H2@Ports Workshop, San Francisco, September 2019

Hydrogen in the Port of Hamburg

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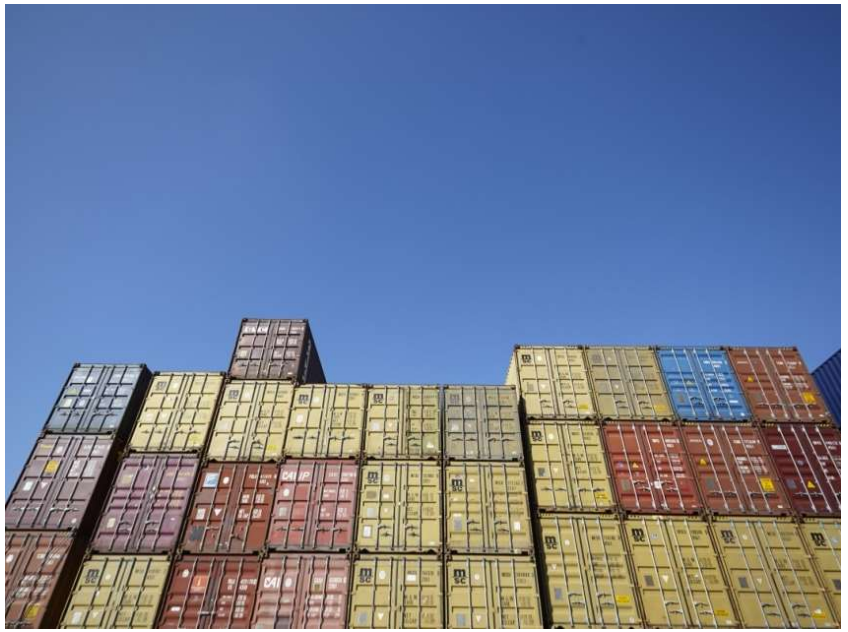
Port of Hamburg is No. 19 in the world (Los Angeles No. 17, Long Beach No. 20).

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

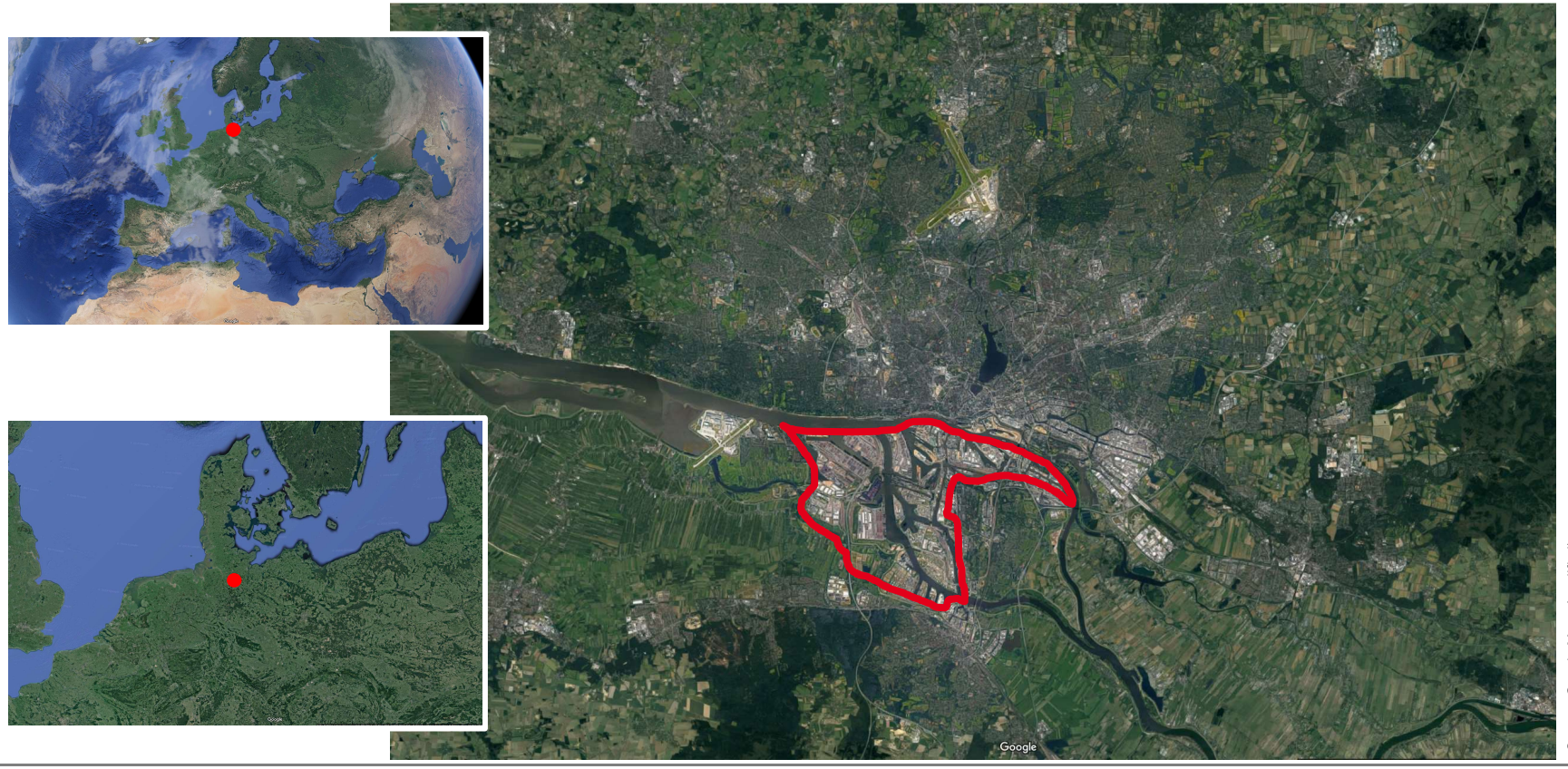
Infrastructure:

- Quai walls for seagoing vessels: 27 miles
- Public roads in the port: 88 miles
- Port railway sidings: 179 miles
- Port area: 17.600 acres



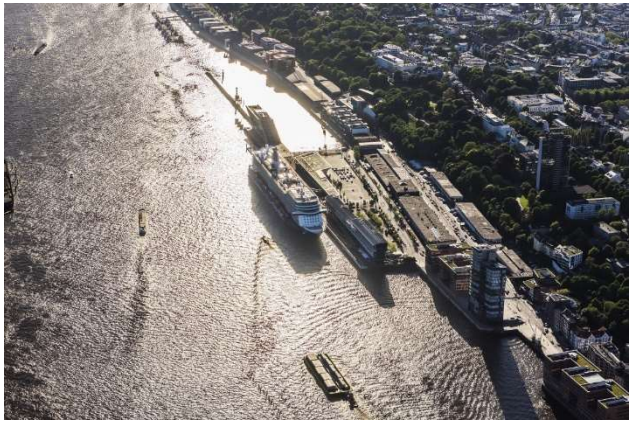
Source: HPA-Bildarchiv/Gregor Schläger

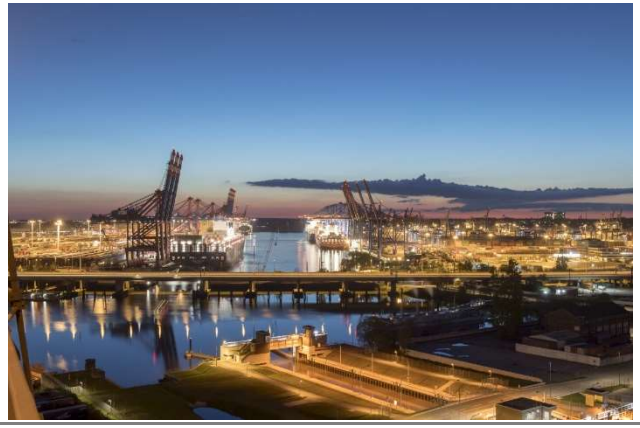
Almost 2 million people live in a 10-mile radius of the port.



Source: Google Maps (modified)

Fostering sustainability is key for the future of the port.

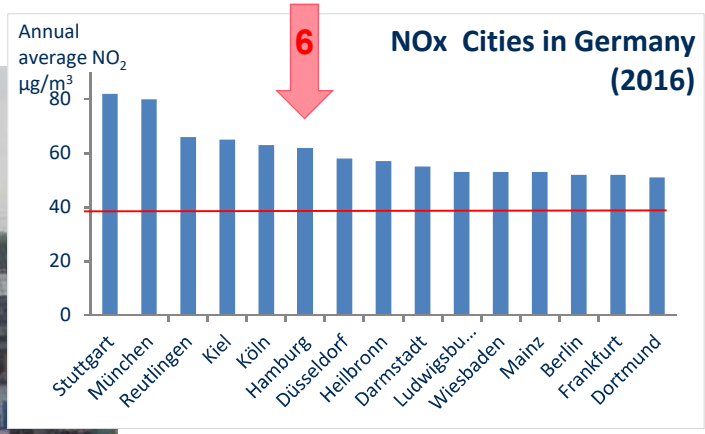


Source: HPA-Bildarchiv/ Sandra Fielker (4)

Port of Hamburg must reduce emissions.

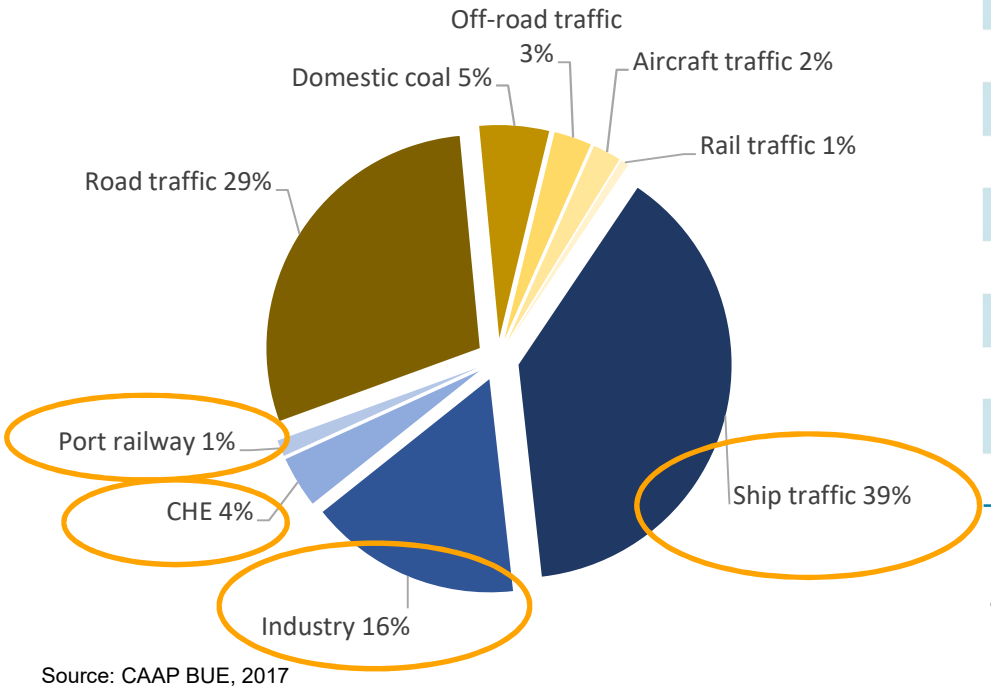
Since 2004 Clean Air Action Planning



Source: HPA, Bernd-Rainer Albers

50 % of the city's NO_x emissions are related to port activities.

Shares of NO_x emitting groups:



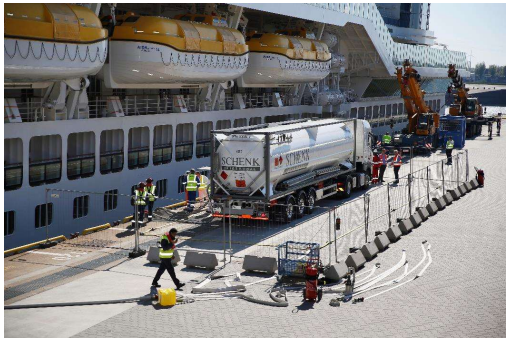
Source: CAAP BUE, 2017

Emission group	t NO_x
Ship traffic	7.944
Road traffic	5.949
Industry	3.286
Domestic coal	1.080
Cargo handling equipment (CHE)	797
Off-road traffic	585
Aircraft traffic	442
Rail traffic	131
Port railway	257
Total	**20.471**

- Results of Clean Air Action Plan from 2017.

The port community is heavily working on reducing CO_2 and other emissions.

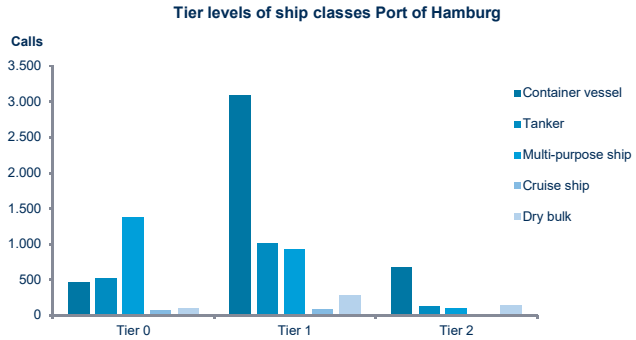
Stationary onshore power supply for both cruise vessels (in operation) and container vessels (planned)



Source: HPA-Bildarchiv (3)

Landside power by LNG truck

Landside power by LNG Hybrid Barge



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

Hydrogen in ports – the next big thing?

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 H_2 production, uses H_2 for processing petroleum products
- Linde Gas: Production and sale of H_2, produced with steam reformer based on natural gas
- Vehicle fuelling station (City of Hamburg in total four stations & one under construction)

Source: BUE

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
- 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.

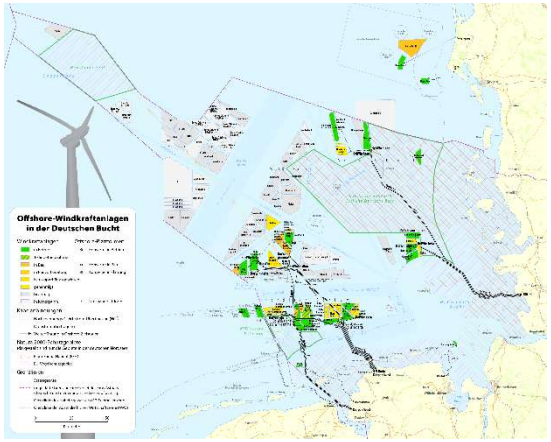
- Elektra: push boat fired by H_2 fuel cell & battery, regular service to Hamburg from 2020 onwards
- Considerations for testing a harbour tug fired by H_2
- Becker Marine Systems considers retrofitting five trucks with H_2 fuel cells, fuelling infrastructure in the port area to be provided
- Increasing interest in shipping industry – first cruise ship equipped with fuel cell planned for 2021
- Considerations for H_2 emergency power supply for onshore power stations
- Due to the location, the port has potential for a H_2 production / storage / logistics site

Source: https://www.marsys.tu-berlin.de/menue/forschung/elektra/

Source: http://www.thb.info

Outlook: Ports as logistics hubs for Power-to-Gas technology

Source: http://www.offshore-windindustrie.de/



Source: https://de.wikipedia.org/

- North Germany has a surplus of energy production from offshore wind parks
- H_2 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

North Sea
Wind Power Hub

Source: https://www.solarify.eu/

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