

# Environmental Benchmarking for Freight Transportation Air Emissions



## Talking Freight Webinar

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## We're going to discuss:

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- What is environmental benchmarking?
- Business case for benchmarking
- Benchmarking process
- Types of benchmarking metrics
- Major industry benchmarking initiatives
- Case studies



## Project background

- Funded by National Cooperative Freight Research Program
- Focus on freight transportation and air emissions
- Discuss benchmarking from the perspective of carriers (truck, rail, air, marine), facility operators (ports, airports) and shippers
- Examine benchmarking at different levels (fleet, facility, organization, supply chain)

# *What is environmental benchmarking?*



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# What is benchmarking?

## ■ Business tool for improving performance

- “Benchmarking is the continuous process of measuring products, services and practices against the toughest competitors or those recognized as industry leaders” - David Kearns
- “Benchmarking is the search for industry best practices that lead to superior performance” - Robert Camp





## What is benchmarking? (continued)

- Outward looking
- Search for best practices appropriate for your business
- Can involve comparisons within your industry or look outside your industry
- Focused on the most important parts of your business
- Data driven
- Action oriented - built on detailed understanding of achievable performance in different markets



## What kind of environmental impacts?

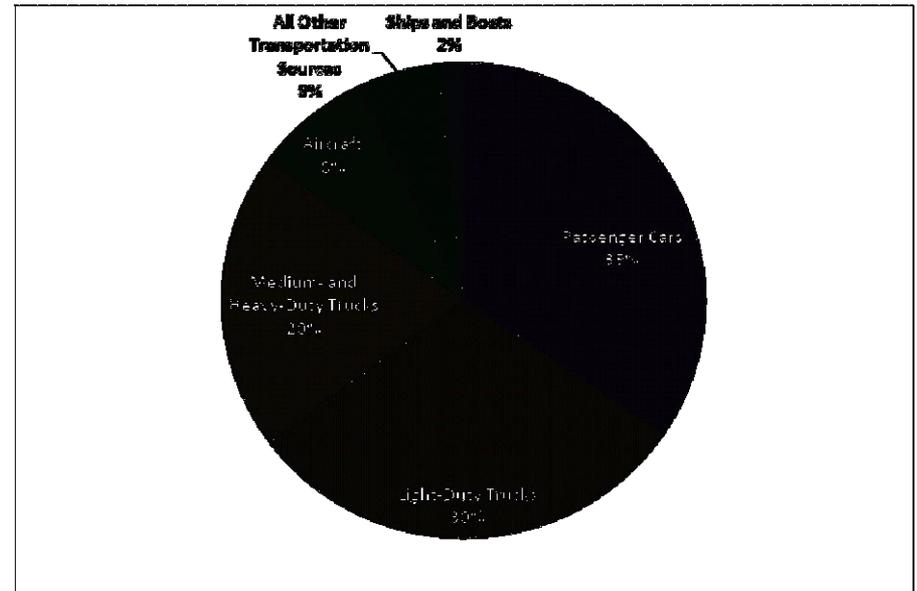
- Direct and indirect air emissions impacts
- World Resources Institute and the World Business Council for Sustainable Development GHG protocol defines three emissions scopes
  - Scope 1 direct emissions from equipment and vehicles owned by the company
  - Scope 2 emissions associated with purchased electricity
  - Scope 3 emissions are indirect emissions that are a consequence of a company's actions, but are not controlled by them (purchasing transportation, employee commuting)

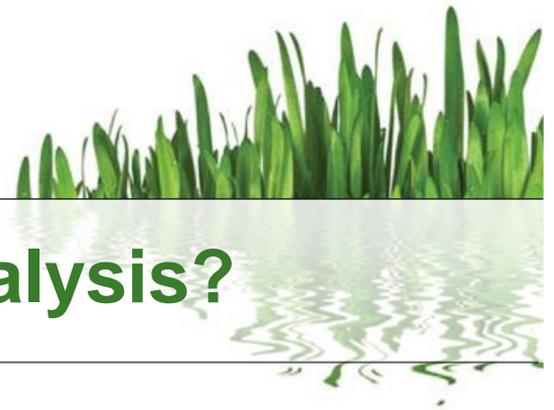


## What kind of air pollutants?

- Criteria air pollutants
  - NO<sub>x</sub>, PM, SO<sub>x</sub>, etc.
- Greenhouse gases (GHG)
  - CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs
- Air toxics
  - Diesel particulate matter

GHGs from Transportation





# What entity types and scales of analysis?

Entity Types	Scales of Analysis			
	Fleet	Facility	Corridor	Organization
Truck Carrier				
Rail Carrier				
Marine Carrier				
Air Carrier				
Marine Port				
Airport				
Shipper & Receiver				

# *Business Benefits of Environmental Benchmarking*



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# Business benefits of environmental benchmarking

- Improved information for management
- Reduced costs
- Competitive advantage
- Reduced risk

Average Retail Fuel Prices





## Business benefits of environmental benchmarking (continued)

- Demonstrating environmental stewardship can raise the standing of the company with stakeholders
  - Customers
  - Local community
  - Potential and current employees
  - Regulators and licensing agencies
  - Investors

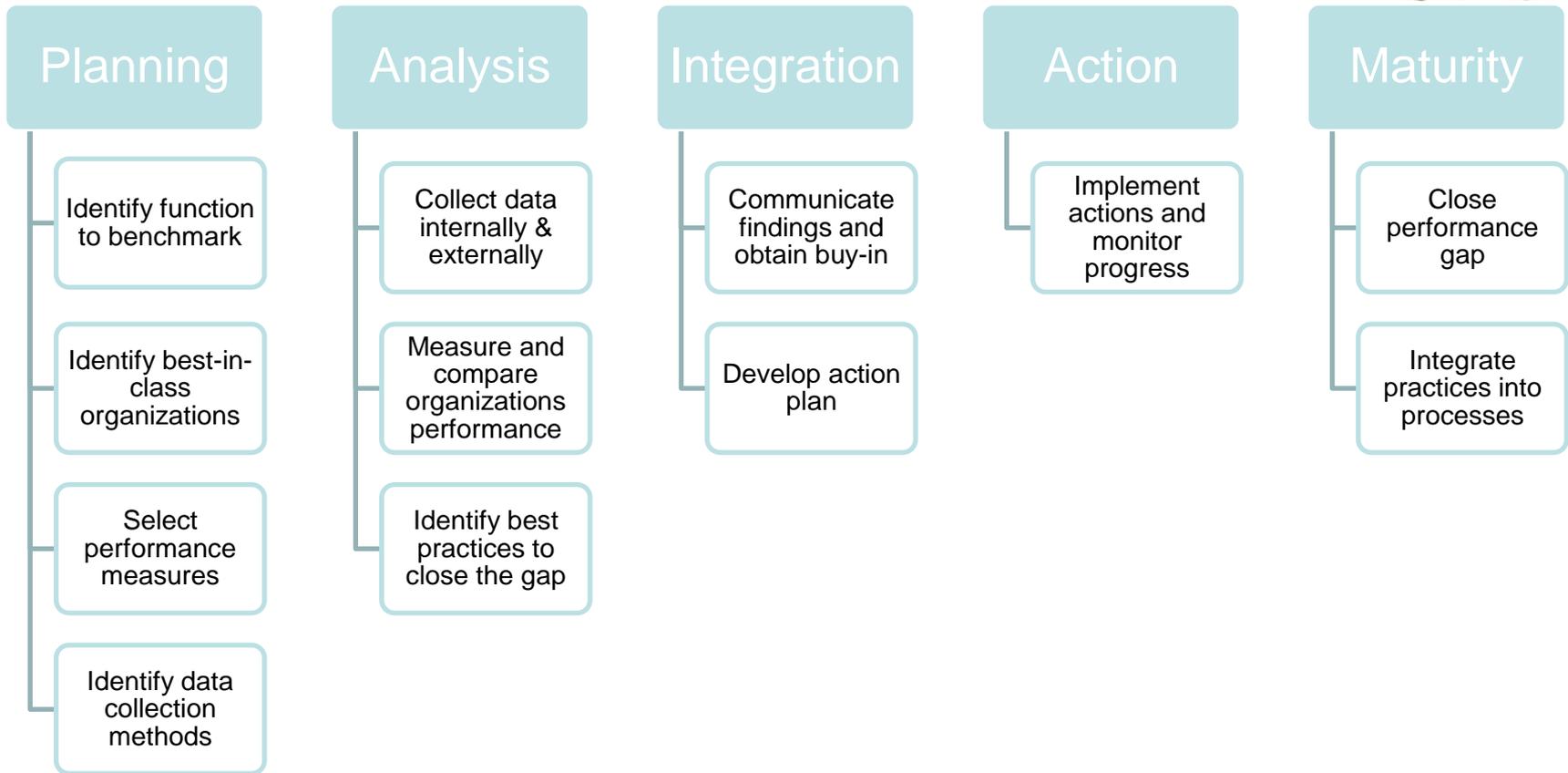
# *Benchmarking Process*



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# Detailed process overview





# Planning

- Identify function to benchmark
  - Define important function, break into steps
- Identify best-in-class organizations in that function
  - Type of partner (internal, competitive, industry, functional, generic)
- Select performance measures
  - How do measures link to organizational goals or the measures used by other organizations?
- Identify data collection methods
  - Existing data review, surveys, interviews, focus groups, site visits

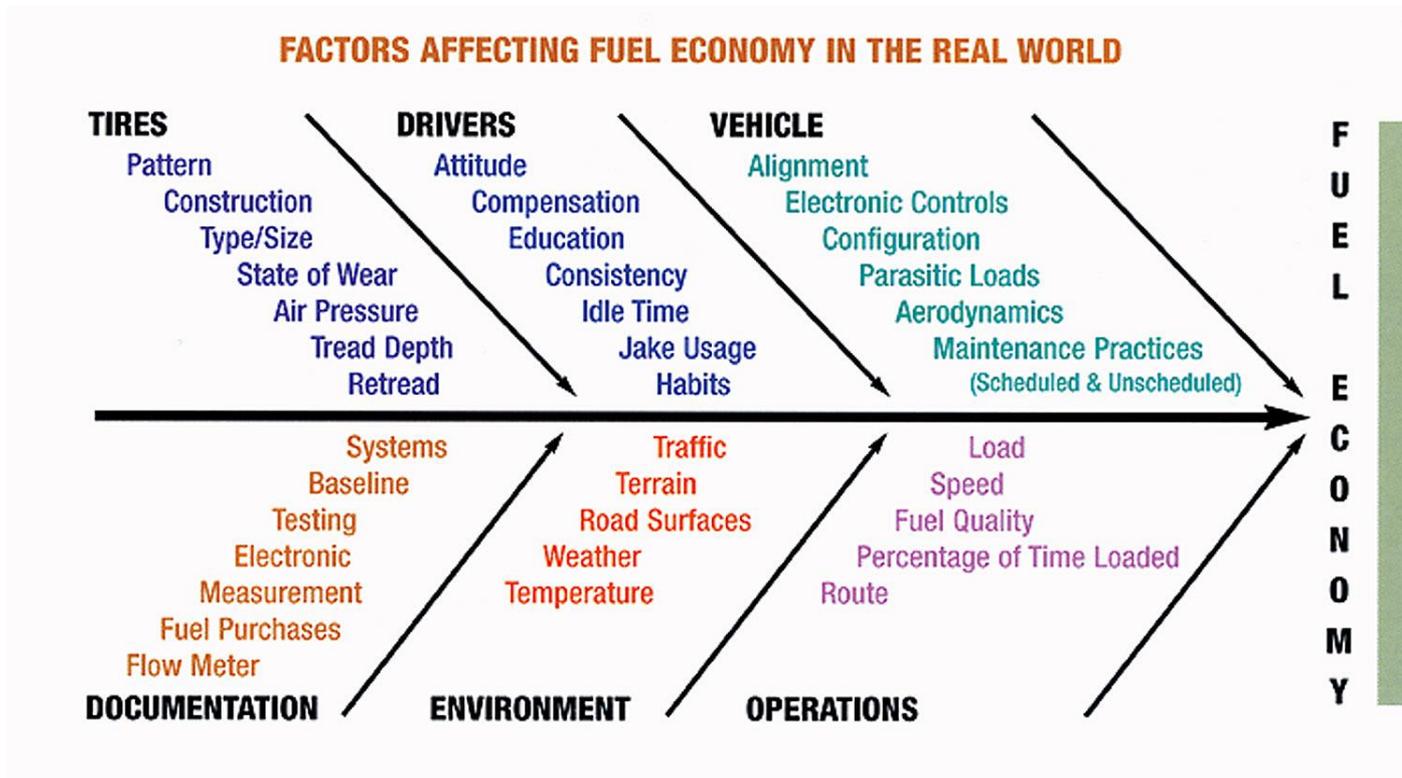


## Analysis

- **Collect data internally and externally**
  - Structured process to understand differences
- **Measure and compare organizations' performance**
  - Focus on both positive and negative gaps
  - Understand the enablers
- **Identify best practices to close gap**
  - Vehicle, operational, infrastructure



# Analysis: Fishbone chart of fuel economy enablers



# *Types of Environmental Benchmarking Metrics*



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## Types of environmental performance evaluation

- Management performance indicators
- Operational performance indicators
- Environmental condition indicators
  
- Types of quantitative indicators
  - Absolute (tons of CO<sub>2</sub>)
  - Relative or normalized (gallons of fuel per ton-mile)
  - Indexed (percent change in CO<sub>2</sub> emissions from 2008)
  - Aggregated (CO<sub>2</sub> emissions from all transportation activities)
  - Weighted (Walmart's proposed sustainability index)



# Sample truck carrier performance measures

Functional Unit	Environmental Performance Metric	Level of Analysis			
		Organization	Fleet	Facility	Corridor
Total Miles	Average emissions (CO <sub>2</sub> , NO <sub>x</sub> , PM) per mile	✓	✓		✓
	Average MPG	✓	✓		✓
	% empty miles	✓	✓		✓
	Average customer density per route	✓	✓		✓
Revenue Miles	Average emissions per revenue mile	✓	✓		✓
Ton-Miles	Average emissions per ton-mile	✓	✓		✓
	Average gallons of fuel consumed per ton-mile	✓	✓		✓
Revenue	Average emissions per unit of transportation revenue	✓	✓		
Volume of goods moved	Emissions per cubic foot-miles	✓	✓		✓



# Sample truck carrier performance measures (continued)

Functional Unit	Environmental Performance Metric	Level of Analysis			
		Organization	Fleet	Facility	Corridor
Truck/trailer Improvements	% trucks with transmission and drivetrain improvements	✓	✓		
	% trucks with engine improvements	✓	✓		
	% trucks with aerodynamic improvements	✓	✓		
	% trucks with rolling resistance improvements	✓	✓		
Engine Operating Hours	Idling hours as a % of total engine-on hours	✓	✓		✓
Truck Terminal	Total annual emissions from truck terminal per average number of trucks serviced at the terminal			✓	
Truck Terminal	LEED certification score			✓	
Year of Company Operation	SmartWay Score	✓	✓		
Year of Company Operation	DOW Jones Sustainability Index	✓			

# *Major Benchmarking Initiatives*



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## Examples of industry benchmarking programs

### ■ EPA SmartWay Transport Partnership

- Flagship program for improving fuel efficiency and reducing greenhouse gases and air pollution from the freight sector
- Over 3,000 participants, including most of the largest truck carriers, all Class 1 railroads, shippers and many logistics companies
- Program assesses emissions (CO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>) of carrier fleets and benchmarks them against peers
- Primary metrics are grams of emissions per mile and grams per ton-mile
- Truck fleets are ranked in 1 of 5 performance “bins” for CO<sub>2</sub>, NO<sub>x</sub>, PM
- EPA working to add other freight modes to program



# SmartWay Trucking Industry Segmentation

## **Truck carriers**

**Truckload dry van**

**Less-than-truckload dry van**

**Package Delivery**

**Moving**

**Expedited**

**Drayage**

**Tanker**

**Flatbed**

**Refrigerated**

**Auto Carrier**

**Heavy/Bulk**

**Specialized**

**Mixed (no predominant operation or equipment type)**

## **Logistics companies**

**Multimodal carriers (truck and rail intermodal operations)**



## Examples of industry benchmarking programs (continued)

- Clean Cargo Working Group
  - Partnership of containership operators and shippers
- Green Marine Program
  - Initially for the Great Lakes and St. Lawrence corridor
  - Covers SO<sub>x</sub>, NO<sub>x</sub> and GHGs, invasive species, noise, water quality
- Carbon Disclosure Project
  - Voluntary CO<sub>2</sub> emissions reporting
  - Ability to benchmark against peer groups
  - Showcase successful mitigation strategies



## Examples of industry benchmarking programs (continued)

- **Truckload Carriers Association benchmarking program**
  - Carriers are segmented into carrier specialty groups
  - Monthly statistics, in-person meetings – includes fuel economy
- **Dow Jones Sustainability Index**
  - Global and regional benchmarks
  - Includes climate change mitigation and supply chain standards
- **Supply Chain Consortium**
  - Supply chain efficiency benchmarking



## Status of environmental benchmarking in freight transportation

- Among truck carriers, participation in SmartWay was the most common form of environmental benchmarking
- Multiple environmental benchmarking efforts in the marine sector (e.g., Clean Cargo Working Group, Green Marine, Clean Shipping Index, IMO indices)
- Many carriers do not currently conduct environmental benchmarking, even for fuel economy
- Making meaningful comparisons among different carriers is perceived as a major challenge

# *Case Studies*



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## Con-way fuel benchmarking program

- Truck computers provide detailed data
  - Fuel used and where purchased
  - Gross weight of truck for each movement
  - Origin and destination for each movement, including empty moves
  - Vehicle miles of travel
  - Driver behavior—shifting, braking, acceleration, speed, idling, etc.
  - Characteristics of tractor—make, age, transmission, etc.
  - Characteristics of trailer make, age, any special features



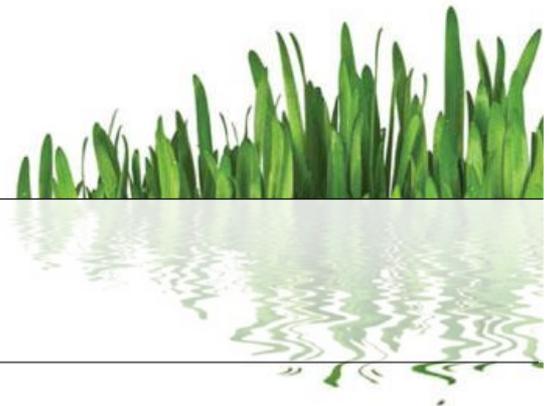
## Con-way fuel benchmarking program (continued)

- Comparative industry fuel economy data
  - Salesmen for original equipment manufacturers
  - Industry groups such as the Technology and Maintenance Council
  - Private carriers
  - SmartWay



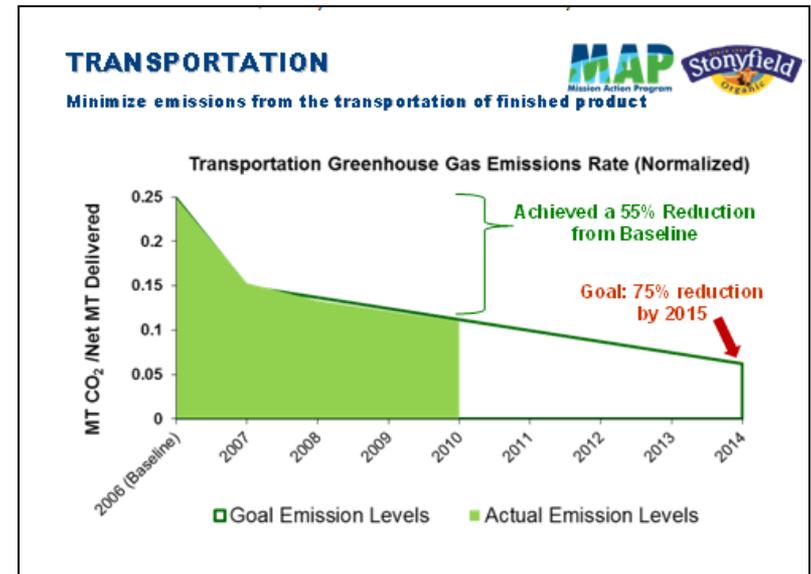
## Con-way fuel efficiency measures

- Direct fuel efficiency measures
  - Correction of fuel-wasting practices of drivers
  - Types of equipment acquired – side skirts & under trays
  - Maintenance practices
- Measures with broader corporate goals:
  - Design of LTL network – saved 20,000 gallons fuel per day
  - Dispatch software
  - Marketing strategy—in which lanes to build density
  - Equipment life



# Stonyfield Farms

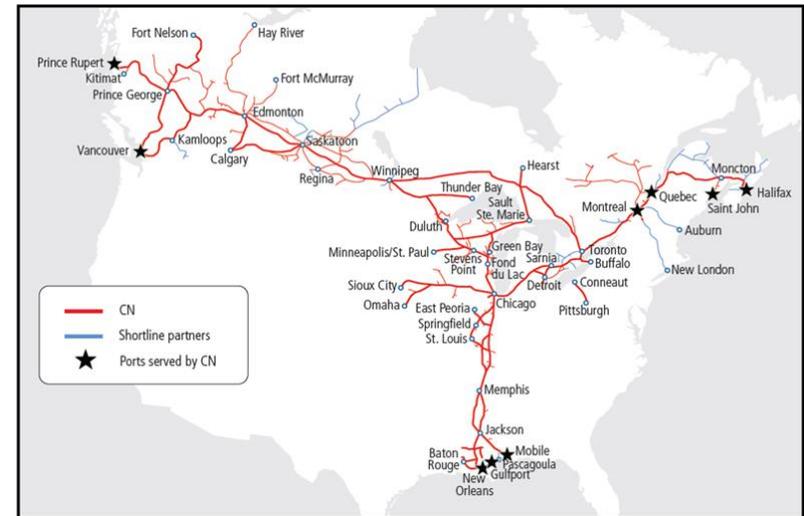
- Benchmarking customer emissions
  - Uses data from 3PL Ryder to track performance
  - Metrics include – metric tons of CO2/metric ton product delivered & CO2 emissions/customer
  - Provides comparative information to customers
  - Shifted LTL routes to multi-stop TL routes – 40% VMT reduction





# Canadian National Railway

- Participates in Carbon Disclosure Project
- Metrics:
  - CO<sub>2</sub>-e per gross ton-mile for rail
  - Gross ton mile per gallon of fuel consumed – all modes
- Geographical comparison of routes

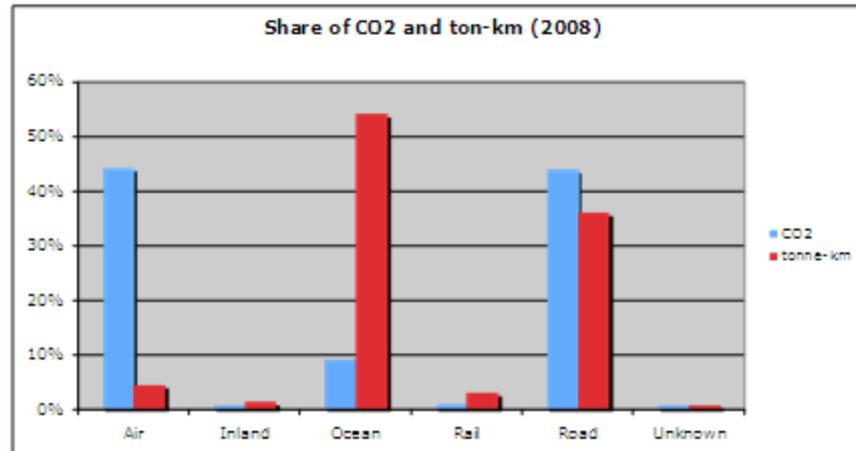
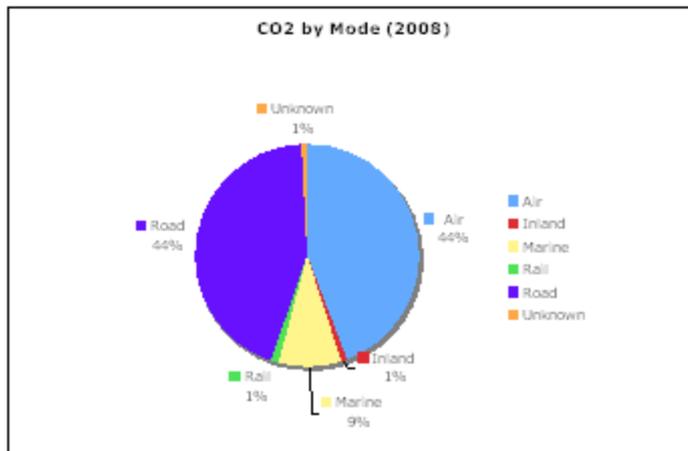




# Leading energy company

## ■ Logistics Center of Excellence

- Benchmarked mitigation strategies and CO2 inventory program
- Developed scope 3 emissions inventory & mode shift program
- Wind turbine supply chain optimization – 1000 ton CO2 emission reduction & 5 million cost savings





## Contact Information

- NCFRP Report 21, *Handbook on Applying Environmental Benchmarking in Freight Transportation* available at the web link below:

[http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp\\_rpt\\_021.pdf](http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_021.pdf)

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