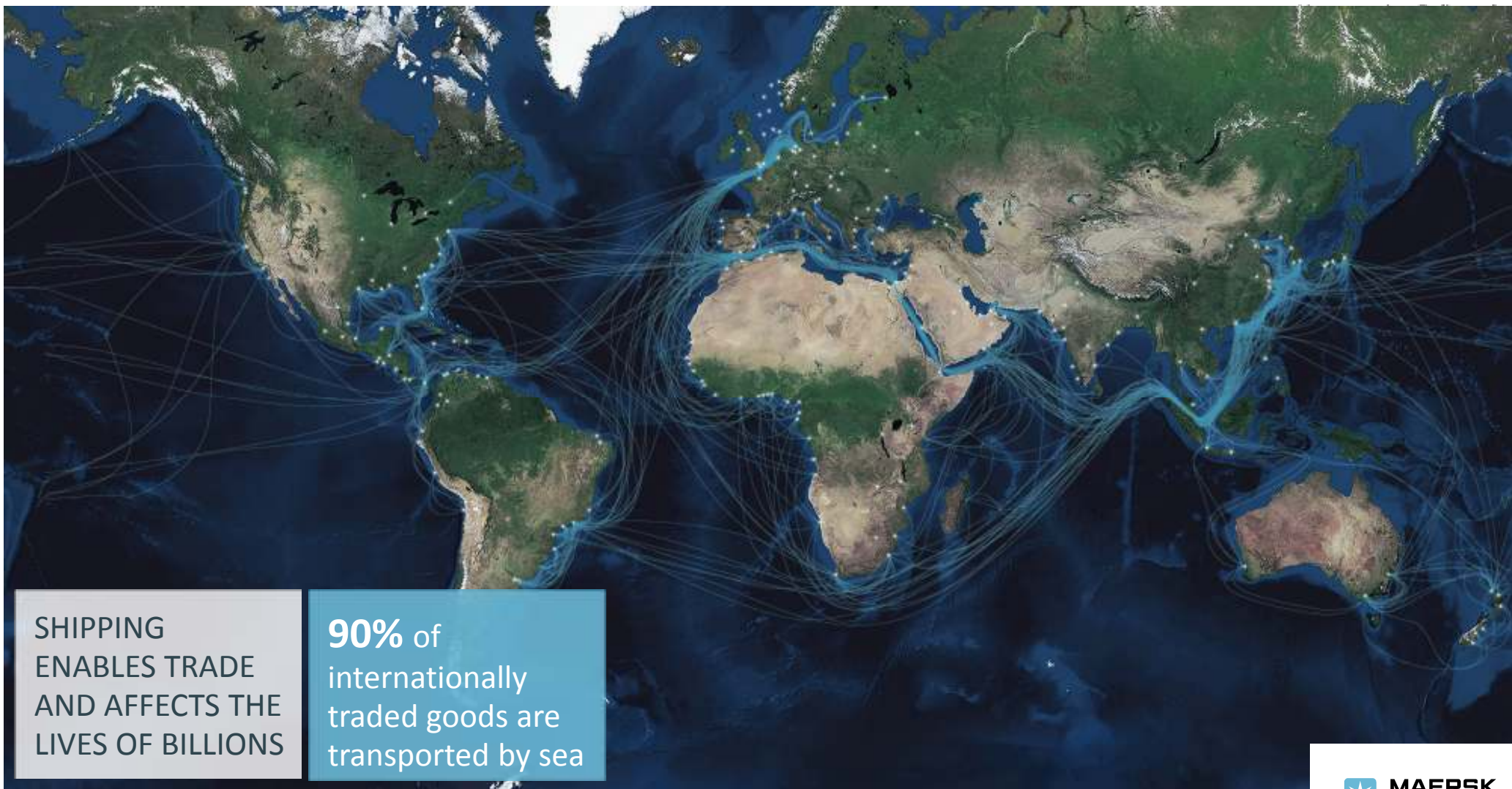




## Partnering to Address Air Impacts from Vessels and Port Operations

NACAA Public Outreach Committee Webinar 12/20/2017

Lee Kindberg, HSE Director, Maersk Line



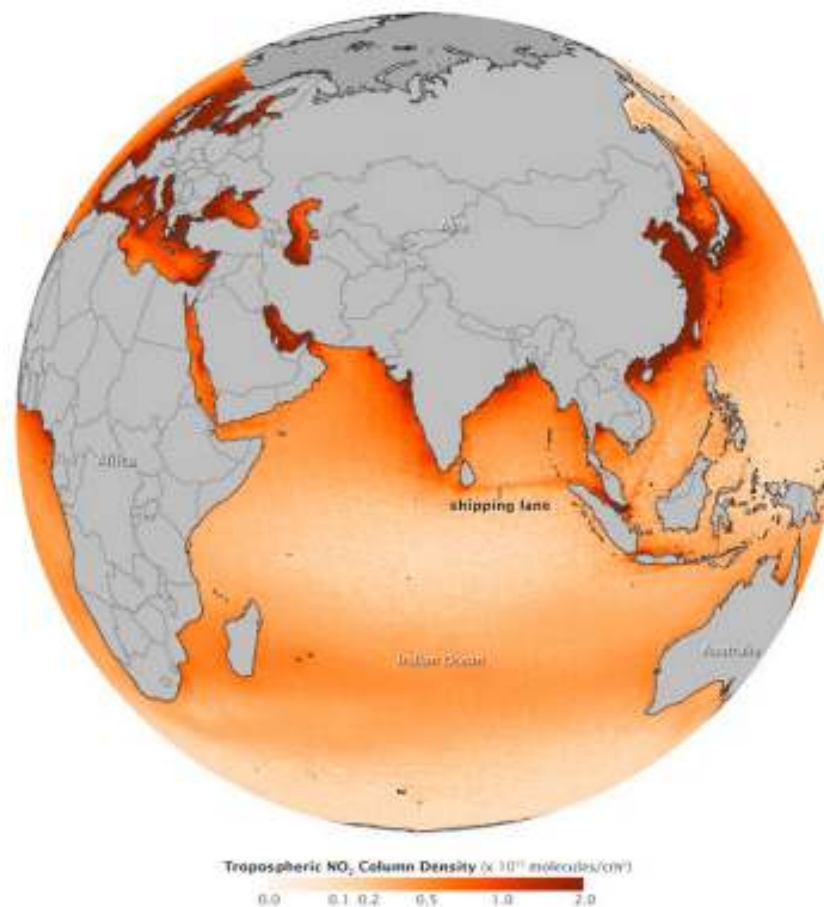
SHIPPING  
ENABLES TRADE  
AND AFFECTS THE  
LIVES OF BILLIONS

**90%** of  
internationally  
traded goods are  
transported by sea

Ocean shipping is the most energy-efficient way to move cargo long distances...  
*But is impacting the planet*

90% of all goods transported globally are carried by ship.

Ocean shipping generates ~2% of all man-made CO<sub>2</sub>.



acquired 2005 - 2012

<http://climate.nasa.gov/news/860>

# Agenda

1. How ocean shipping works
2. Shipping and environmental impacts
3. Partnering to reduce impacts



Today, a single ship can deliver thousands of tons of cargo for many customers to dozens of ports. But it was not always this way ...



## Diesel engines have replaced wind power



## Containers have replaced “break bulk” cargo handling



Containers are standard sizes: 20', 40', 45'

*A 40-foot container is the size of a city bus. It can hold . . .*



**One million Legos**



**10,000 Nike Shoes**

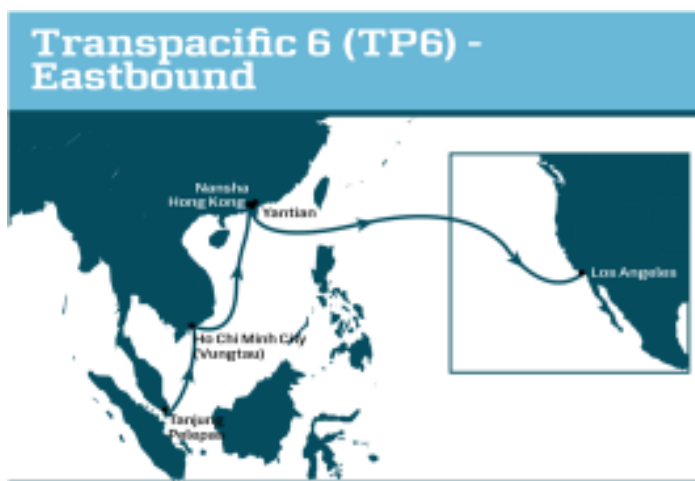


**1,500 DVD Players**

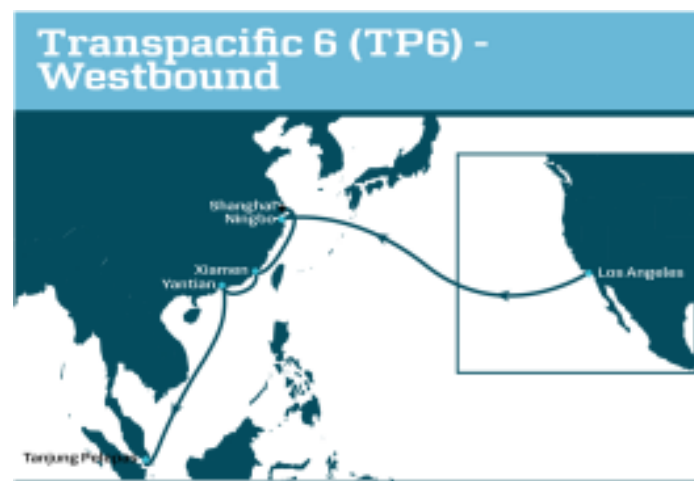


“Liner shipping” means vessels have strict routes and schedules.

*Routes require several weeks, so multiple vessels are scheduled on each route to provide regular service (weekly).*



Port	Arrives	Departs	Transit
Tanjung Pelepas, Malaysia	FRI	SUN	--
Ho Chi Minh City (Vungtau), Vietnam	TUE	TUE	2
Nansha, Mainland China	FRI	SAT	5
Yantian, Mainland China	SAT	SUN	7
Hong Kong, Hong Kong	SUN	MON	8
Los Angeles, CA, USA	SUN	THU	22



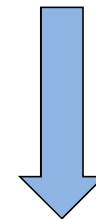
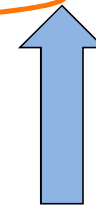
Port	Arrives	Departs	Transit
Los Angeles, CA, USA	SUN	THU	--
Ningbo, Mainland China	WED	THU	12
Shanghai (YR), Mainland China	FRI	SAT	14
Xiamen, Mainland China	MON	MON	17
Yantian, Mainland China	TUE	WED	19
Tanjung Pelepas, Malaysia	SAT	MON	23

# A 14 week round trip requires 14 vessels.

*Sample Vessel Schedule: Georg Maersk on TP-6 in 2010*

Port Name	Arrival Date	Departure Date
Hong Kong	18 Apr 2010 04:00	19 Apr 2010 04:00
Los Angeles	30 Apr 2010 18:00	03 May 2010 17:00
Yokohama	20 May 2010 01:00	20 May 2010 16:00
Nagoya	21 May 2010 08:00	21 May 2010 18:00
Shanghai	23 May 2010 17:00	24 May 2010 07:00
Ningbo	24 May 2010 19:00	25 May 2010 06:00
Xiamen	26 May 2010 13:00	27 May 2010 00:01
Hong Kong	27 May 2010 18:00	28 May 2010 11:00
Yantian	28 May 2010 17:00	29 May 2010 07:00
Tanjung Pelepas	01 Jun 2010 09:00	02 Jun 2010 16:00
Jeddah	11 Jun 2010 23:00	12 Jun 2010 23:00
Suez Canal	15 Jun 2010 01:00	15 Jun 2010 17:00
Barcelona	19 Jun 2010 08:00	20 Jun 2010 08:00
Valencia	21 Jun 2010 02:00	22 Jun 2010 08:00
Algeciras	23 Jun 2010 08:00	24 Jun 2010 14:00
Port Tangier Mediterranee	25 Jun 2010 00:01	26 Jun 2010 02:00
Suez Canal	01 Jul 2010 19:00	02 Jul 2010 17:00
Tanjung Pelepas	17 Jul 2010 02:30	18 Jul 2010 10:30
Vung Tau	20 Jul 2010 08:00	21 Jul 2010 08:00
Yantian	23 Jul 2010 15:00	24 Jul 2010 22:00
Hong Kong	25 Jul 2010 04:00	26 Jul 2010 04:00
Los Angeles	08 Aug 2010 18:00	12 Aug 2010 03:00

14 week  
round  
trip



## The conversation starts with transparency

Container shipping is the most energy efficient means to move high volumes of goods across long distances.

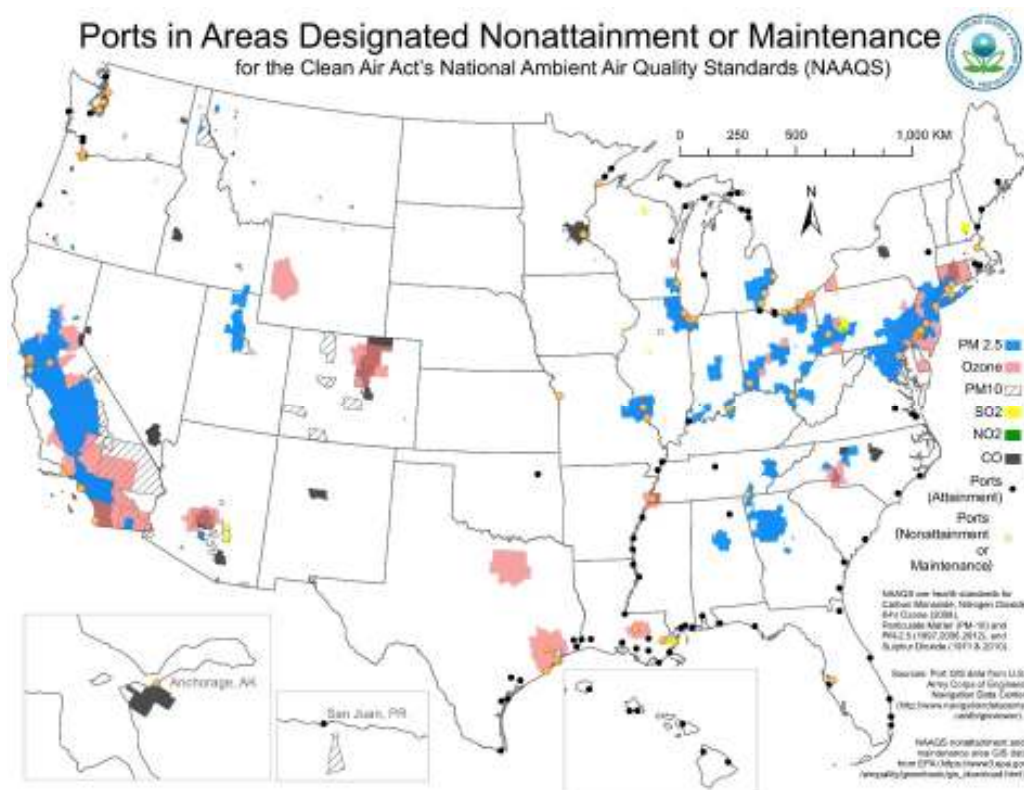
However, in absolute terms, the environmental impacts of the industry are significant.



### Our fleet environmental impacts, 2016:

1. Fuel consumption: 9.4 million tonnes  
CO<sub>2</sub> emissions: 30.5 million tonnes
2. SO<sub>x</sub> emissions: 489,000 tonnes  
NO<sub>x</sub> emissions: 751,000 tonnes
3. Waste: 125,000 tonnes
4. Ballast water, risk of discharges or spills
5. Use of paint and chemicals

# Port-related operations are significant sources of air emissions and greenhouse gases.



Many ports are in areas with existing air quality challenges and nearby populations.

The largest sources of port-related emissions are vessels and trucks.

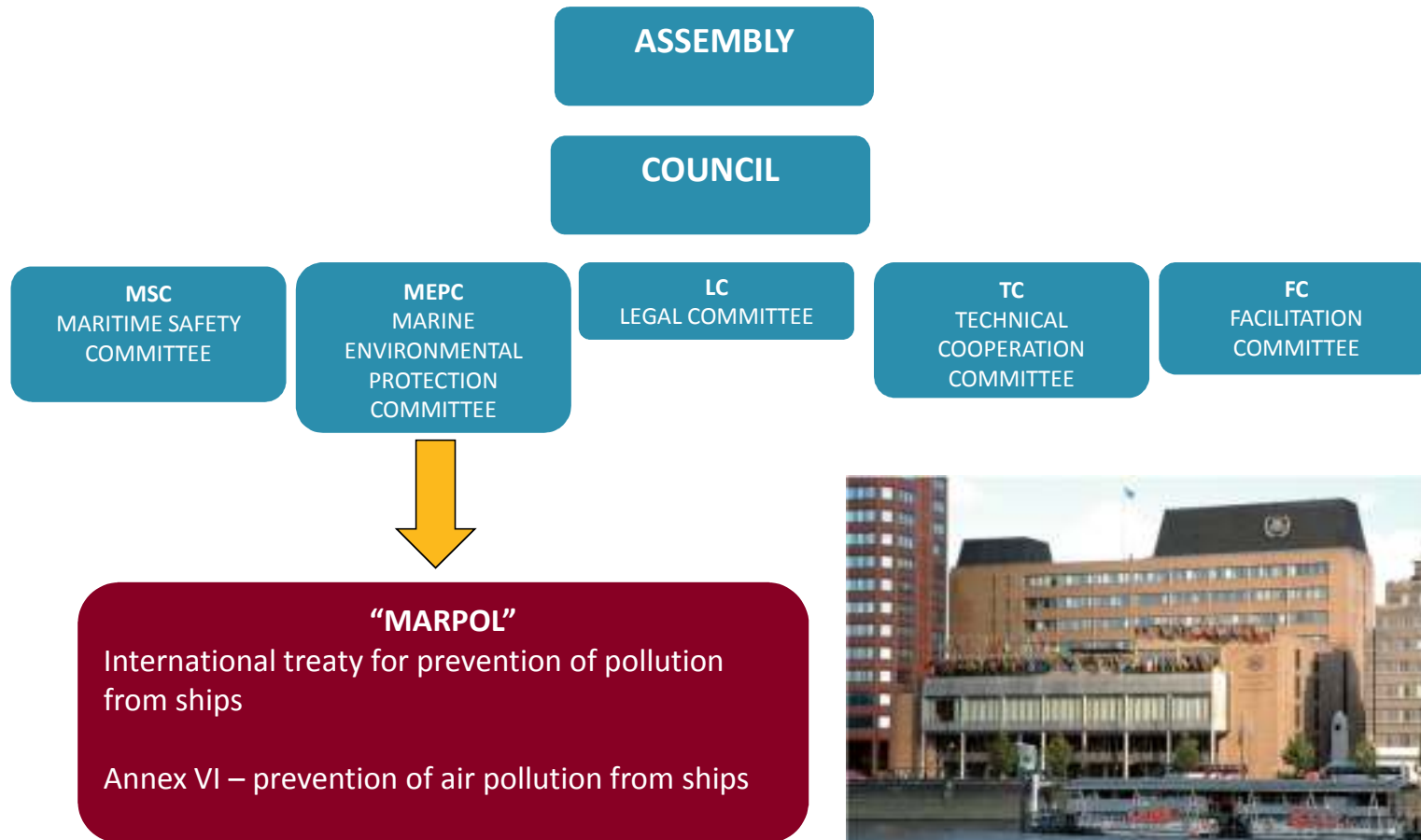
# International vessel regulations

Vessels are regulated through a number of international conventions and treaties, as well as U.S. regulations, including:

- International Maritime Organization (IMO)
- International Safety management (ISM) code
- MARPOL – all annexes
- Vessel Classification Societies
- 33 CFR (Navigation and Navigable Waters)
- 46 CFR (Shipping)
- California At-berth and Fuel regulations
- OPA-90
- and others.....

Regulations are enforced by “Flag States,” “Port States” and some countries, states and local jurisdictions.

# International Maritime Organization (IMO)



# Hot topics at IMO: Air pollution and Climate

## SOx – Sulfur Oxides

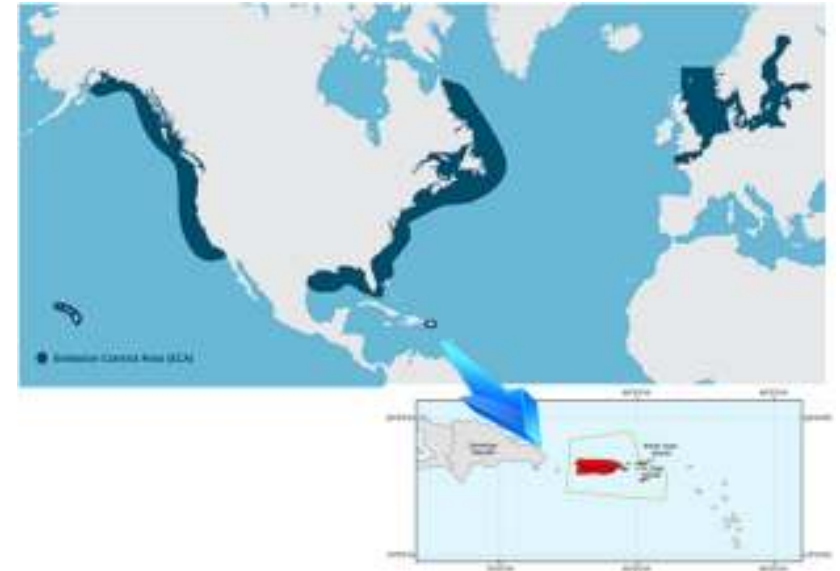
- Fuel sulfur is regulated globally:
  - Today: 3.50% globally
  - 2020: Global fuel requirement moves to 0.50% sulfur
  - Emission Control Areas (ECAs) have tighter limits: 0.1% sulfur (1000 ppm)
- Scrubbers or other alternative technologies may be used to accomplish equivalent reductions

## NOx – Nitrogen Oxides

- Like trucks, a system of engine tiers is established
  - Tier I for ships built after 2000
  - Tier II for ships built after 2013
  - Tier III (80% reduction vs. Tier I) required in ECAs for ships built 2016 (NAM) and 2021 (EU)

## Greenhouse gases:

- Energy Efficiency Design Index (EEDI) and reduction requirements
- Energy Efficiency Operations Index
- SEEMP
- IMO reporting scheme vs. EU MRV requirements



The number of voluntary transportation reporting and metrics systems is also increasing.

*Many of these are focused on CO2, and some include criteria pollutants.*





# US EPA's SmartWay® Transport Partnership

Your promise. Delivered.

SmartWay reduces transportation-related emissions by:

- Sharing best practices
- Developing protocols and calculations tools
- “Myth-busting” technology claims
- Creating incentives to improve supply chain fuel efficiency.

Launched in 2004





Standard methods are available to report the environmental impacts of ocean shipping.

*The best-accepted are from the Clean Cargo Working Group.*

2017 CCWG Members



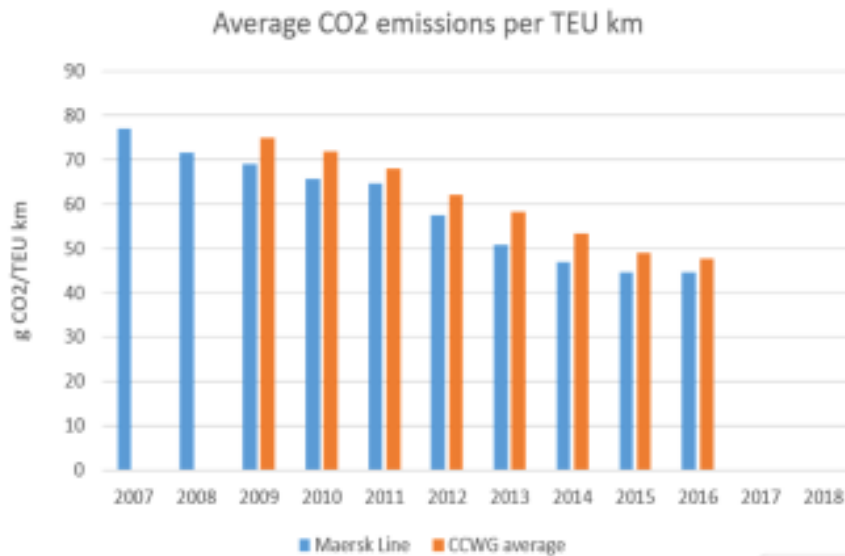
**>85%** of the global container capacity in CCWG membership

- Annual data collection and benchmarking since 2005
- Standardized CO<sub>2</sub> industry methodologies
- Verification protocol.
- Enables customers to make informed decisions and integration of sustainability into the supplier selection process.



# Vessels are increasingly fuel efficient (so use current data)

*This reduces fuel use, CO<sub>2</sub> and other air emissions in our customers' supply chains.*



verified by:



## 2016 results:

**Maersk Line -42%**

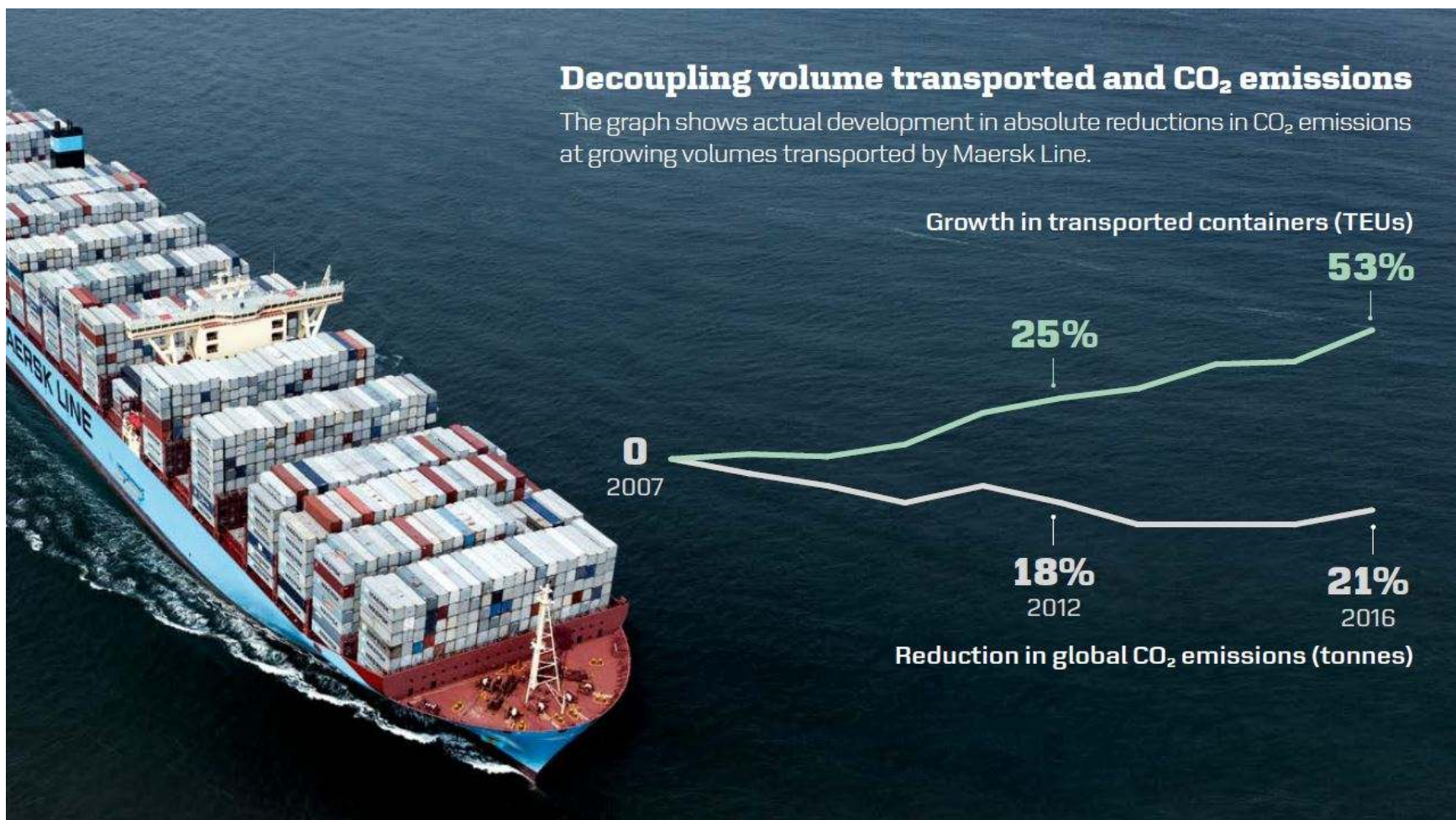
less CO<sub>2</sub> per container per km vs. 2007

**CCWG -34% vs. 2009**

## How?

- New vessels
- Eco-Retrofitting vessels
- Network design
- "Smart steaming"
- Big data

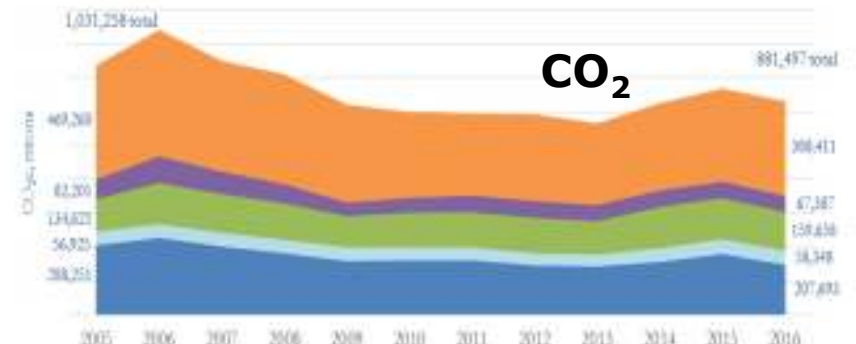
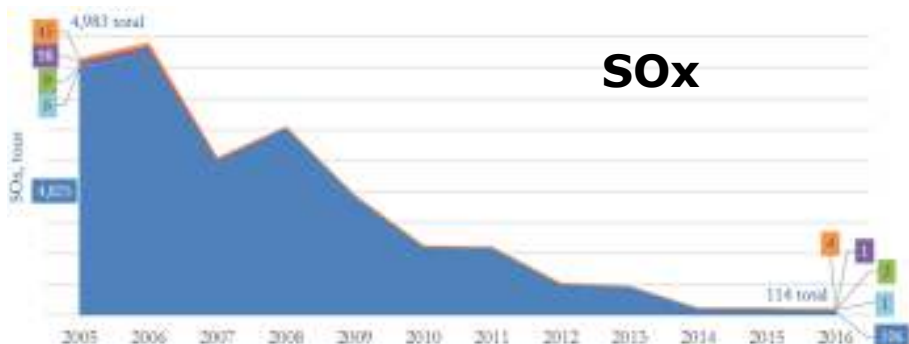
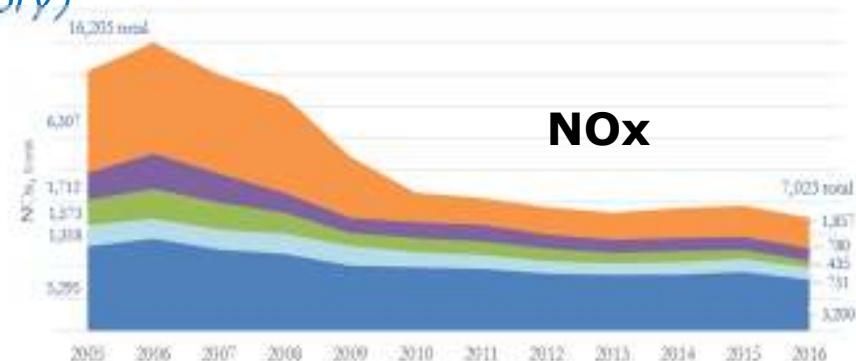
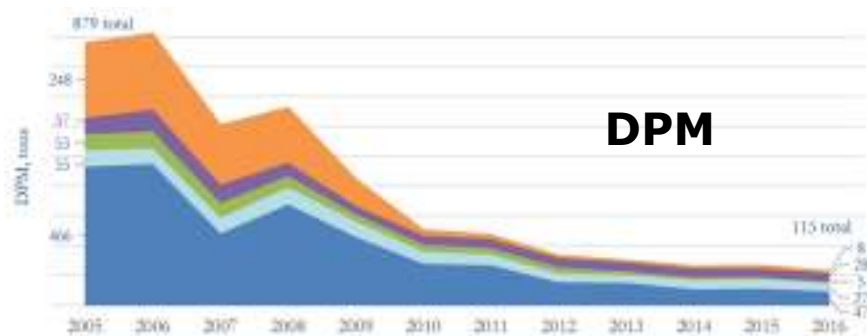
*2020 Maersk Line goal: Reduce CO<sub>2</sub> by 60% vs. 2007*



# Vessels are significant sources of air emissions in ports.

*Improvements are clear, but the vessel share is growing as other modes have reduced emissions more quickly.*

*(source: Port of Los Angeles 2016 emissions inventory)*



- Heavy-Duty Vehicles
- Locomotives
- Cargo Handling Equipment
- Harbor Craft
- Ocean-Going Vessels

## Voluntary Environmental Programs for Vessels are Effective

Location	Type	Enroll?	Data request
Port of LA	Speeds	No	Port provides speed reports to be verified
	ESI* Cleaner vessel	Yes	ESI enrollment Tier 3 NOx certificate
Port of Long Beach	Speeds Speed + AMP	No	Port provides speed reports to be verified Dockage waiver requires shore power data be submitted
	Cleaner vessel	Yes	Tier 2 or 3 NOx certificate
Port Authority of NY & NJ	Speed plus ESI	Yes	Port provides a report on speeds to be verified
Vancouver, Canada	Menu-based	Yes	Vessels are entered in Port database at first call annually
Prince Rupert, Canada	Menu-based	No	Port helps identify scores in a menu of programs.
Santa Barbara Channel (no port)	Speed	Yes	Privately funded, specific vessels are selected, must also participate in LA or LB speed reduction.

\* ESI is the International Association of Ports & Harbors' centralized vessel environmental rating program

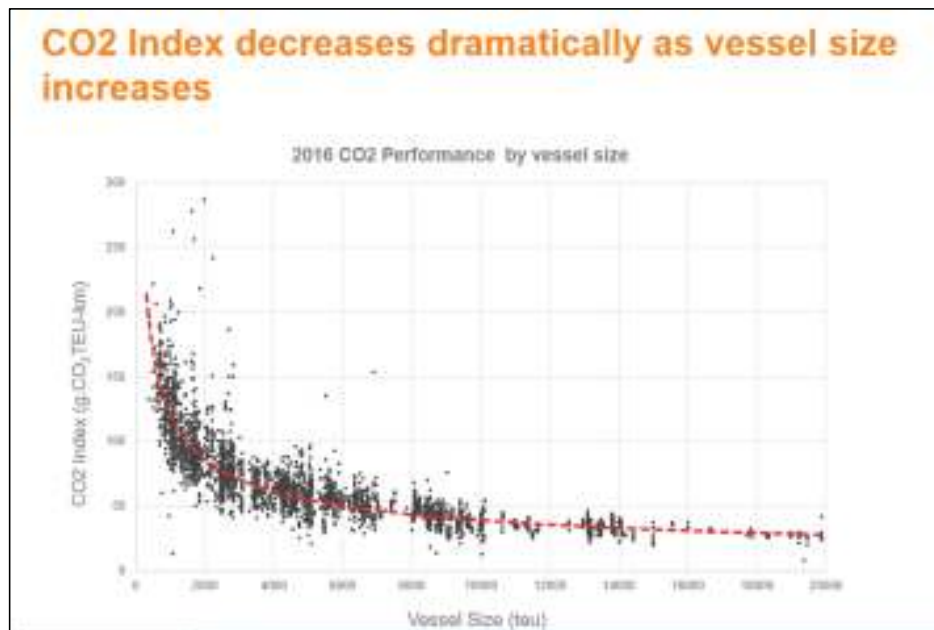
# How can industry and government work together to make progress?

- Industry wants to reduce our impact
  - Limited resources
  - Cannot pass costs to shippers
- KISS
  - Help level the playing field:
    - Enforce the rules / verify data
    - Incentives work
    - Coordinate voluntary and mandatory programs
- Consider each stakeholder's concerns and resources.



Idea – encourage bigger vessels and cleaner vessels

Emissions are a function of size, age, operations and efficiency.



Other air emissions are proportional to fuel use and CO<sub>2</sub>.

Source: BSR Clean Cargo Working Group, 2016 Environmental Performance study of over 3000 vessels.



Idea: Encourage vessels and terminals to work together to reduce time in port:



**Just a 10% reduction in port stay time → 10% less emissions at berth  
AND  
Slower steaming to reduce emissions at sea**

Be creative!

## Example: "Protecting Blue Whales and Blue Skies"

Voluntary Vessel Speed Reduction Incentive Program

Film: <https://vimeo.com/204713174>

### Santa Barbara Channel Region

Strategy: reduce ship speeds to  $\leq 12$  knots

- Cuts smog-forming nitrogen oxides
- Protects endangered whales
- Smog season and whales overlap in summer
- Successful programs in 2014, 2016 and 2017

2014	2016	2017
Santa Barbara Channel	Channel and Outside Channel Islands	Channel region (both routes) and SF Bay Area
Two air districts, one national marine sanctuary	Two air districts, one national marine sanctuary	Three air districts, four national marine sanctuaries
<b>Emission Reductions:</b> 12.4 tons NOx 500+ tons GHG	<b>Emission Reductions:</b> 25.6 tons NOx 1000+ metric tons GHG	<b>TBD</b> (Ended November 15)



Maersk Sustainability Report:  
<http://www.maersk.com/sustainability>



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