2018 Inventory of Air Emissions

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Environmental Management

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AMP: Alternative Maritime Power
CAAP: Clean Air Action Plan
CARB: California Air Resources Board
CHE: Cargo Handling Equipment
CO$_2$e: Carbon Dioxide Equivalent
DPM: Diesel Particulate Matter
EI: Emissions Inventory
EPA: U.S. Environmental Protection Agency
ESI: Environmental Ship Index
gWh: gigawatt-hour
OGV: Ocean Going Vessel
NOx: Oxides of Nitrogen
SOx: Oxides of Sulfur
T4 int: Tier 4 Interim (engines)
T4 fin: Tier 4 Final (engines)
TEU: Twenty Foot Equivalent Unit
µg/m$^3$: micrograms per cubic meter (concentration in air)
VSR: Vessel Speed Reduction
POLA Annual Emissions Inventories

- Annual Activity-based
  - 2001, 2005 – 2018
- Source categories
  - Ships, harbor craft, cargo handling equipment, trucks, locomotives
- Pollutants
  - PM, PM$_{10}$, PM$_{2.5}$, DPM, NO$_{x}$, SO$_{x}$, HC, CO
- Greenhouse gases
  - CO$_{2}$, CH$_{4}$, N$_{2}$O, CO$_{2}$e
- Coordinated with CARB, SCAQMD, & EPA
Emissions Reductions since 2005

- Diesel Particulate Matter: DOWN
  - 87%
  - 2023 Goal: 77%

- Nitrogen Oxides: DOWN
  - 60%
  - 2023 Goal: 59%

- Sulfur Oxides: DOWN
  - 98%
  - 2023 Goal: 93%

- Greenhouse Gases Equivalent: DOWN
  - 10%
  - TEU Increase
  - 26%
## Emissions Inventory Detail

<table>
<thead>
<tr>
<th>EI Year</th>
<th>DPM</th>
<th>NO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>SO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>CO</th>
<th>HC</th>
<th>CO&lt;sub&gt;2&lt;/sub&gt;e</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tpy</td>
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<td>tpy</td>
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<td>tpy</td>
<td>tonnes</td>
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<tr>
<td>2018</td>
<td>118</td>
<td>6,554</td>
<td>118</td>
<td>2,132</td>
<td>380</td>
<td>933,572</td>
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<tr>
<td>2017</td>
<td>116</td>
<td>6,616</td>
<td>121</td>
<td>1,989</td>
<td>369</td>
<td>907,778</td>
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<tr>
<td>2005</td>
<td>879</td>
<td>16,206</td>
<td>4,983</td>
<td>3,757</td>
<td>850</td>
<td>1,036,876</td>
</tr>
</tbody>
</table>

| Previous Year (2017-2018) | 1% | -1% | -2% | 7% | 3% | 3% |
| CAAP Progress (2005-2018)  | -87% | -60% | -98% | -43% | -55% | -10% |
Variable Emissions Explained

• Increased Throughput
• Port Efficiency Improvements
• Ship Incentive Programs
• Cleaner Fuels
• Increased use of Shore Power
• Transition to Cleaner Equipment
Source Category NO$_x$ Trends

The graph shows the emissions of NO$_x$ from different source categories over the years from 2005 to 2018. The categories include Ocean-Going Vessels, Harbor Craft, Cargo Handling Equipment, Locomotives, and Heavy-Duty Vehicles.

- **Ocean-Going Vessels**: The highest emissions were in 2005 with a total of 16,206 tons. Emissions decreased significantly over the years, reaching a total of 6,554 tons in 2018.
- **Harbor Craft**: Emissions were consistently low, with a total of 1,482 tons in 2018.
- **Cargo Handling Equipment**: Emissions were moderate, with a total of 886 tons in 2018.
- **Locomotives**: Emissions were relatively low, with a total of 464 tons in 2018.
- **Heavy-Duty Vehicles**: Emissions were the lowest, with a total of 290 tons in 2018.

In addition, the graph compares the NO$_x$ emissions to the 2014 and 2023 San Pedro Bay Standards. The emissions have decreased significantly over the years, reaching a 60% reduction by 2018.
Source Category SO$_x$ Trends

SO$_x$, tons

Ocean-Going Vessels
Harbor Craft
Cargo Handling Equipment

118 total

2014 & 2023 San Pedro Bay Standards

2005 Baseline  TEUs  Annual SO$_x$ Emissions

98%
Comparison to other ports

• Very few ports do comprehensive emission inventories:
  o Geographical domains different
  o More Source Categories
  o Frequency (annual inventories)
  o Better Data (e.g. operators/vessel boarding/marine exchange/Incentive program)
  o Models for analysis are different in other states and countries

• As a result, emissions comparisons are typically apples to oranges
Port Program Benefits

• We can *compare our programs* to other Ports beyond San Pedro Bay:
  
  o Our ships meet the most stringent requirements in the world:
    
    • No other ports have a 40 nm VSR boundary with 90%+ participation rates
    • California fuel requirements are the most strict – ships must meet sulfur and fuel quality requirements
    • Most shore power outlets (and higher usage) in the world

  o Our trucks meet strict California emissions standards (more strict than anywhere in the world)
    • Our Clean Truck Program is ahead of state requirements and is a model for others to follow

  o Cleanest Cargo Locomotive Switching Fleet (Tier III+)
Port of Los Angeles has spent more than $400 million on environmental programs since CAAP adoption in 2006

- Industry has spent more than $2 billion to reduce emissions

Recognized as international leaders in port air emission reduction programs

- Other Ports around the world routinely consult with POLA staff in the development of their emissions reduction initiatives

- IMO asked Ports’ staff to provide training to other ports around the world on emission inventory development and air quality program planning
Looking Ahead

- CAAP 2017 (increased focus on NOx and GHG)
- Continued development of clean technologies
  - Near-Zero and Zero Emissions Onroad Trucks
  - Near-Zero and Zero Emissions Container Handling Equipment
- Continued focus on Supply Chain Efficiency
- Continued use of AMP
- Continued participation in incentive programs (VSR and ESI)
- Replacement of older equipment
Available Online

https://www.portoflosangeles.org/environment/studies_reports.asp