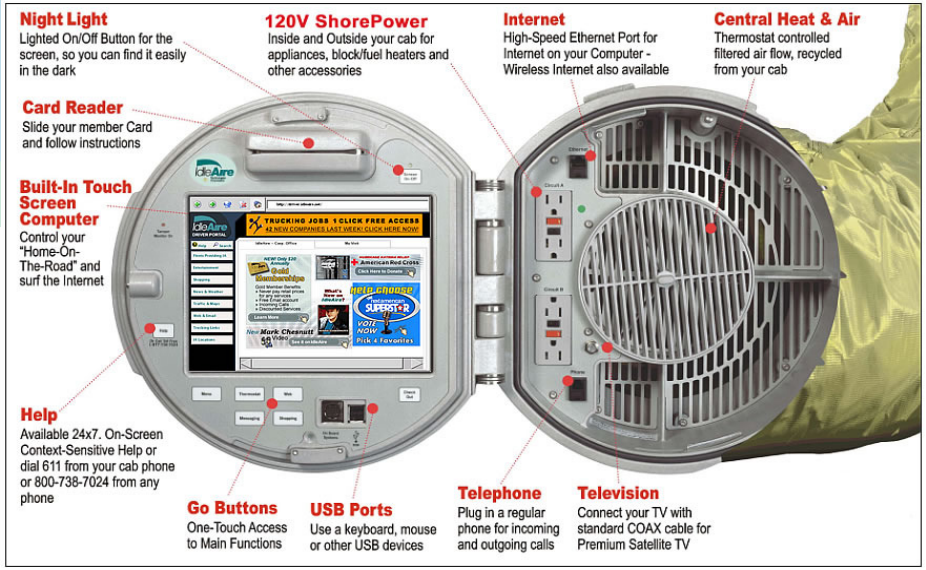
Advanced Truck Stop Electrification

Advanced Truck Stop Electrification



Idle Reduction Technologies

For Trucks and Locomotives

Average fuel savings	Emissions Controlled
Trucks: 1 gal/hr	CO_2, NOx, and PM
Rail: 4 - 12 gal/hr	

- Automatic Shut-Down/Start Up System
- Battery Powered Systems
- Diesel Driven Heating System
- Auxiliary Power Unit/Generator Set
- Truck Stop Electrification

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Low Rolling Resistance Tires

Single Wide Base and Improved Duals

Average fuel savings	Emissions Controlled
Trucks: 4 - 5%	CO_2, NOx

- Single-wide tires and aluminum wheels
  - Reduced rolling resistance
  - Reduced weight
- Low rolling resistance duals can be as effective as singles

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Trailer Aerodynamics

Average fuel savings	Emissions Controlled
Trucks: 5%	CO_2, NOx

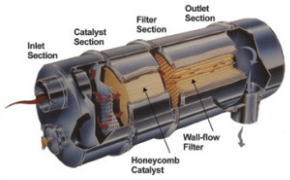
- Trailer Fairings, Side-skirts
- Nose Cone and Trailer Tail

Exhaust After-Treatment Devices

Average fuel savings	Emissions Controlled
----	PM

- Diesel Oxidation Catalysts
  - Estimated cost: $1,000
  - Reduce PM by 25% – 40%

- Particulate Matter Filters
  - Estimated cost $6,000
  - Reduce PM by 80% – 90%



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Intermodal Shipping