

# Puget Sound Maritime Air Emissions Inventory



Tacoma City Council IPS Committee  
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## Importance of Emissions Inventories

- Data collection is the starting place for air quality programs
  - Can't manage what you don't measure
- Demonstrates our commitment to transparency
- Tracks progress towards goals
- Helps prioritize emission reduction programs and policies
  - Identifies areas where emissions are greatest and where they are easiest to control
  - Allows emission reductions, environmental benefits, and societal benefits to be weighed against cost

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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
- $\text{Emissions} = A [\text{hp-hr}] \times \text{EF} [\text{grams/hp-hr}]$

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

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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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## Source Categories

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



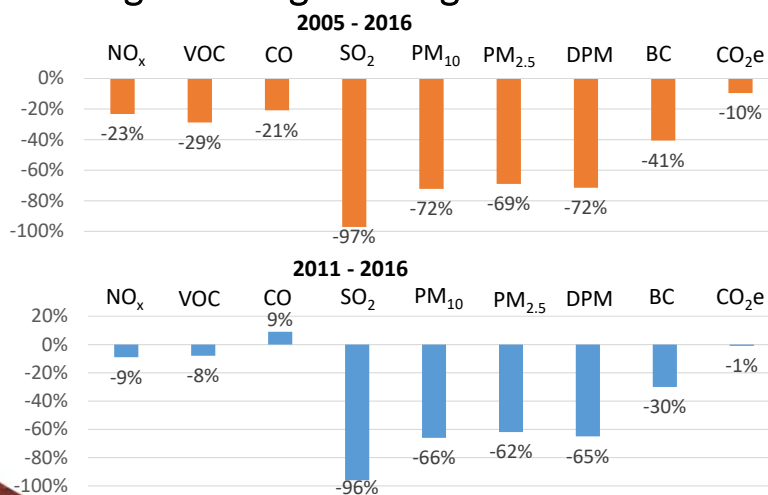
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## Pollutants Inventoried

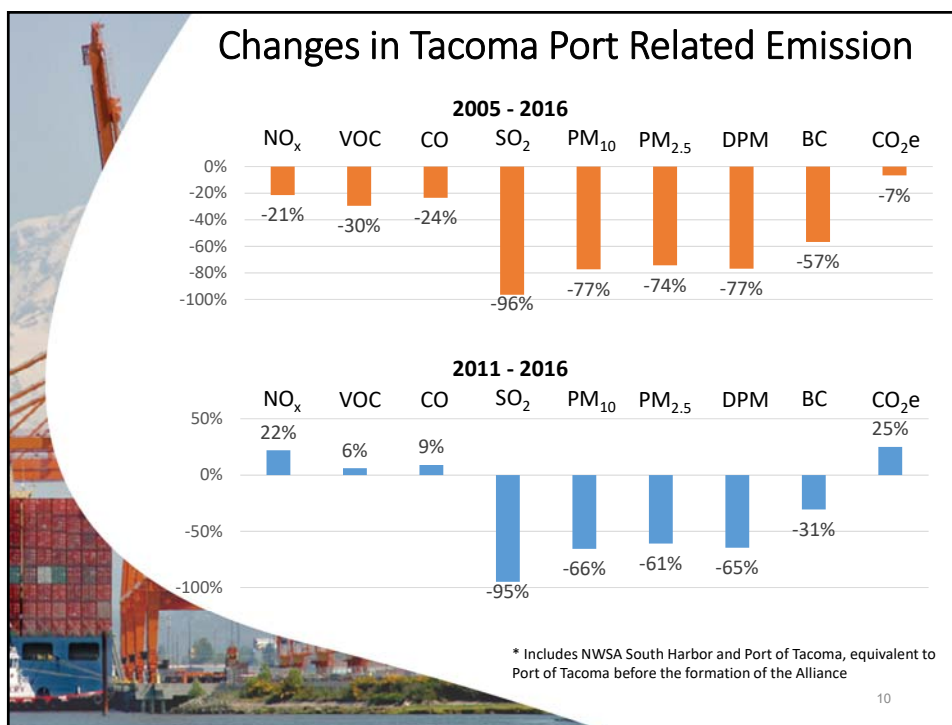
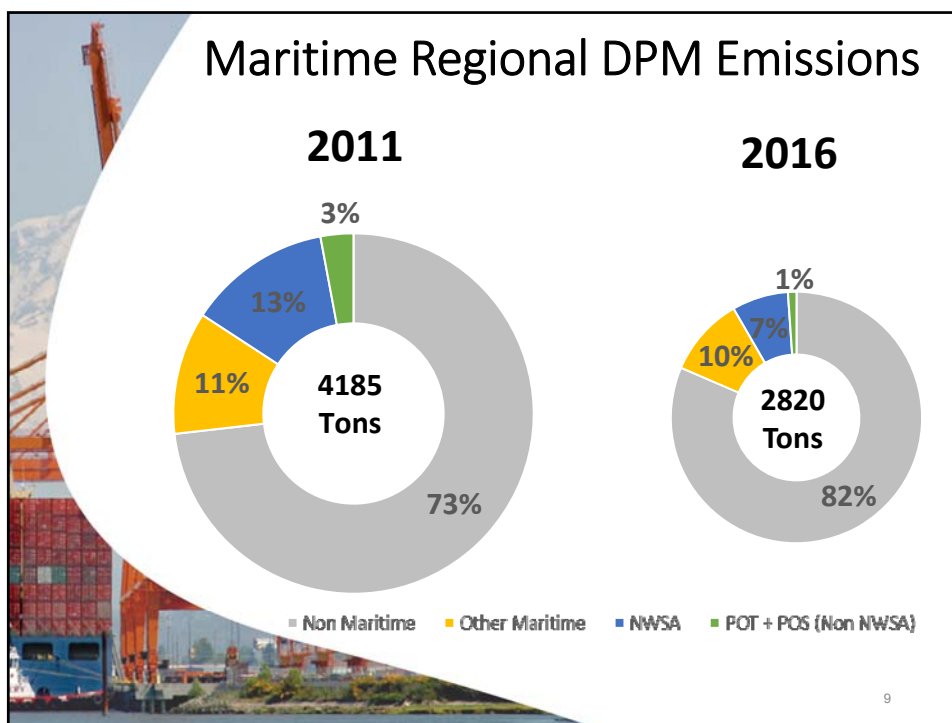
- Criteria Air Pollutants
  - Particulate Matter (PM)
    - Fine PM (PM<sub>2.5</sub>)
    - Coarse PM (PM<sub>10</sub>)
    - Diesel PM (DPM)
  - Sulfur Dioxide (SO<sub>2</sub>)
  - Nitrogen Oxides (NO<sub>x</sub>)
  - Carbon Monoxide (CO)
  - Volatile Organic Compounds (VOCs)
- Greenhouse Gasses (GHG)
  - Carbon Dioxide (CO<sub>2</sub>)
  - Methane (CH<sub>4</sub>)
  - Nitrous Oxide (N<sub>2</sub>O)
  - GHG are reported together in CO<sub>2</sub> equivalents (CO<sub>2</sub>e)
- Other
  - Black Carbon (soot)
    - Part of PM<sub>2.5</sub>
    - Climate forcer

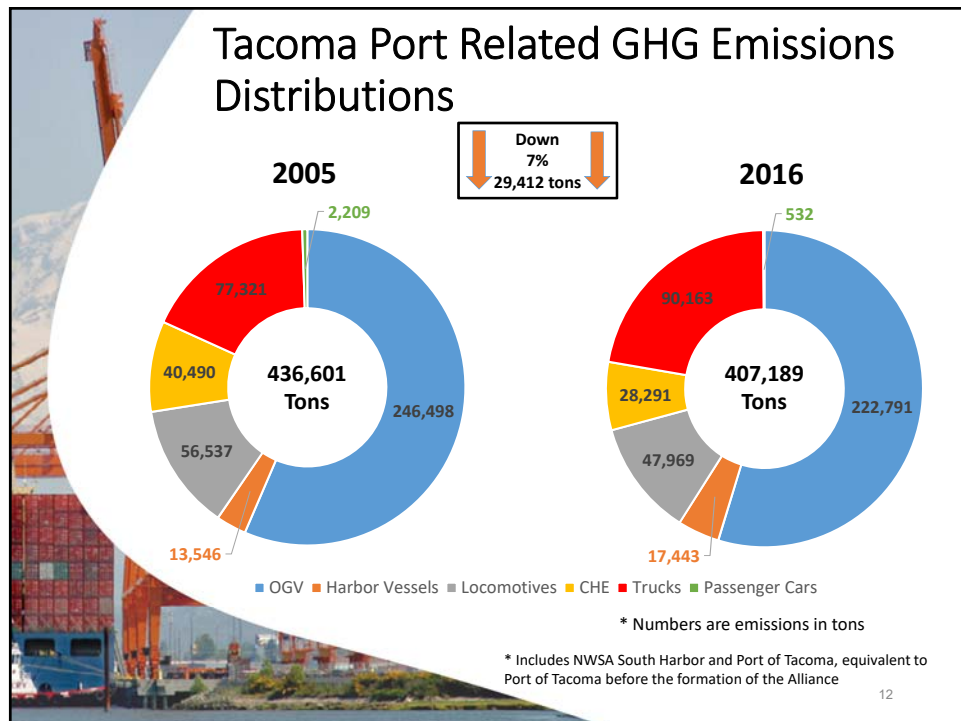
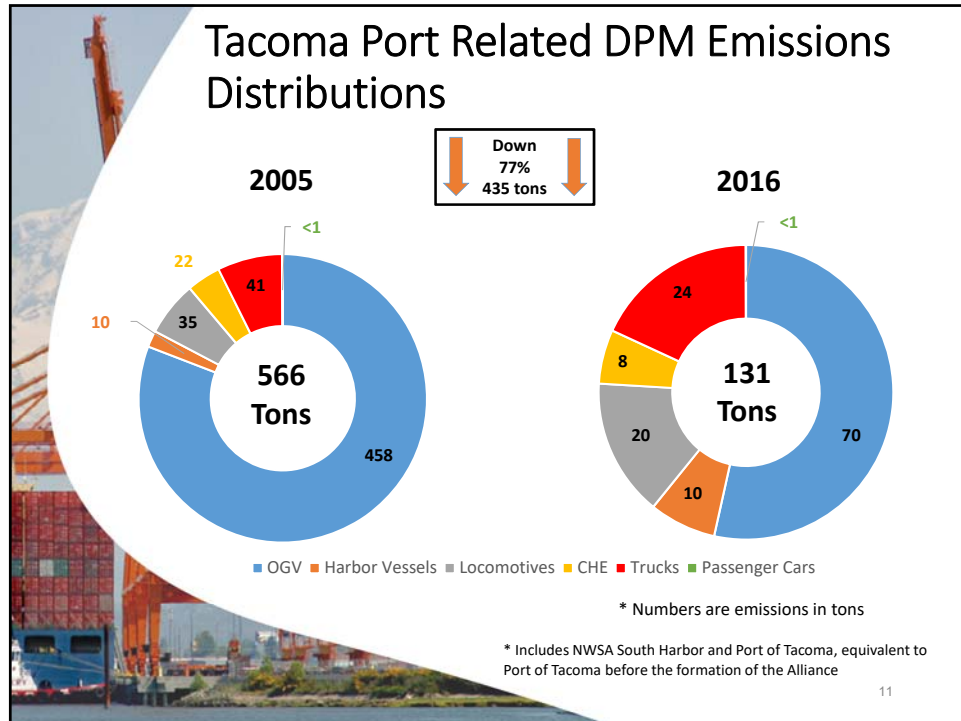
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## Maritime Industry-Wide Airshed Emission Changes Throughout Puget Sound



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## Conclusions

- PSEI is a great example of public/private partnership. Agencies, industry, ports come together to create positive change.
- Air emissions from maritime-related sources have decreased significantly in the Puget Sound Airshed
  - Combination of local, national, and international regulations and port initiatives
- There is still work to be done to address maritime air pollution
  - Disproportionately impacted communities
  - Greenhouse Gasses

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## Questions?

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## NWSA South Harbor Port Scale Emissions

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	Black Carbon	CO <sub>2</sub> e
2016	1,573	89	317	32	49	45	46	24.5	132,119
2011	1,149	66	245	440	76	65	66	23.6	87,321
2005	1,720	97	363	592	104	91	92	38.1	116,948
2016 vs 2011 Change	37%	35%	29%	-93%	-36%	-30%	-31%	4%	51%
2016 vs 2005 Change	-9%	-8%	-13%	-95%	-53%	-50%	-50%	-36%	13%

Year	TEU	Cargo Total Vessel (Tonnes) Movements
2016	2,221,410	16,750,757
2011	1,488,795	11,880,230
2005	2,070,000	13,431,333
2016 vs 2011 Change	49%	41%
2016 vs 2005 Change	7%	25%

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## NWSA North Harbor Airshed Scale Emissions

Year	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	DPM	Black Carbon	CO <sub>2</sub> e
2016	3,630	121	443	76	80	74	77	22.4	248,475
2011	6,398	235	775	2,973	425	351	411	63	364,496
2005	7,573	323	925	3,555	552	456	532	82	387,625
2016 vs 2011 Change	-43%	-49%	-43%	-97%	-81%	-79%	-81%	-64%	-32%
2016 vs 2005 Change	-52%	-63%	-52%	-98%	-86%	-84%	-85%	-73%	-36%

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

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## Progress Towards NWPCAS Targets

Port	DPM % Change	GHG % Change
NWSA (NH + SH)	-80%	-17%
POT	-77%	-22%
POS	-62%	44%
Total	-78%	-8%

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