Puget Sound Maritime Air Emissions Inventory

PUGET SOUND MARITIME AIR FORUM

Tacoma City Council
September 25, 2018
Presented by:
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Northwest Ports Clean Air Strategy

- In 2007, ports voluntarily and proactively decided to create a framework for quantifying and addressing air quality impacts
- Puget Sound Maritime Air Emissions Inventory (PSEI)
  - First in 2007 for model year 2005 (baseline)
- Northwest Ports Clean Air Strategy (NWPCAS)
  - First iteration published in 2008

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Emissions Inventory Methods and Application

- **Data collection is the starting place for air quality programs**
  - Can't manage what you don't measure
  - Track progress towards targets
- **Helps prioritize emission reduction programs and policies**
  - Allows emission reductions, environmental benefits, and societal benefits to be weighed against cost
- **Activity Based: Modeled based on reported vessel, vehicle, equipment usage.**
  - Emissions = A [hp-hr] x EF [grams/hp-hr]

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Source Categories

- **Ocean Going Vessels (OGV)**
- **Cargo Handling Equipment (CHE)**
- **Locomotives**
- **Harbor Vessels**
- **Trucks**
- **Fleet Vehicles**





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Geographical Extent

- **U.S. Portion of the Puget Sound/ Georgia Basin Airshed (we'll call this the Puget Sound Airshed)**
  - From the Cascade to the Olympic Mountains and from Olympia to the Canadian border
- **Emission Scale**
  - We focus on "Airshed scale" emissions
    - Includes all truck, train, OGV, and harbor craft emissions on and off port within the Airshed boundary that are associated with maritime activity

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Pollutants Inventoried

- **Criteria Air Pollutants**
  - Particulate Matter (PM)
    - Fine PM ($PM_{2.5}$)
    - Coarse PM (PM_{10})
    - Diesel PM (DPM)
  - Sulfur Dioxide (SO_2)
  - Nitrogen Oxides (NO_x)
  - Carbon Monoxide (CO)
  - Volatile Organic Compounds (VOCs)
- **Greenhouse Gasses (GHG)**
  - Carbon Dioxide (CO_2)
  - Methane (CH_4)
  - Nitrous Oxide (N_2O)
  - GHG are reported together in CO_2 equivalents (CO_2e)
- **Other**
  - Black Carbon (soot)
    - Part of $PM_{2.5}$
    - Climate forcer

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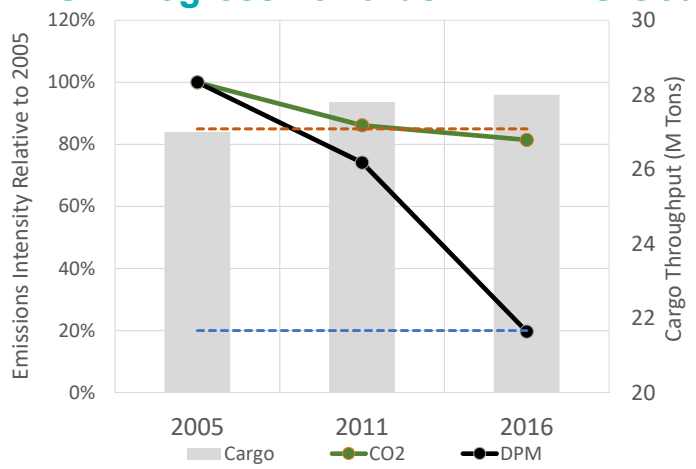
NWSA Progress Towards NWPCAS Goals



- Goals: Reduce DPM by 80% and GHG by 15% per ton of cargo by 2020.
- Results of 2016 Inventory show that goals have been met

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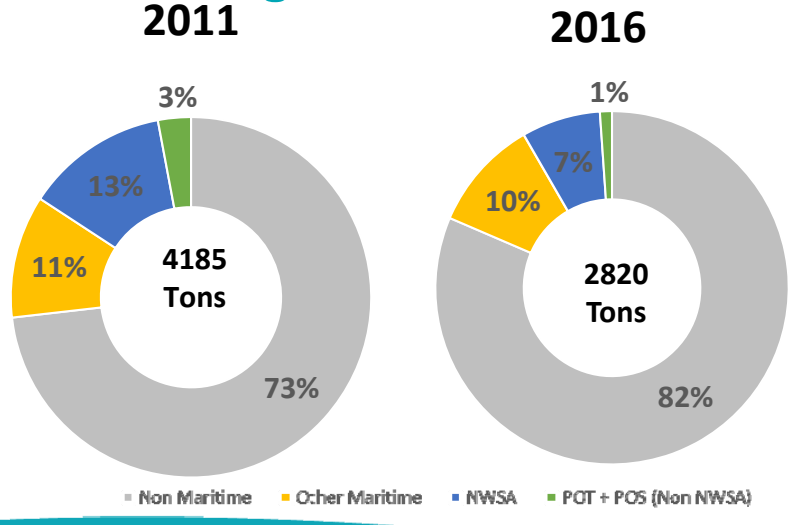
Maritime Regional DPM Emissions



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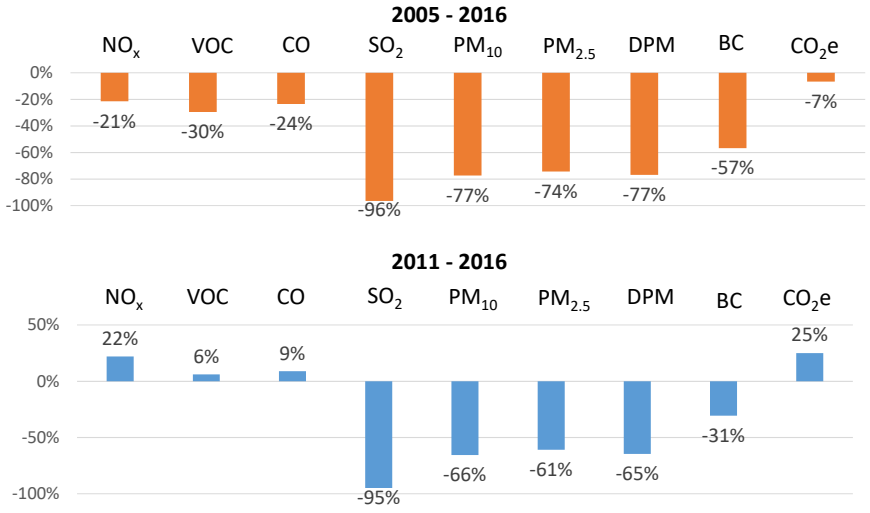
Changes in Tacoma Port Related Emission



* Includes NWSA South Harbor and Port of Tacoma, equivalent to Port of Tacoma before the formation of the Alliance

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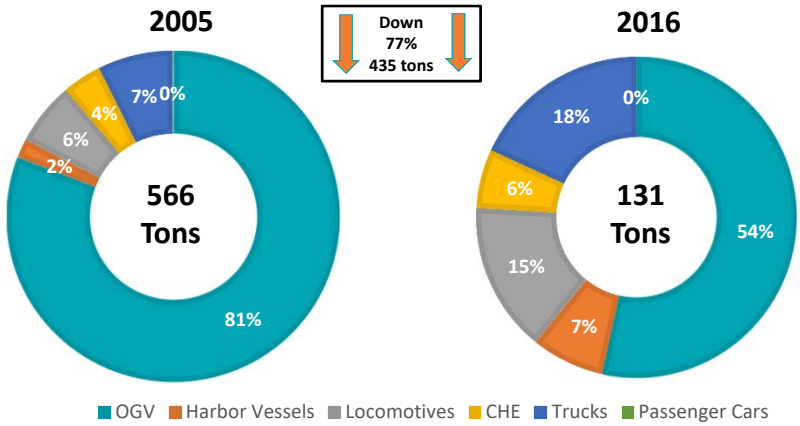
Tacoma Port Related DPM Emissions Distributions



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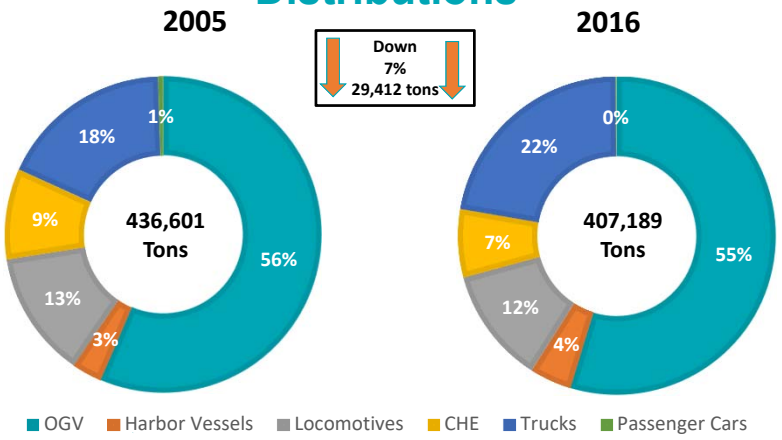
Tacoma Port Related GHG Emissions Distributions



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Conclusions/ Next Steps

- Air emissions from maritime-related sources have decreased significantly in the Puget Sound Airshed
  - Combination of port initiatives and local, national, and international regulations and
- There is still work to be done to address maritime air pollution
  - Greenhouse Gasses
    - NWSA GHG Resolution: keep with Paris Accord goals (2 °C)
  - Remaining diesel pollution
  - Disproportionately impacted communities
- Beginning update to Northwest Ports Clean Air Strategy
  - Align strategy with port, local, and regional GHG policies
  - Set plan for technology adoption to proactively reduce impact

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Questions?

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Backup Slides

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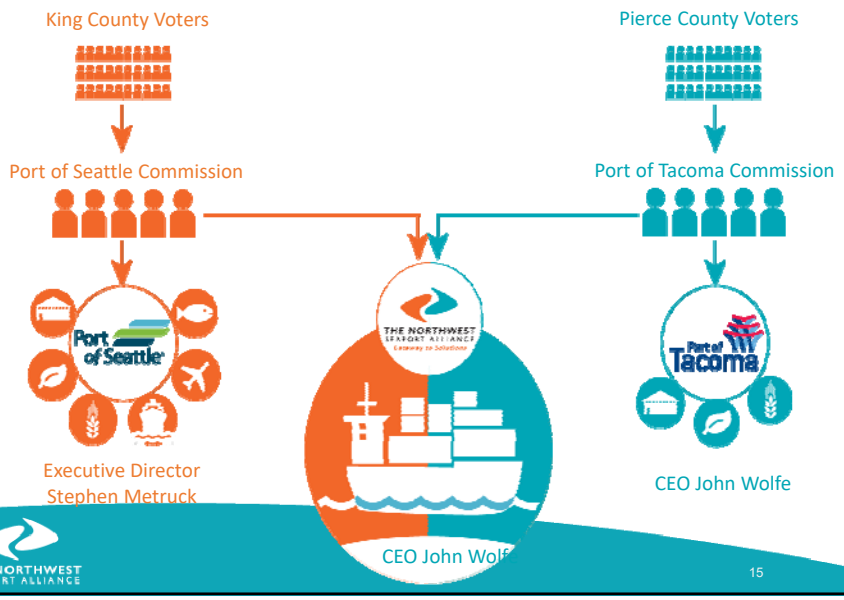
The Northwest Seaport Alliance



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Puget Sound Maritime Air Forum

The Air Forum is a partnership between Ports, government agencies, and industrial partners.

- **The Northwest Seaport Alliance**
- **Port of Anacortes**
- **Port of Everett**
- **Port of Olympia**
- **Port of Port Angeles**
- **Port of Tacoma**
- **Port of Seattle**
- **Northwest Clean Air Agency**
- **Puget Sound Clean Air Agency**
- **Puget Sound Regional Council**
- **U.S. Environmental Protection Agency (EPA)**
- **Washington State Department of Ecology**
- **Washington State Department of Transportation**
- **North West and Canada Cruise Association**
- **Pacific Merchant Shipping Association**
- **Western States Petroleum Association**

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Analytical Method

- **Activity Based: Calculate emissions based on recorded and estimated "activity levels"**
  - Use surveys and vessel, vehicle, and equipment records to determine activity levels
    - Type of equipment (e.g., yard truck)
    - Intensity of operation (average horsepower)
    - Duration of operation (hours)
- **Emission factor translates activity level to emissions**
  - Emissions per activity
- **Emissions = A [hp-hr] x EF [grams/hp-hr]**

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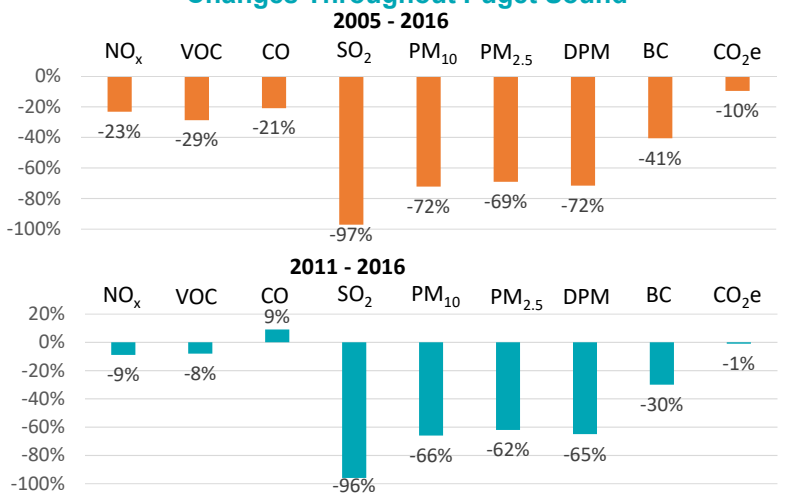
Maritime Industry-Wide Airshed Emission Changes Throughout Puget Sound



* All maritime sources port + non port

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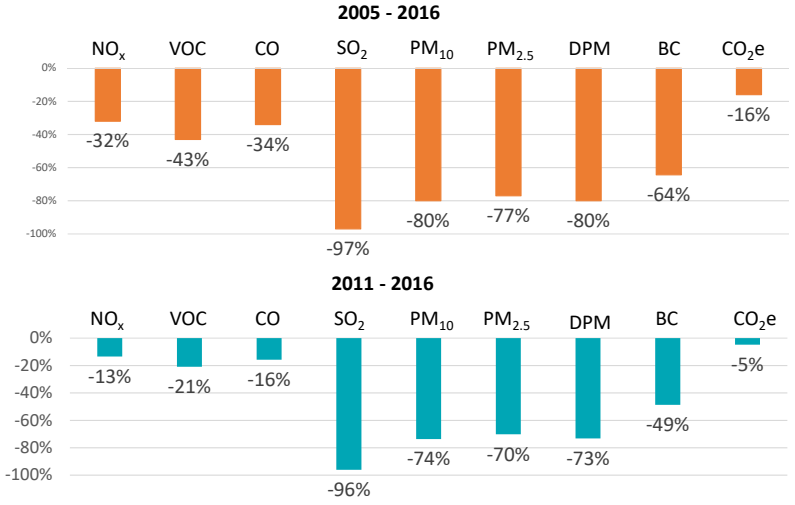
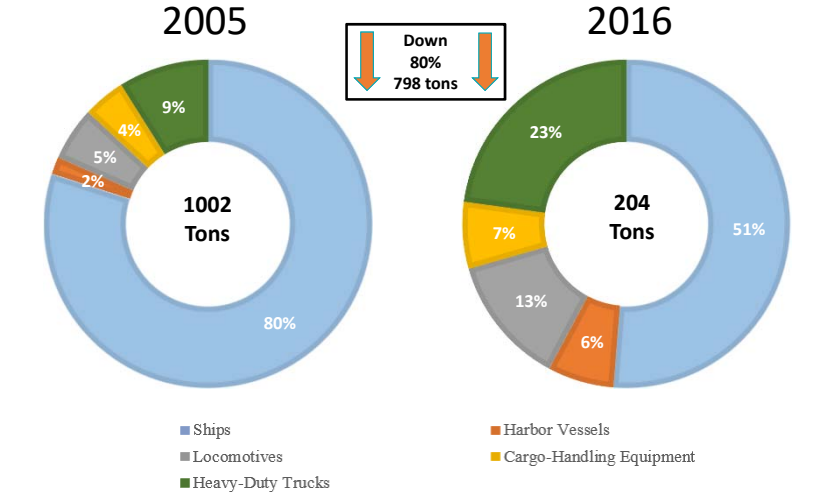
NWSA Total Emission Trends



*North and South Harbor (Seattle and Tacoma)

NWSA DPM Emission Distributions



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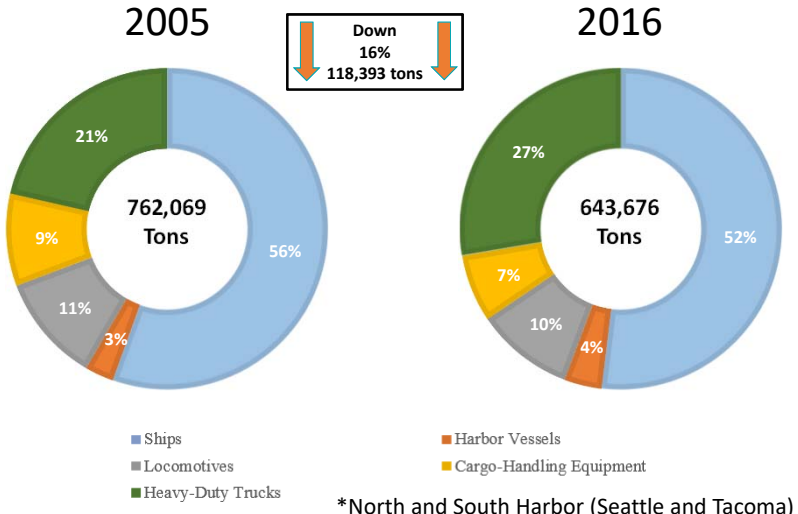
NWSA GHG Emission Distributions



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NWSA Cargo Throughputs

North Harbor

Year	TEU	Cargo (MT)	Total Vessel Movements
2016	1,394,343	11,276,112	928
2011	2,033,535	17,735,810	1,622
2005	2,087,929	15,515,753	1,524
2016 vs 2011 Change	**-31%**	**-36%**	**-43%**
2016 vs 2005 Change	**-33%**	**-27%**	**-39%**

South Harbor

Year	TEU	Cargo (MT)	Total Vessel Movements
2016	2,221,410	16,750,757	1,882
2011	1,488,795	10,166,264	1,465
2005	2,070,000	11,523,387	1,835
2016 vs 2011 Change	**49%**	**65%**	**28%**
2016 vs 2005 Change	**7%**	**45%**	**3%**

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Progress Towards NWPCAS Targets

Port	DPM % Change	GHG % Change
NWSA (NH + SH)	-80%	-19%
POT	-77%	-22%
POS	-79%	-8%
Total	-79%	-12%

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