Overview on actions to reduce shipping emissions

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Outline

- Background
- Examples of actions to reduce shipping emissions
- Conclusion
Most global vehicle markets now have emissions/efficiency standards

- The marine sector becomes one of the foremost transport emission sources
Marine emissions: Future growth

- The marine sector represents about 11% of transport fuel use, CO₂
  - Marine sector fuel use/CO₂ to double-triple; percent contribution increases
  - Marine sector NOₓ, SOₓ, PM₂.₅ emissions can be 10-40% of mobile source emissions

Cleaner ports, ships: Many approaches

- Different approaches make sense - are not mutually exclusive

<table>
<thead>
<tr>
<th>General relative advantages</th>
<th>Voluntary</th>
<th>Regulatory</th>
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<tbody>
<tr>
<td></td>
<td>Quicker action</td>
<td>Increased certainty (actions, emission reduction, timing)</td>
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<td>Local actions to suit local needs, complexity</td>
<td>More uniform approach for competitive global market</td>
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<td>Provide ground work, data, and experience for later policy</td>
<td>Larger emission reduction potential</td>
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<th>Examples</th>
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<tr>
<td>EEDI efficiency before 2013</td>
<td>Vessel efficiency, CO₂ standards</td>
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<td>Fuel switching (e.g., Fair Wind Charter)</td>
<td>Low fuel sulfur requirements</td>
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<td>Port technology incentives (e.g., from “Incentive Tool”)</td>
<td>Tier I-III NOₓ, SOₓ, PM standards</td>
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<td>Operational port improvements (e.g., from “Air Quality Toolbox”)</td>
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Policies for cleaner shipping

- **MARPOL Annex VI**
  - $\text{NO}_x$: Tier I-III standards
  - $\text{SO}_x$: Cleaner fuel
  - $\text{CO}_2$: Energy efficiency standards (EEDI, SEEMP)

- **Regional and national policy**
  - EU and U.S: Low sulfur diesel for inland shipping
  - Stringent regulations on $\text{NO}_x$ and HC
Emission Control Areas (ECAs)

- ECAs offer dramatic $\text{SO}_x$, $\text{NO}_x$, PM emission benefits from ships
  - Many marine-intensive, heavily polluted areas are yet to have ECA regulations

Marine pollution control: Benefits

- North America’s Emission Control Area (“ECA”) benefits are enormous
  - NO\(_x\), SO\(_x\), PM\(_{2.5}\) benefits from ship/port emission reductions in the US shown below
  - Annual health benefits from ECA are larger than all other recent US regulations

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<tbody>
<tr>
<td>NO(_x) (short tons)</td>
<td>2,800,000</td>
<td>2,600,000</td>
<td>738,000</td>
<td>795,000</td>
<td>1,200,000</td>
<td>8,133,000</td>
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<tr>
<td>PM2.5 (short tons)</td>
<td>36,000</td>
<td>109,000</td>
<td>129,000</td>
<td>27,000</td>
<td>143,000</td>
<td>444,000</td>
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<tr>
<td>VOC (short tons)</td>
<td>401,000</td>
<td>115,000</td>
<td>34,000</td>
<td>43,000</td>
<td>0</td>
<td>593,000</td>
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<tr>
<td>SO(_x) (short tons)</td>
<td>281,000</td>
<td>142,000</td>
<td>376,000</td>
<td>0</td>
<td>1,300,000</td>
<td>2,099,000</td>
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<tr>
<td>Total Cost (billion)</td>
<td>$5.3</td>
<td>$4.2</td>
<td>$1.7</td>
<td>$0.7</td>
<td>$3.1</td>
<td>$15</td>
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<tr>
<td>Total Monetized Benefits (billion)</td>
<td>$25</td>
<td>$70</td>
<td>$80</td>
<td>$11</td>
<td>$110</td>
<td>$296</td>
</tr>
<tr>
<td>Avoided Premature Mortality</td>
<td>4,300</td>
<td>8,300</td>
<td>12,000</td>
<td>1,400</td>
<td>13,000</td>
<td>39,000</td>
</tr>
<tr>
<td>Avoided Hospital Admissions</td>
<td>3,000</td>
<td>7,100</td>
<td>8,900</td>
<td>870</td>
<td>12,400</td>
<td>32,270</td>
</tr>
<tr>
<td>Avoided Lost Work Days</td>
<td>700,000</td>
<td>1,500,000</td>
<td>1,000,000</td>
<td>120,000</td>
<td>1,400,000</td>
<td>4,720,000</td>
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Source: US EPA
Marine fuels: Relatively uncontrolled

- Low sulfur fuels directly reduce emissions and enable lower-emission technology on ships and at-port vehicles, equipment
  - 50-90% of NO\textsubscript{x}; >90% of SO\textsubscript{x}; 75-90% of PM from ports is from ocean-going vessels

Marine emissions: Technical potential

- Known efficiency and in-use operation strategies can reduce shipping CO$_2$ emission rates by over one-third by the year 2030
  - Aggressive slow-steaming, LNG penetration, black carbon controls would go further


Many opportunities to reduce fuel cost, CO$_2$
- Many *with net benefits* (fuel savings > costs)

Conclusions

- Shipping and port activities’ emission impacts can be reduced with best practices in deployment of available technology, operational strategies, and improved port management practices.
- Data collection and analysis of potential scenarios can offer powerful tools to prioritize port-level decision-making.
- Many actions can bring forth major emission reductions at ports:
  - International, national, regional, and local policies
  - Voluntary local actions and incentives can be tailored to local needs
  - Collaboration between and within governments, and with industry are crucial
Thank You

www.theicct.org/marine