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This project is co-funded
by the European Union

„Clean Air in Ports“

Malte Siegert, Head of Environmental Policy

NABU Hamburg

Urban Innovations: Hamburg-Hong Kong Dialogue,
Monday, October 12th 2015



NABU e.V. (Germany)



- German Nature and Biodiversity Conservation Union
- Founded in 1899
- 560.000 members and donors
- Member of Birdlife International

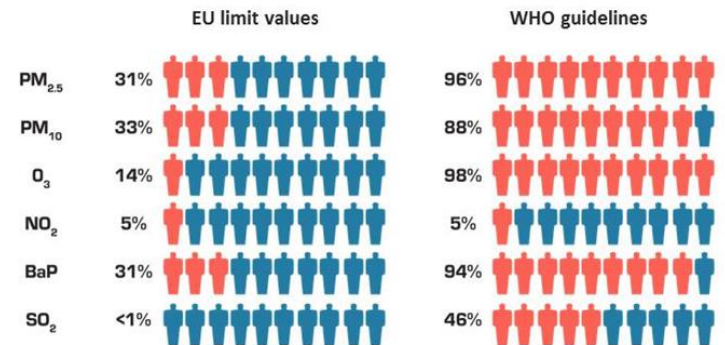
Why Act? Air Pollution in Europe



- 90% of people living in European cities exposed to harmful air pollution levels
- EU: 400,000 premature deaths p. a. due to poor air quality
- 50,000 premature death in EU due to international shipping

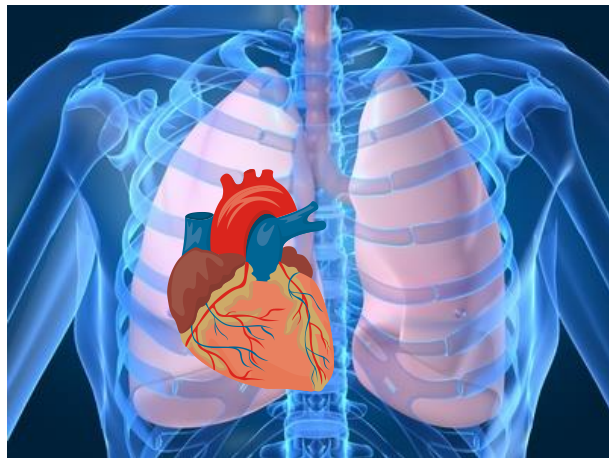
Europeans' exposure to harmful levels of air pollution

EU urban population exposed to harmful levels of air pollution in 2011, according to:



Up to a third of Europeans living in cities are exposed to air pollutant levels exceeding EU air quality standards. And around 90 % of Europeans living in cities are exposed to levels of air pollutants deemed damaging to health by the World Health Organization's more stringent guidelines.

Air Pollution: Why Act?



Health

Environment



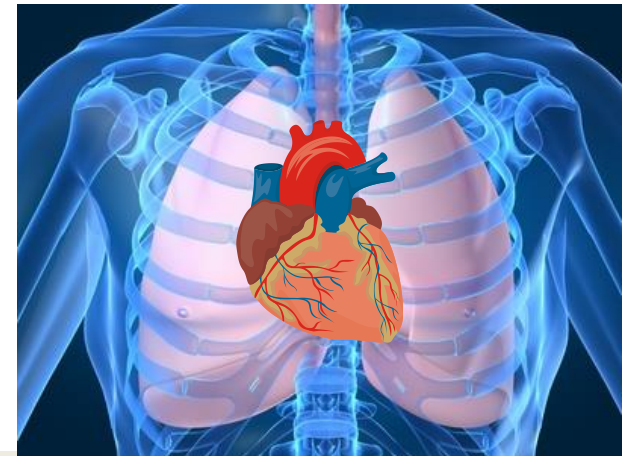
Climate



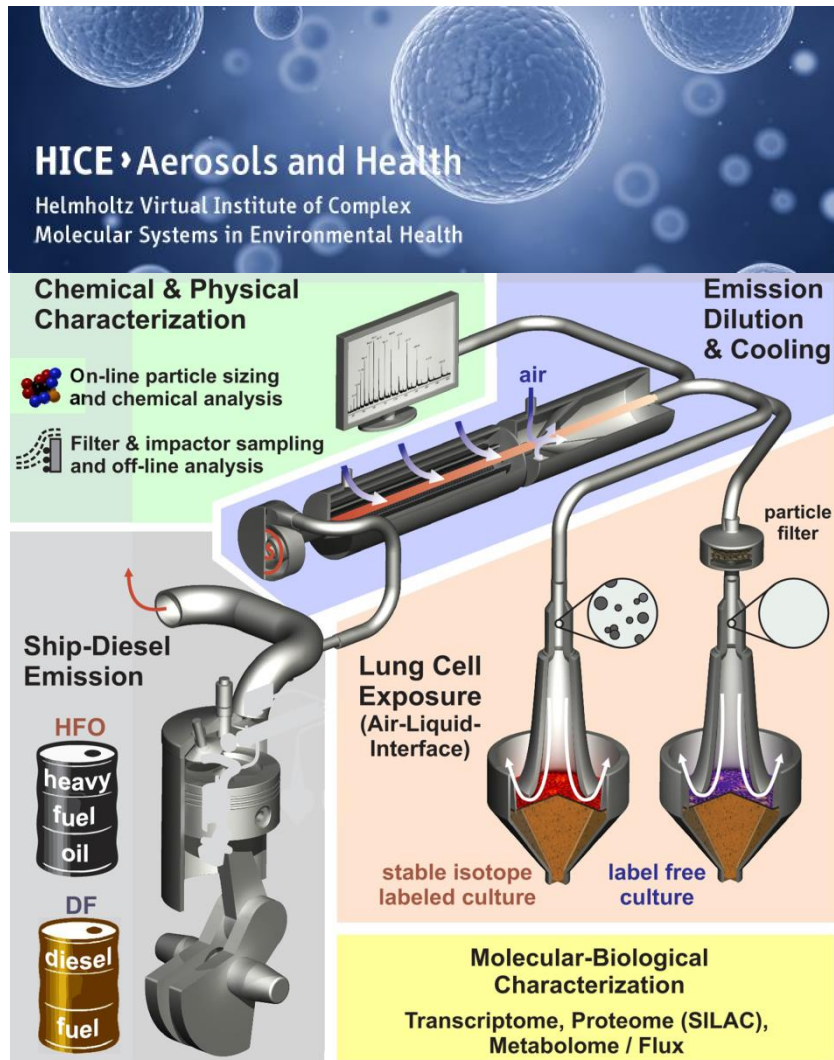
Health / Health Costs



- cardio-vascular disease, asthma, bronchitis, cancer, Alzheimer
- EU health costs: € 760 billion due to bad air quality



Health / Health Costs



Results:

- Diesel more particles than HFO
- HFO emissions high concentrations of toxic compounds

Conclusion:
Installation of DPF

Source: www.hice-vi.eu/

Environmental Damage



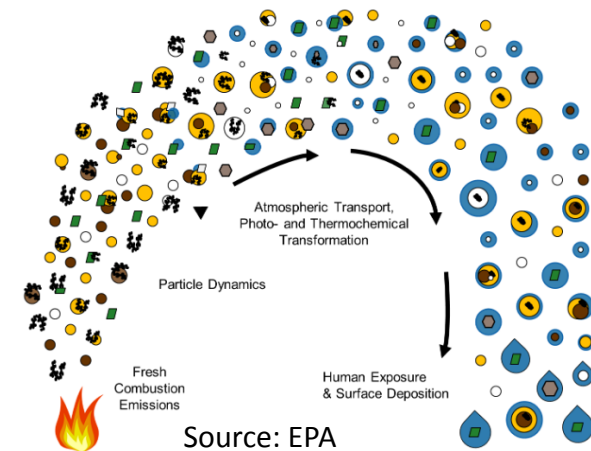
- Acid rain
- Declining forests
- Acidification of soils
- Damage to plant vegetation
- Eutrophication of fresh water bodies, soils and coastal areas



Consequences for the Climate



- Soot contributes to atmospheric warming, lowers reflection capacity of snow and ice
- BC responsible for 40% of arctic warming



Background: EU Legislation



European Union

EU Legislation: Single Emitters



Emitter	Directive on
Ocean going vessels	Sulfur content of marine fuels
Port equipment	Emissions of non-road mobile machinery
Trains	Emissions of non-road mobile machinery
Inland ships	Emissions of non-road mobile machinery
Trucks	Emission of gaseous and particulate pollutants from compression-ignition engines
Cars	Emissions from light passenger and commercial vehicles

EU Ambient Air Quality Directive (AQD 2008/50/EC)



- sulphur dioxides
- nitrogen dioxide and oxides of nitrogen
- PM10
- PM2.5
- lead
- benzene
- carbon monoxide
- **No Ultrafine Particles (PM 0.1)**

EU National Emission Ceilings Directive (NEC 2001/81/EC)



sulphur dioxides

nitrogen dioxides

volatile organic compounds

Ammonia

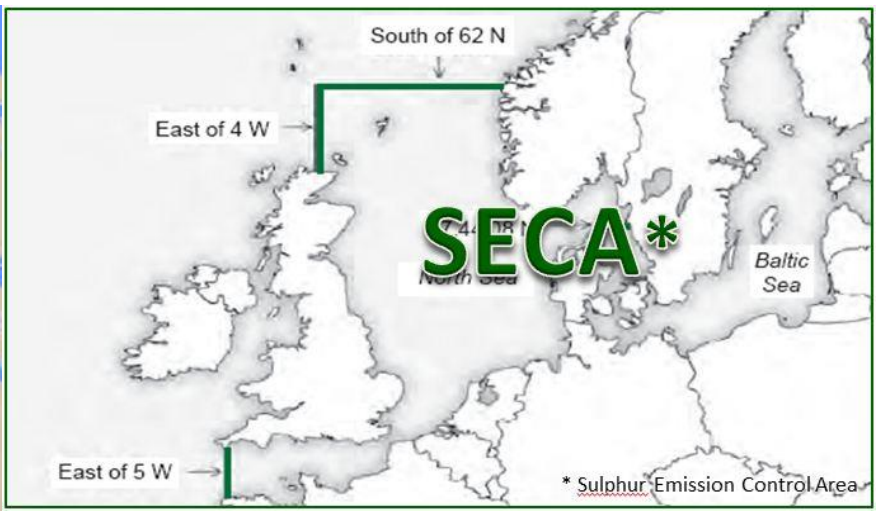
- **Emission reduction targets too low**
- **Postponement to 2030**



ECA / SECA



Source: cruisetricks.de

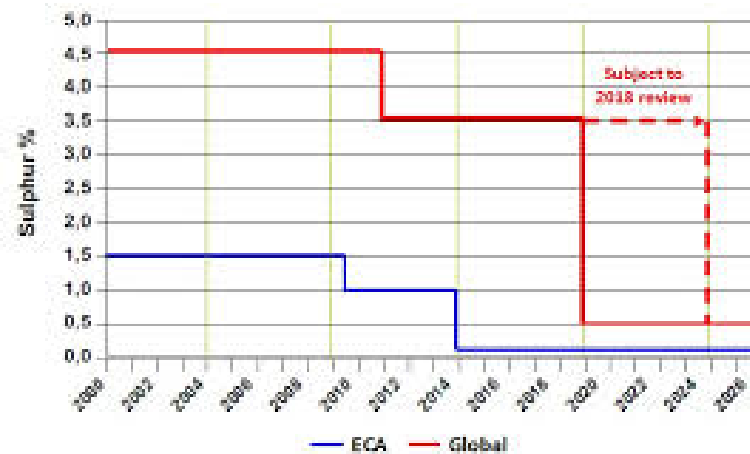


Source: theloadstar.co.uk



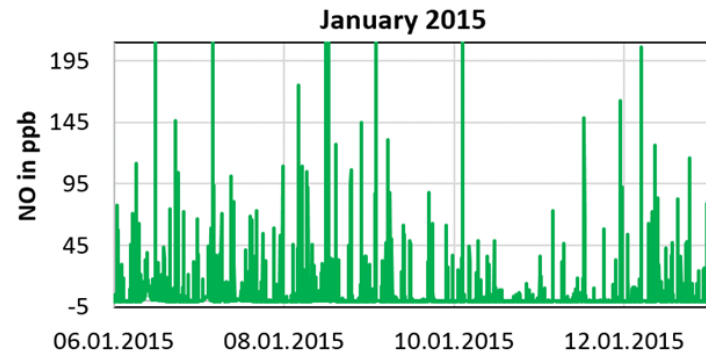
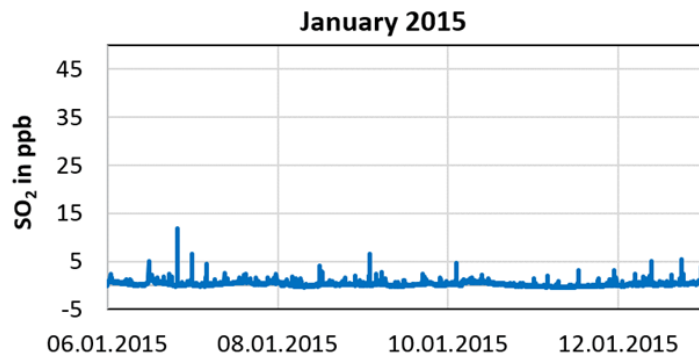
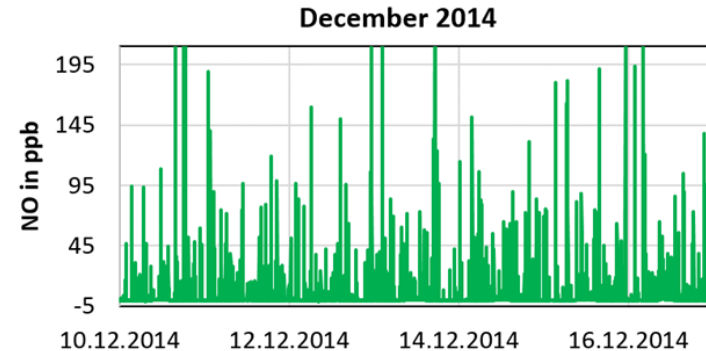
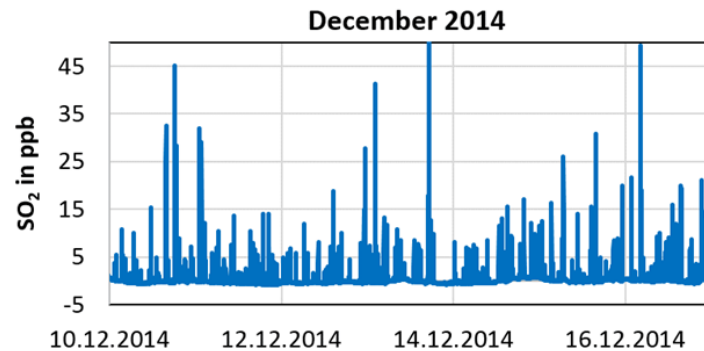
EU: Sulphur Limits

- Truck 0,001 %
- SECA (ECA) 0,1 %
- EU-Ports (since 2010) 0,1 %
- Open Sea 3,5 %



Source: kittiwake.com

Control / Compliance: River Elbe



Institute of Environmental Physics (IUP, University Bremen, Germany)
Federal Maritime and Hydrographic Agency (BSH, Germany)
www.mesmart.de

Source: Federal Maritime and Hydrographic Agency

NABU Air Quality Projects Shipping & Ports



NABU Air Quality Projects Shipping & Ports

- Cruise Ship Campaign
- EU LIFE + “Clean Air in Ports”
- Containership Campaign



NABU: Cruise Ship Campaign





**„ALL-INCLUSIVE“ HEISST BEI UNS:
RUSSPARTIKEL, STICKOXIDE UND SCHWERÖL
SIND IM PREIS INBEGRIFFEN!**



EIN KREUZFAHRTSCHIFF VERURSACHT SO VIELE ABGASE WIE 5 MILLIONEN AUTOS.

NABU: Cruise Ship Campaign

- Umbrella EU-Project:
“Sootfree for the Climate” -
- NABU: Cruise Ship Campaign





Why Cruise Ship Business?

- Public attention (soft target)
- 2011: Cruise Ships without any exhaust treatment
- 2014: Germany leading European Market





An Attractive Cruise Destination: Hamburg





2006: 60 calls (< 150 000 visitors), 1 Terminal

2014: 180 calls (> 550 000 visitors), 3 Terminals



NABU: Cruise Ship Ranking 2014



KREUZFAHRT-RANKING 2014

Die Angaben beruhen z.T. auf Aussagen der Reedereien und sind ohne Gewähr.

PLATZ	REEDEREI	SCHIFFSNAME/-KLASSE	JUNGFERNFAHRT	PASSAGIERE	KOSTEN (EUR)	NABU-WERTUNG*
1	AIDA	PRIMA	2015	3.250	415.000.000	🌿🌿🌿🌿🌿
	AIDA	K.A.	2016	3.250	415.000.000	🌿🌿🌿🌿🌿
3	COSTA	DIADEMA	2014	4.928	556.000.000	🌿🌿🌿🌿🌿
4	TUI CRUISES	MEIN SCHIFF 3	2014	2.500	415.000.000	🌿🌿🌿🌿🌿
	TUI CRUISES	MEIN SCHIFF 4	2015	2.500	415.000.000	🌿🌿🌿🌿🌿
	TUI CRUISES	MEIN SCHIFF 5	2016	2.500	415.000.000	🌿🌿🌿🌿🌿
	TUI CRUISES	MEIN SCHIFF 6	2017	2.500	415.000.000	🌿🌿🌿🌿🌿
	MSC	SEASIDE CLASS	2017	5.300	K.A.	🌿🌿🌿🌿🌿
	MSC	SEASIDE CLASS	2018	5.300	K.A.	🌿🌿🌿🌿🌿
12	MSC	K.A.	2018	5.700	750.000.000	🌿🌿🌿🌿🌿
	MSC	K.A.	2019	5.700	750.000.000	🌿🌿🌿🌿🌿
	P&O CRUISES	BRITANNIA	2015	3.611	560.000.000	🌿🌿🌿🌿🌿
	NORWEGIAN	ESCAPE	2015	4.200	K.A.	🌿🌿🌿🌿🌿
17	NORWEGIAN	BLISS	2017	4.200	K.A.	🌿🌿🌿🌿🌿
	NORWEGIAN	K.A.	2018	4.200	800.000.000	🌿🌿🌿🌿🌿
	NORWEGIAN	K.A.	2019	4.200	800.000.000	🌿🌿🌿🌿🌿
	NORWEGIAN	GETAWAY	2014	4.000	600.000.000	🌿🌿🌿🌿🌿
	PRINCESS	REGAL PRINCESS	2014	3.600	558.000.000	🌿🌿🌿🌿🌿
	ROYAL CARIBBEAN	QUANTUM OF THE SEAS	2014	4.100	784.000.000	🌿🌿🌿🌿🌿
	ROYAL CARIBBEAN	ANTHEM OF THE SEAS	2015	4.100	784.000.000	🌿🌿🌿🌿🌿
	VIKING OCEAN	STAR	2015	988	K.A.	🌿🌿🌿🌿🌿
	VIKING OCEAN	SKY	2016	928	K.A.	🌿🌿🌿🌿🌿
	VIKING OCEAN	SEA	2016	928	K.A.	🌿🌿🌿🌿🌿
17	ROYAL CARIBBEAN	QUANTUM CLASS	2016	4.100	784.000.000	🌿🌿🌿🌿🌿
	ROYAL CARIBBEAN	OASIS CLASS	2016	5.400	1.030.000.000	🌿🌿🌿🌿🌿
	VIKING OCEAN	K.A.	2017	928	K.A.	🌿🌿🌿🌿🌿
	ROYAL CARIBBEAN	OASIS CLASS	2017	5.400	1.030.000.000	🌿🌿🌿🌿🌿
	PRINCESS	REGAL PRINCESS	2017	3.600	558.000.000	🌿🌿🌿🌿🌿
	PRINCESS	REGAL PRINCESS	2017	3.600	558.000.000	🌿🌿🌿🌿🌿

*FOLGENDES LIEGT DER WERTUNG ZU GRUNDE:

- 🌿🌿🌿🌿🌿 = mit Schweröl; ohne Abgastechnik
- 🌿🌿🌿🌿🌿 = mit Schweröl + Scrubber
- 🌿🌿🌿🌿🌿 = mit Schweröl + Scrubber + SCR-Katalysator
- 🌿🌿🌿🌿🌿 = mit Schweröl + Scrubber + SCR-Katalysator + Landstromanschluss
- 🌿🌿🌿🌿🌿 = mit Schweröl + Scrubber + Partikelfilter + Landstromanschluss
- 🌿🌿🌿🌿🌿 = mit Schweröl + Scrubber + SCR-Katalysator + Partikelfilter + Landstromanschluss
- 🌿🌿🌿🌿🌿 = ohne Schweröl; mit SCR-Katalysator + Partikelfilter + Landstromanschluss

NABU: Cruise Ship Ranking 2015



KREUZFAHRT-RANKING 2015

Die Angaben beruhen z.T. auf Aussagen der Reedereien und sind ohne Gewähr.

PLATZ	REEDEREI	SCHIFFSNAME/-KLASSE	JUNGFERNFAHRT	PASSAGIERE	KOSTEN(EUR)	NABU-WERTUNG*
1	AIDA	K.A.	2019	6.600	K.A.	🌿🌿🌿🌿
	AIDA	K.A.	2020	6.600	K.A.	🌿🌿🌿🌿
	COSTA	K.A.	2019-2022	6.600	K.A.	🌿🌿🌿🌿
	COSTA	K.A.	2019-2022	6.600	K.A.	🌿🌿🌿🌿
5	AIDA	PRIMA	2016	3.250	455.000.000	🌿🌿🌿🌿
	AIDA	MIA	2016	3.250	455.000.000	🌿🌿🌿🌿
7	TUI CRUISES	MEIN SCHIFF 4	2015	2.500	415.000.000	🌿🌿🌿🌿
	TUI CRUISES	MEIN SCHIFF 5	2016	2.500	565.000.000	🌿🌿🌿🌿
	TUI CRUISES	MEIN SCHIFF 6	2017	2.500	565.000.000	🌿🌿🌿🌿
	TUI CRUISES	MEIN SCHIFF 7	2018	2.500	565.000.000	🌿🌿🌿🌿
	TUI CRUISES	MEIN SCHIFF 8	2019	2.500	565.000.000	🌿🌿🌿🌿
12	MSC	SEASIDE	2017	5.700	930.000.000	🌿🌿🌿🌿
	MSC	SEASIDE CLASS	2017	5.300	880.000.000	🌿🌿🌿🌿
	MSC	SEASIDE CLASS	2018	5.300	880.000.000	🌿🌿🌿🌿
	MSC	SEASIDE CLASS	2019	5.700	930.000.000	🌿🌿🌿🌿
	NORWEGIAN	ESCAPE	2015	4.200	830.000.000	🌿🌿🌿🌿
	NORWEGIAN	BLISS	2017	4.200	830.000.000	🌿🌿🌿🌿
	NORWEGIAN	K.A.	2019	4.200	980.000.000	🌿🌿🌿🌿
	P&O CRUISES	BRITANNIA	2015	3.611	560.000.000	🌿🌿🌿🌿
	ROYAL CARIBBEAN	ANTHEM OF THE SEAS	2015	4.100	784.000.000	🌿🌿🌿🌿
	ROYAL CARIBBEAN	OVATION OF THE SEAS	2016	4.100	784.000.000	🌿🌿🌿🌿
24	ROYAL CARIBBEAN	HARMONY OF THE SEAS	2016	5.400	1.030.000.000	🌿🌿🌿🌿
	ROYAL CARIBBEAN	OASIS CLASS	2018	5.400	1.030.000.000	🌿🌿🌿🌿
	PONANT	LE LYRIAL	2015	264	120.000.000	🌿🌿🌿🌿
	VIKING OCEAN	STAR	2015	944	278.000.000	🌿🌿🌿🌿
	VIKING OCEAN	SKY	2016	928	280.000.000	🌿🌿🌿🌿
VIKING OCEAN	SEA	2016	928	280.000.000	🌿🌿🌿🌿	
VIKING OCEAN	SUN	2018	928	280.000.000	🌿🌿🌿🌿	

*FOLGENDES LIEGT DER WERTUNG ZU GRUNDE:

🌿🌿🌿🌿 = mit Schweröl; ohne Abgastechnik

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🌿🌿🌿🌿 = mit Schweröl + Scrubber + SCR-Katalysator + Partikelfilter + Landstromanschluss

🌿🌿🌿🌿 = ohne Schweröl; mit SCR-Katalysator + Partikelfilter + Landstromanschluss - oder Flüssiggas

MIR STINKTS!
KREUZFAHRTSCHIFFE
SAUBER MACHEN!



NABU: Cruise Ship Campaign

Success beyond legislation

- First Cruise Ships equipped with DPF and SCR (e.g. AIDA, TUI-Cruises)
- More exhaust treatment installed or LNG in the future (horizon 2020)
- 2 OPS options for Cruise Ships in Hamburg



NABU: Containership Campaign

- Producers / Manufactures
- Logistic Chain
- Customer



NABU: EU-funded LIFE+ Project „Clean Air in Ports“





NABU: EU LIFE+ Project „Clean Air in Ports“

- 6 Conferences / workshops
- Contribution to several events (e.g. Green Ports Congress 2012-15, IAPH World Ports Congress)
- Manual „Clean Air in Ports“ (www.nabu.de/ports)



NABU: EU LIFE+ Project „Clean Air in Ports“

Stakeholders

- Administrations
- Port authorities
- High sea shipping companies
- Terminal operators
- Logistic companies
- Industry
- Public transport
- Utilities
- Scientists

Current Challenges in Ports

- Sulphur Dioxides (SO_x)
- Nitrogen Oxides (NO_x)
- Particulate Matter (PM)
- Black Carbon(BC)

From: NRMM, Street, Rail, Terminals, Ships, Inland Ships



Olaf Otto Becker

Air Pollution in Ports

Sources



Ships

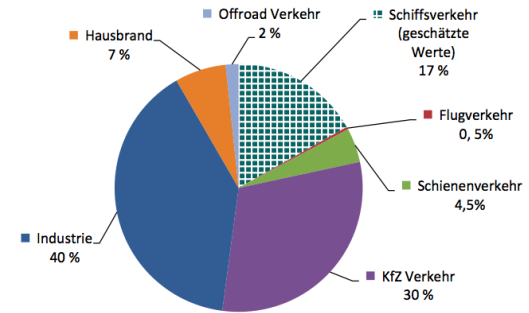
Port Machinery

Inland Ships

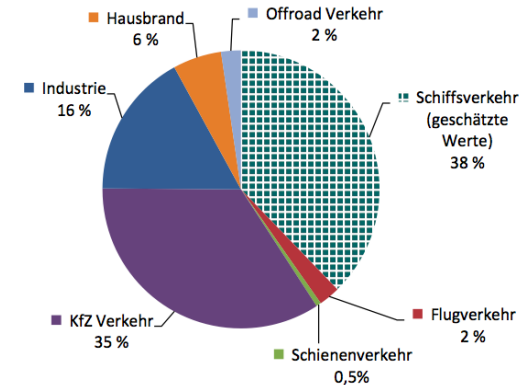
Trucks / Cars

Locomotives

Feinstaub (PM₁₀)



Stickoxide (NO_x)



Source: Hamburg Air Quality Plan

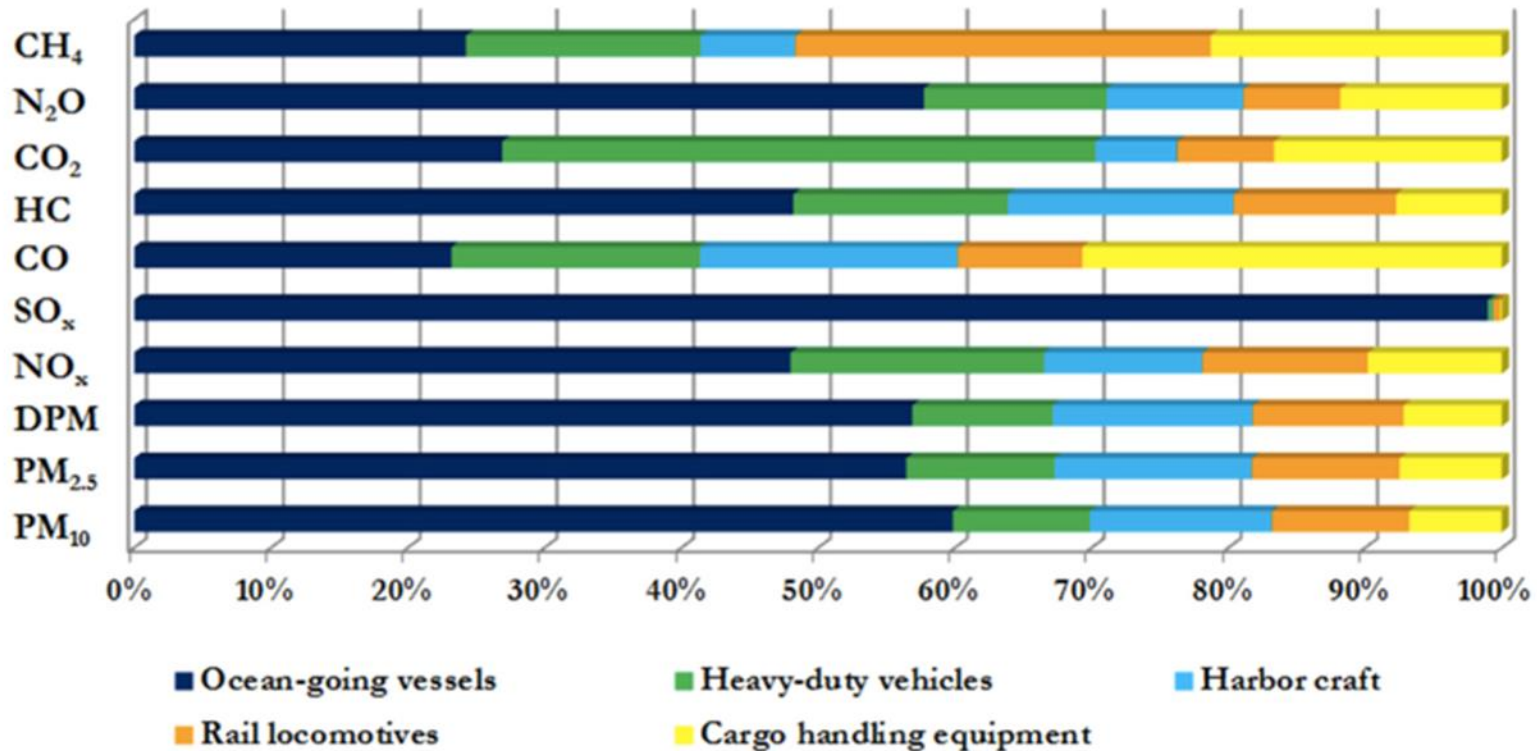
„Clean Air in Ports“: Options for Ports



Emission Inventory



Figure ES.3: 2010 Port-related Emissions by Category, %



Port of LA- 2010 Emission Inventory

Emission Inventory



2005 - 2013 AIR QUALITY REPORT CARD



PRIMARY POLLUTANTS DEFINED

DPM – Diesel Particulate Matter
 NOx – Oxides of Nitrogen
 SOx – Oxides of Sulfur
 PM_{2.5} – Particulate Matter less than 2.5 microns in diameter
 PM₁₀ – Particulate Matter less than 10 microns in diameter
 CO₂ – Carbon Dioxide (A Green House Gas contributor)

OVERALL EMISSIONS REDUCTIONS CY 2005-2013

Pollutant	CY 2005-2013	
	%	tons
DPM	80%	712
PM _{2.5}	79%	651
PM ₁₀	80%	779
NOx	57%	9,311
SOx	90%	4,645

EMISSIONS PER 10,000 TBU HANDLED

Pollutant	CY 2005-2013	
	%	tons
DPM	81%	0.96
PM _{2.5}	79%	0.88
PM ₁₀	81%	1.05
NOx	59%	12.90
SOx	90%	6.24

OCEAN-GOING VESSEL EMISSIONS REDUCTIONS

Pollutant	CY 2005-2013	
	%	tons
DPM	81%	3.66
PM _{2.5}	78%	3.53
PM ₁₀	81%	4.56
NOx	34%	1,811
SOx	89%	4,496

HEAVY-DUTY VEHICLE/CLEAN TRUCK EMISSIONS REDUCTIONS

Pollutant	CY 2005-2013	
	%	tons
DPM	93%	229
PM _{2.5}	93%	209
PM ₁₀	93%	227
NOx	80%	5,113
SOx	91%	38

HARBOR CRAFT EMISSIONS REDUCTIONS

Pollutant	CY 2005-2013	
	%	tons
DPM	52%	29
PM _{2.5}	52%	27
PM ₁₀	52%	29
NOx	47%	615
SOx	91%	6

RAIL EMISSIONS REDUCTIONS

Pollutant	CY 2005-2013	
	%	tons
DPM	49%	28
PM _{2.5}	49%	26
PM ₁₀	49%	28
NOx	52%	884
SOx	99%	97

CARGO HANDLING EQUIPMENT EMISSIONS REDUCTIONS

Pollutant	CY 2005-2013	
	%	tons
DPM	76%	40
PM _{2.5}	73%	36
PM ₁₀	73%	39
NOx	57%	888
SOx	84%	8

CO₂ EQUIVALENT REDUCTIONS BY SOURCE TYPE

Source Type	CY 2005-2013	
	%	metric tons
Ocean-Going Vessels	35%	103,603
Harbor Craft	16%	9,132
Cargo Handling Equipment*	-3%	-3,680
Rail	19%	15,403
Heavy-Duty Vehicles	25%	116,459
TOTAL		240,917

* All percent based after credit for in-units except cargo handling equipment

SAN PEDRO BAY STANDARDS

- The San Pedro Bay Standards establish the long-term emissions-reduction and health risk-reduction goals for the ports of Los Angeles and Long Beach.
- Emission Reduction Standard for DPM, NOx, and SOx have target years of 2014 and 2023 to support state ambient air quality goals.
- Health Risk Reduction Standard has a target year of 2020 to align with CARB's Goods Movement Emission Reduction Plan.

Clean Air Action Plan (CAAP) Goals (% reduction compared to 2005)	2014	2023
DPM	72%	77%
NOx	22%	59%
SOx	93%	93%

Health Risk Reduction Standard (2020) (% reduction in residential cancer risk compared to 2005)

Health Risk Reduction Standard (2020)	85%
---------------------------------------	-----

2014-0000_01/13

Non Road Mobile Machines (NRMM)



Non Road Mobile Machines (NRMM)



- „Automatic Guided Vehicles“ (AGV) PoLB, HH, RO
- Hydrogen fork lift (MSC Antwerp)
- LNG-driven fork lift Diesel/electric drives (container bridges, cranes, van carrier)
- E-Mobility for harbor operation
- Filter systems



Street related Traffic



Street related Traffic



- Port Road Management: „Smart Port Logistics“, Hamburg Port Authority
- „Clean Truck Programme“
Port of LA and Port of Long Beach
- eHighway / Siemens
- Incentives for measures beyond regulation





Rail Services

Rail Services



- Partikel filter for diesel lokomotives
- Electrification
- Hybrid-Systems
- Light waggons (HHLA -30% weight)

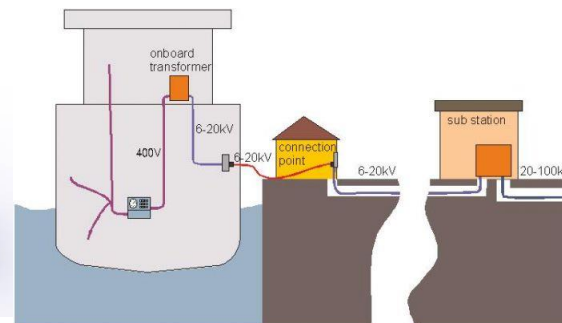
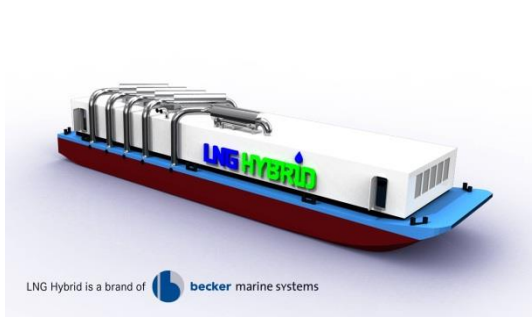


Ocean Shipping



Ocean Shipping (Ports)

- LNG-supply
- LNG „Power-Barge“ or “Power-Pack“
- Onshore Power Supply (OPS)





Ocean Shipping (Ships)

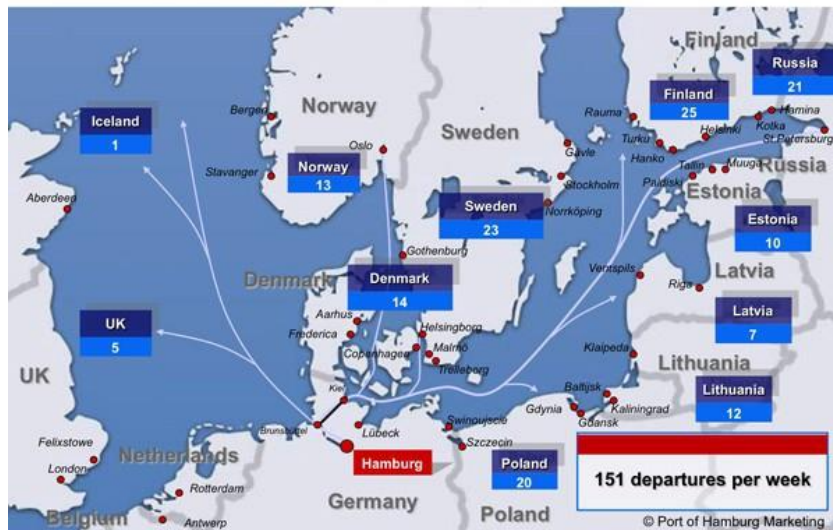
- Marine Diesel
- LNG, Methanol, Ethanol, Hydrogen, Hybrid, E-Ship, Wind-Ship
- DPF and SCR
- OPS-ready

Port of Hamburg

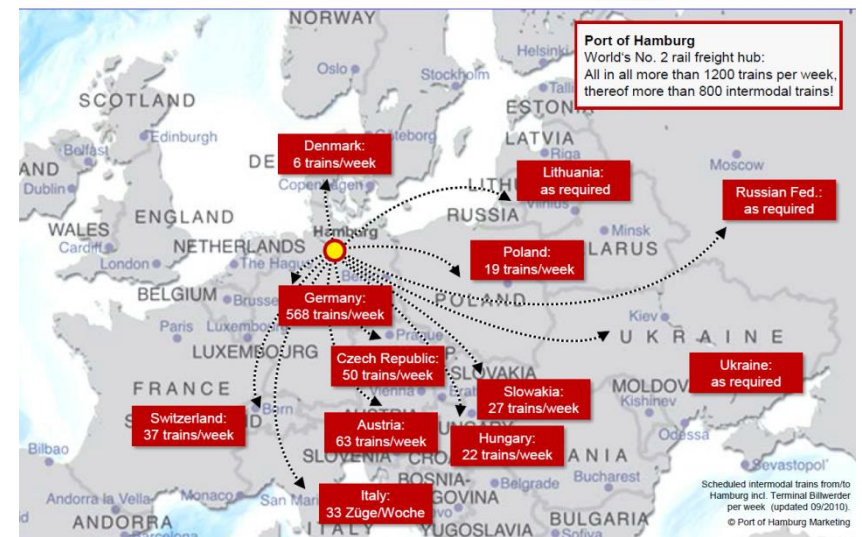


Port of Hamburg

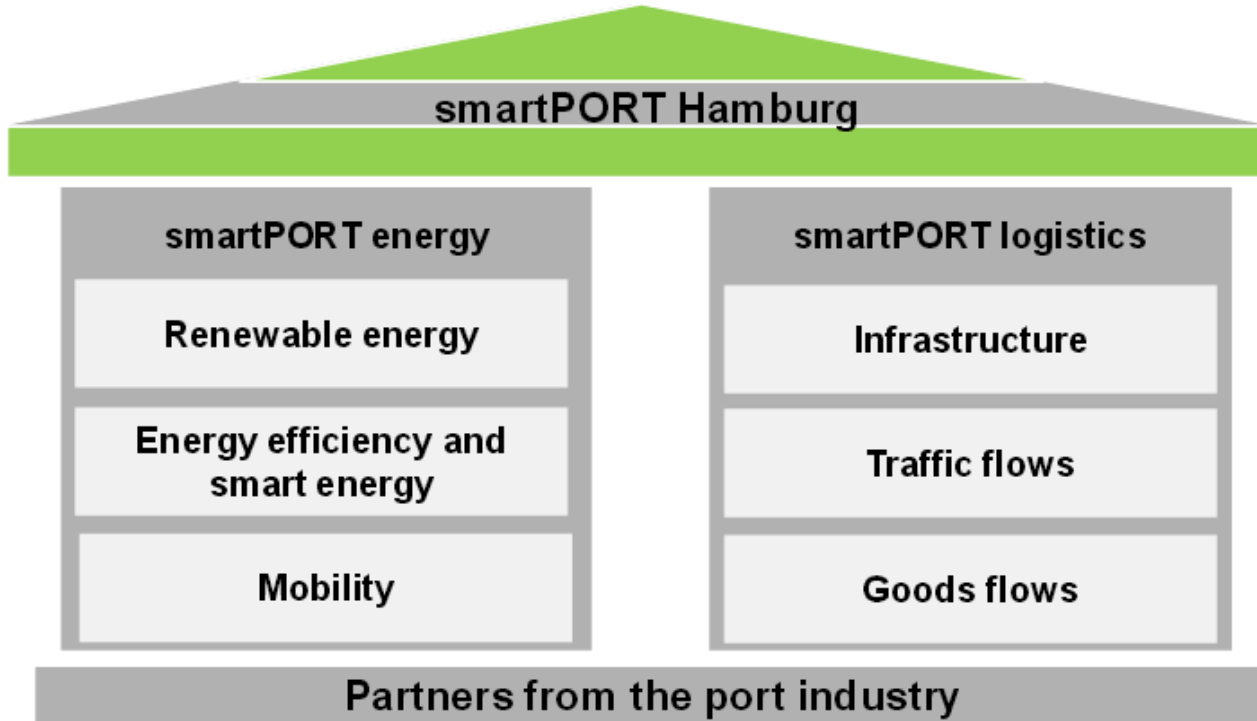
Port of Hamburg Feeder Connections in 2011



Intermodal Railway Services offered in Hamburg

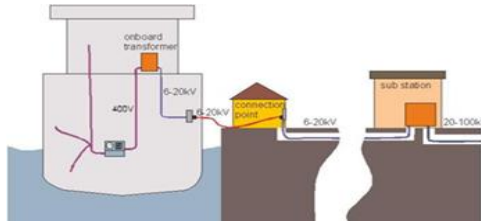


Port of Hamburg: smartPORT

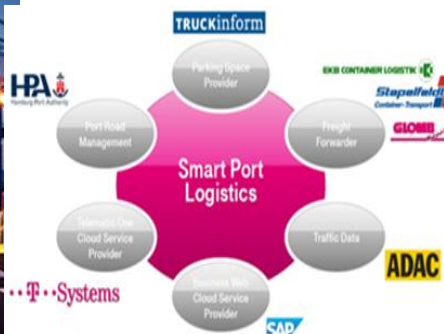


Source: HPA

The "Ideal Port"



LNG Hybrid is a brand of becker marine systems



Summary Best Practice

Ships

- Ecological port fees, restrictions, LSF, slow steaming, OPS

NRMM

- Incentives for / demand diesel particulate filters
- Alt. energies / technologies
- Efficiency measures

Trucks

- Incentives for clean trucks / ban dirty trucks
- Optimize traffic flow
- Optimize arrival / departure

Terminals

- AGV, solar, wind turbines





NABU Publication: “Clean Air in Ports



www.nabu.de/ports



Take Home Message

- Air pollution in ports is a serious problem
- Many best practice examples, too little implementation
- More national and international regulation needed
- More control (compliance)



Thank you!

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