Hydrogen in the Port of Hamburg

Bjoern Pistol, Hamburg Port Authority
Management Board
Head of Port Estate and Maritime Affairs
Port of Hamburg is No. 19 in the world (Los Angeles No. 17, Long Beach No. 20).

**Total cargo handling in the port in 2018:**

- Seaborne cargo: 135.1 Mio. tons
  - Bulk cargo handling: 44.2 Mio. tons
  - General cargo handling: 90.9 Mio. tons
- Container handling: 8.7 Mio. TEU
- Inland navigation: 9.9 Mio. tons
- Cruise passengers: 880,000 pax

**Infrastructure:**

- Quai walls for seagoing vessels: 27 miles
- Public roads in the port: 88 miles
- Port railway sidings: 179 miles
- Port area: 17,600 acres

Source: HPA-Bildarchiv/Gregor Schläger
Almost 2 million people live in a 10-mile radius of the port.
Fostering sustainability is key for the future of the port.

Source: HPA-Bildarchiv / Sandra Fielker (4)
Port of Hamburg must reduce emissions.

Since 2004 Clean Air Action Planning

NOx, PM10, SO2, CO2

Annual average NO2 µg/m³ (2016)

Cities in Germany (2016)

Source: HPA, Bernd-Rainer Albers
50% of the city's NO$_x$ emissions are related to port activities.

Shares of NO$_x$ emitting groups:

- Ship traffic: 39%
- Road traffic: 29%
- Domestic coal: 5%
- Aircraft traffic: 3%
- Rail traffic: 1%
- Off-road traffic: 3%
- Industry: 16%
- Cargo handling equipment (CHE): 4%
- Port railway: 1%

Source: CAAP BUE, 2017

<table>
<thead>
<tr>
<th>Emission group</th>
<th>t NO$_x$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship traffic</td>
<td>7.944</td>
</tr>
<tr>
<td>Road traffic</td>
<td>5.949</td>
</tr>
<tr>
<td>Industry</td>
<td>3.286</td>
</tr>
<tr>
<td>Domestic coal</td>
<td>1.080</td>
</tr>
<tr>
<td>Cargo handling equipment (CHE)</td>
<td>797</td>
</tr>
<tr>
<td>Off-road traffic</td>
<td>585</td>
</tr>
<tr>
<td>Aircraft traffic</td>
<td>442</td>
</tr>
<tr>
<td>Rail traffic</td>
<td>131</td>
</tr>
<tr>
<td>Port railway</td>
<td>257</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.471</strong></td>
</tr>
</tbody>
</table>

Results of Clean Air Action Plan from 2017.
The port community is heavily working on reducing CO₂ and other emissions.

Stationary onshore power supply for both cruise vessels (in operation) and container vessels (planned)

Landside power by LNG truck

Landside power by LNG Hybrid Barge

Hydrogen in ports – the next big thing?

Tier levels of ship classes Port of Hamburg

Port Fee System: Graduation of port fees according to Tier-Level 2019

Source: HPA-Bildarchiv (3)

Source: https://www.boerse-online.de/
As the current focus is on LNG, hydrogen is today a niche product in Hamburg.

- Mainly landside supply: production & usage of industry, fuelling infrastructure, waterside and landside demand is slowly developing

- Refinery H&R Ölwerke Schindler GmbH: 5 MW Electrolyzer-renewable electricity is used for H₂ production, uses H₂ for processing petroleum products

- Linde Gas: Production and sale of H₂, produced with steam reformer based on natural gas

- Vehicle fuelling station (City of Hamburg in total four stations & one under construction)

Source: https://www.now-gmbh.de/
The port authority currently has a supportive and conceptual role.

- HPA is not providing bunkering / fuelling infrastructure → up to business

- HPA rents out areas within the port for hydrogen start-ups (e.g. suppliers or production) and takes a supportive role during approval processes. However: there is currently a lack of demand

- HPA supports hydrogen initiatives by participating in the IAPH working group ‘Clean Marine Fuels’ and local shipping industry working groups

- \( \text{H}_2 \) receives increasing political support in Hamburg; first pilot projects in planning; „H\(_2\)“-strategy for Northern Germany“ in elaboration

Source: https://www.tageblatt.de/
Hydrogen is slowly taking off and innovative projects are being set up.

- Elektra: push boat fired by H₂ fuel cell & battery, regular service to Hamburg from 2020 onwards

- Considerations for testing a harbour tug fired by H₂

- Becker Marine Systems considers retrofitting five trucks with H₂ fuel cells, fuelling infrastructure in the port area to be provided

- Increasing interest in shipping industry – first cruise ship equipped with fuel cell planned for 2021

- Considerations for H₂ emergency power supply for onshore power stations

- Due to the location, the port has potential for a H₂ production / storage / logistics site
Outlook: Ports as logistics hubs for Power-to-Gas technology

• North Germany has a surplus of energy production from offshore wind parks

• H₂ could be an efficient energy storage system (Power-to-Gas technology)

• Artificial energy islands („wind power hubs“) and ports as industrial areas close to the coasts can form the new energy logistics system of the future