

Supplemental Materials

Carbon Footprint of Supply Chain Transportation and Shipping

Stanford Supply Chain Conference, 22 April 2008

Lee Kindberg
Director, Environment
MAERSK INC.
6000 Carnegie Boulevard, Charlotte NC 28209-4637
tel: (704) 571-2693
E-mail: NAMENVIRO@maersk.com

For additional information, see:







<http://www.maersk.com/en>

www.maerskline.com

http://www.maerskline.com/link/?page=brochure&path=/about_us/environment

[http://www.maerskline.com/link/?page=brochure&path=/about_us/environment/Carbon footprint calculator](http://www.maerskline.com/link/?page=brochure&path=/about_us/environment/Carbon_footprint_calculator)

Drivers of Carbon Emissions and Reduction Potentials

Part of supply chain	Driver of emissions	Ways to reduce emissions (examples)
Ocean transportation 	<ul style="list-style-type: none"> • Volume moved • km covered 	<ul style="list-style-type: none"> • Higher container utilisation • Use of more eco-friendly carriers
Air transportation 	<ul style="list-style-type: none"> • kg moved • km covered 	<ul style="list-style-type: none"> • Air to Sea-Air conversion
Port moves 	<ul style="list-style-type: none"> • Number of containers 	<ul style="list-style-type: none"> • Higher container utilisation • 20' to 40' conversion • CFS-CY conversion
Domestic distribution  	<ul style="list-style-type: none"> • Transportation mode (truck vs. rail) • km covered • Volume moved 	<ul style="list-style-type: none"> • Higher utilisation of delivery trucks/vans • Double-decker trailers • Increased use of rail • Use of bio-fuel
Warehousing 	<ul style="list-style-type: none"> • Number of days in warehouse • Number of CBM 	<ul style="list-style-type: none"> • Reduce safety stock • DC bypassing

The Supply Chain and the Environment

CO₂ emissions can be reduced through

- Understanding the sources of emissions
- Choosing lower-impact modes and carriers
 - Marine carriers with more environmentally responsible vessels
 - Rail
 - Inland waterway transportation (barge)
 - SmartWay trucks
- Increased supply chain efficiency



Opportunity: reduce both CO₂ emissions and costs



Clean Cargo Working Group

www.bsr.org

- **Business-to-business forum “to promote sustainable product transportation.”**
- **Environmental Performance Survey (EPS, done annually)**
- Intermodal calculator - now includes rail, truck
- **Social Responsibility Survey**
- **Members:**
 - **Shippers**: Coca-Cola, The Gap, IKEA, Nike, Nordstrom, Shell, Starbucks, Timberland, Wal-Mart, Cisco, Dell, Fiji Water
 - **Carriers**: APL, CMA-CGM, Cosco, Hanjin, Hapag-Lloyd, “K” Line, Maersk Line, Hyundai, MSC, NYK Line, OOCL, Wallenius Wilhelmsen, Yang Ming,
 - **Others**: Chiquita/Great White Fleet, UPS

Clean Cargo Working Group

Environmental Performance Survey (EPS)

- > Standardized method for calculating and reporting environmental factors for shipping
 - > Basis: WRI GHG Protocol
- > Emissions factors calculated per container by route
 - > Actual port-to-port, route distances
 - > Fuel use for that route
 - > Ship capacities for ships on that route that year
- > Environmental footprint
 - # containers X distance traveled X emissions factor

Calculating the “Carbon Footprint” for ocean shipping

$$\text{CO}_2 \text{ Emissions} = \text{Distance} \times \text{No. of TEU} \times \text{Emission Factor}$$

$$\text{g of CO}_2 = \text{km} \times \text{TEU} \times [\text{g of CO}_2 / (\text{TEU} \times \text{km})]$$

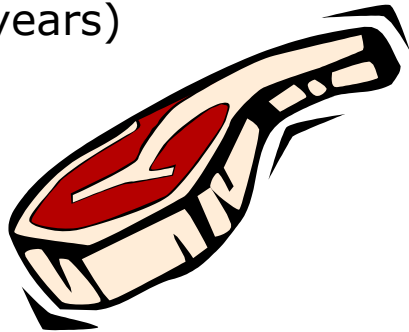
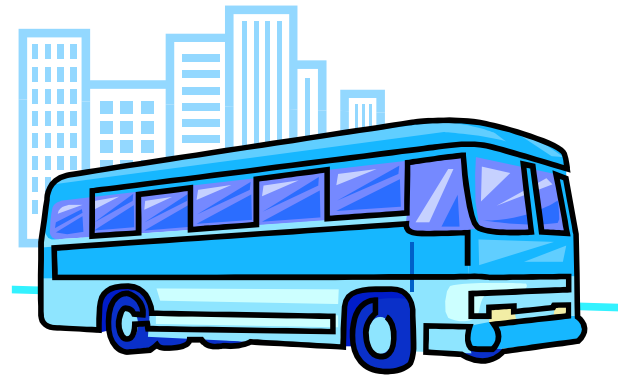
Emissions factor is weighted average of all ships on that particular route.

Basis: Greenhouse Gas Protocol ‘Distance-based methodology’ for calculating CO2 emissions.

<http://www.ghgprotocol.org/DocRoot/7NmWvnZLTBdCB73po4tL/co2-mobile.pdf>

Container Capacity

- One 40-foot -- same dimensions as a city bus
- Can hold:
 - 1,500 DVD players
 - 18,000 T-shirts
 - 90,000 lamb chops (what a four-person family would eat in 450 years)

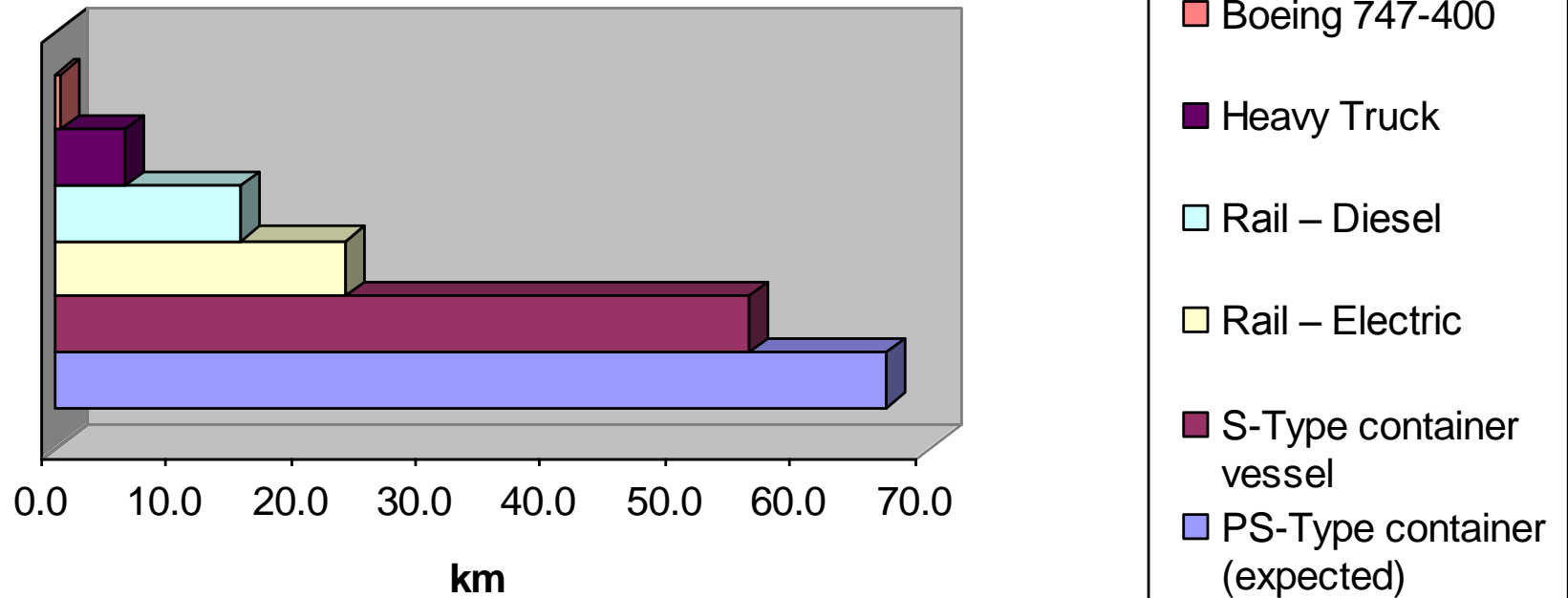


- 45-foot container -- 28,000 Barbie Dolls



Route and vessel do matter

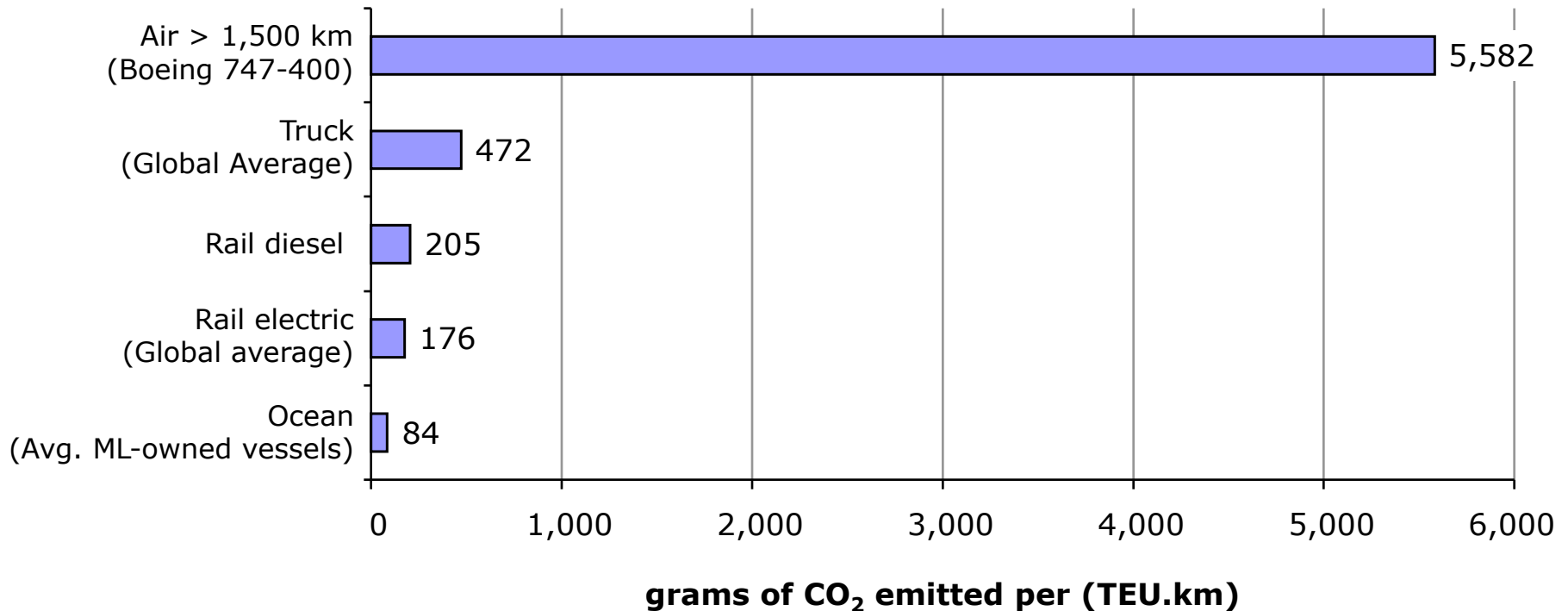
Distance travelled with 1 ton cargo using 1 kWh energy for different transport modes



Rules of thumb: Larger vessels are more efficient, so use less fuel per container. Newer vessels are also generally designed to be more efficient.

CO₂ Emissions by Mode of Transportation

Ocean shipping has the lowest environmental impact for long distance transportation.



What we've learned

- > Very important to use a consistent approach
 - > Different models may give somewhat different
 - > Know & understand the assumptions and numbers
 - > Best if agreed-upon by whole industry
- > Data verification
 - > Unit conversions
 - > Distances
 - > Cargo weights and types
- > Focus on improvements and incorporating CO₂ into business decisions
 - > Using route and mode emissions factors is time efficient
 - > Greater accuracy is much less important than consistent measures and reduction quantity