Maritime Transport and the Climate Change

Ms. Mariana Pereira
Mr. Uira Cavalcante Oliveira
Outline

1. General Characteristics of Ports and Shipping
2. Contribution of Emissions by Maritime Transportation
3. Prevention Measures
4. Climate Change Factors and the impact in Maritime Transportation Sectors
5. Adaptation Measures
Maritime Transportation – Shipping & Ports

- About 90% of world trade;
- Total volume to nearly 9.6 billion tons;
- Around 50,000 merchant ships, registered in over 150 nations;
- Over a million seafarers;
- Over 5,000 ports.
Port Sites
Main Sources

Ports and International Shipping:

The sources of these pollutants are: oceangoing and harbor vessels; cargo handling equipment; locomotives and vehicles.
Contribution of Emissions by Maritime Transportation

**Importance of the contribution**

* Shipping contributed with 2.8% of global CO₂ emission and 15% and 13% of global NOx and SOx emission from anthropogenic sources.

<table>
<thead>
<tr>
<th>Emission*</th>
<th>CO₂</th>
<th>CH4</th>
<th>N₂O</th>
<th>SOx</th>
<th>NOx</th>
<th>Particulate matter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>949 million metric tonnes</td>
<td>288,280 tonnes</td>
<td>42,640 tonnes</td>
<td>10,240 million tonnes</td>
<td>19,002 million tonnes</td>
<td>1,402 million tonnes</td>
</tr>
</tbody>
</table>

* Emission from 2012. Source: Third IMO GHG Study 2014

* Maritime Transport CO₂ emissions are projected to increase by 50% to 250% in the period to 2050.
Contribution of Emissions by Maritime Transportation

Importance of the contribution

* In Ports, shipping is the main source of emission, representing about 70% of total emission.
* The contribution from other sources (port traffic) can be higher depending on the country (i.e. due to differences on fuel regulation). It occurs in Latin America, Africa, Middle East and North America.
* The shipping emission in Ports represents 2% of total shipping emission.

<table>
<thead>
<tr>
<th>Emission*</th>
<th>CO₂</th>
<th>CH₄</th>
<th>SOₓ</th>
<th>NOₓ</th>
<th>Particulate matter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18 million tonnes</td>
<td>0,002 million tonnes</td>
<td>0,2 million tonnes</td>
<td>0,4 million tonnes</td>
<td>1,402 million tonnes</td>
</tr>
</tbody>
</table>

Contribution of Emissions by Maritime Transportation

**Impacts**

Climate Change

Impacts on human health

Ocean acidification
Contribution of Emissions by Maritime Transportation

Prevention measures

* Efficient and lower-emitting propulsion systems
* Clean fuels and alternative energy sources
* Ship design (structure, hull and machinery)
* Emission control technologies (e.g. after exhaust treatment, carbon captures and storage)
* Speed Reduction
Contribution of Emissions by Maritime Transportation

*Route selection
* Monitoring of weather and sailing conditions
* Onshore power supply
* Environmentally differentiated rates/dues
* Taxation
Climate change factor

- Higher temperatures;
- Rising sea levels;
- Extreme weather events (hurricanes, storms);
- Changes in key variables such as prevailing winds, waves, currents, and precipitation rates;
- Changes in erosion/sedimentation patterns;
Potential implications

- Prolonged interruption of operations at the terminals;
- Damage to infrastructure, protection works (jetties, breakwaters, etc.), equipment and cargo;
- Increased costs for maintenance and repair of port facilities;
- Need for reconfiguration (elevation) of operational areas (docks, berths, piers, etc);
- Increased rates of corrosion / oxidation equipment, tanks and pipelines;
Potential implications

- Greater risks of accidents on land and at sea;
- Higher risks of spills and accidents involving dangerous goods;
- Possibility of pollutant dispersion, in the event that contaminated sites on land are affected by rising sea level;
Potential implications

- Increased sedimentation rates and the consequent increased need for dredging;
- Relocation and migration of people and business;
- Climate change enhances habitat disturbance which facilitates the establishment of invasive species;
Potential implications

- Challenge sailing conditions and potentially pose hazards to navigation, ship, cargo, crew and the environment;

- Rising temperature in the Arctic could open some new opportunities for shipping.
Adaptation & prevention measures

Consideration of climate change in:

• The planning and development of activities and port infrastructure (e.g. protective structures, preparation of warning and emergency response systems, planning and zoning of space in port areas);

• Relocation, redesign and construction of coastal protection schemes (e.g. levees, seawalls, dikes, infrastructure elevation);

• Insurance;

• Integrate emergency evacuation procedures into operations;

• Increase monitoring of infrastructure conditions;

• New design for sturdier ship.
THANK YOU!