THE SCIPPER PROJECT

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Shipping Contributions to Inland Pollution Push for the Enforcement of Regulations

Input fra EU's SCIPPER projekt omkring huller i hhv. lovgivning og i håndhævelse v. Erik Fridell, gruppechef hos det svenske miljøinstitut IVL

Name: Erik Fridell

Affiliation: IVL Swedish Environmental Research Institute

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nr.814893

Background: SOx and NOx ECAs in EU waters

Emission Control Areas (ECAS) in EU waters

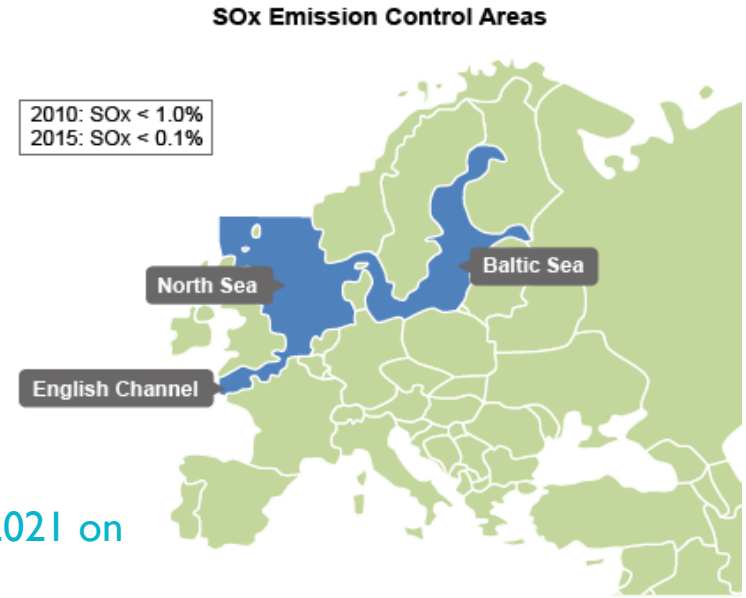
- Currently three regions:
  - Baltic Sea
  - North Sea
  - English Channel

Limits

- 0.1% max S since 1.1.2015
- Baltic and North Seas NO_x Tier III ECAs from 1.1.2021 on

Developments

- On-going discussion for inclusion of the Mediterranean region as a SO_x - ECA



Source: International Maritime Organization

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Response

Some options to meet new emission standards:

- Low sulfur fuel and NOx aftertreatment
- Heavy fuel and both NOx and SOx aftertreatment
- LNG
- Other fuels, like methanol, electrification, etc.

Main Question to be responded by SCIPPER:

How will authorities make sure that correct fuel or proper aftertreatment are being used?

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SCIPPER Overarching objectives

Need for:

- Compliance check of environmental regulations.
- More evidence on monitoring possibilities for low sulphur levels, new pollutants, as well as implications of non-compliant ships to air pollution.

Main objectives:

- To provide evidence on the performance and capacity of different techniques for shipping emissions monitoring and,
- to assess the impacts of shipping emissions on air quality, under different regulatory enforcement scenarios.

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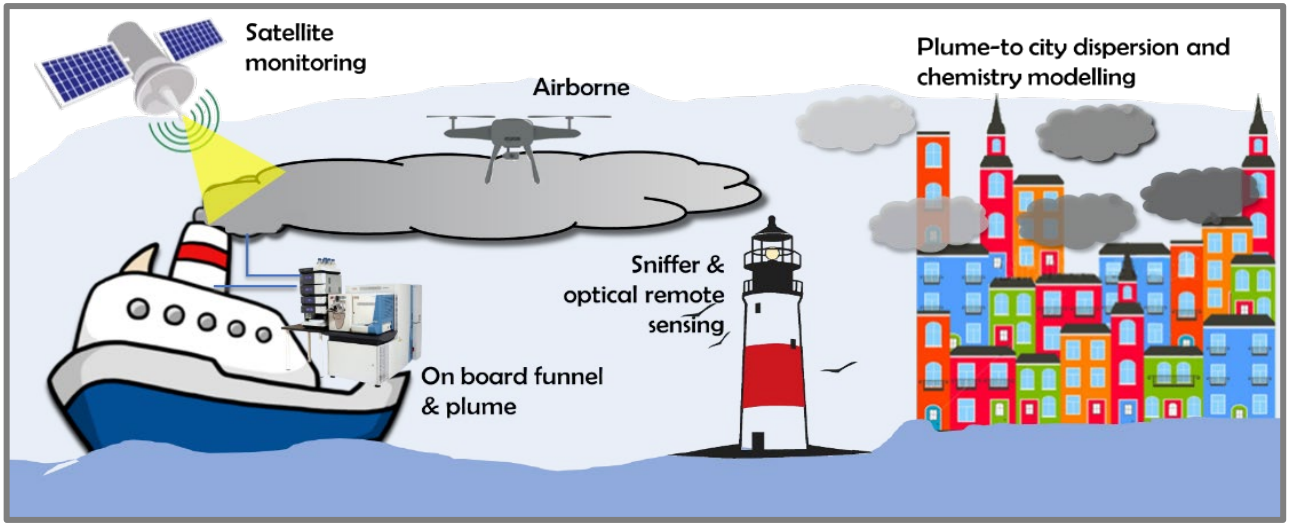
The SCIPPER Concept

Real-world deployment of various monitoring techniques

Implementation of 5 experimental campaigns at different locations



- ❑ Application / validation / comparison of various emission measurement and monitoring techniques for emission standards compliance checking purposes
- ❑ Determination of the impact of shipping on air quality at coastal and harbor level

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WP5 Objectives

- Harmonise reporting procedures for non-compliance measurements.
- Identify gaps in current regulations and propose remedial solutions.
- Identify practical issues and costs of different monitoring methods and make recommendations to policy makers.
- Assess impact of different levels of compliance on future emissions, and exposure.

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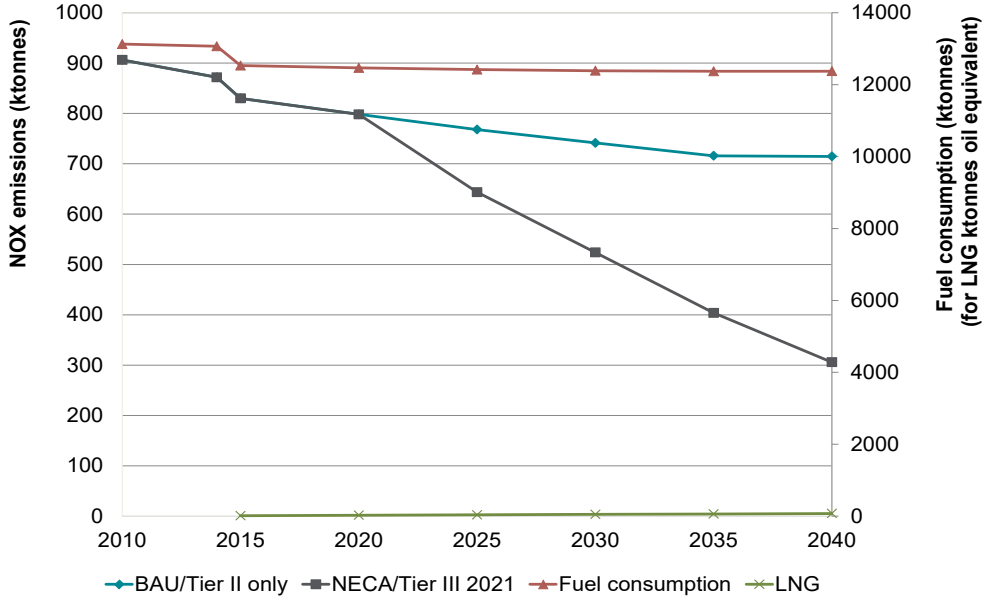
Fuel consumption and NO_X emissions in Baltic and North Seas. With NECA in BS and NS effective 2021.



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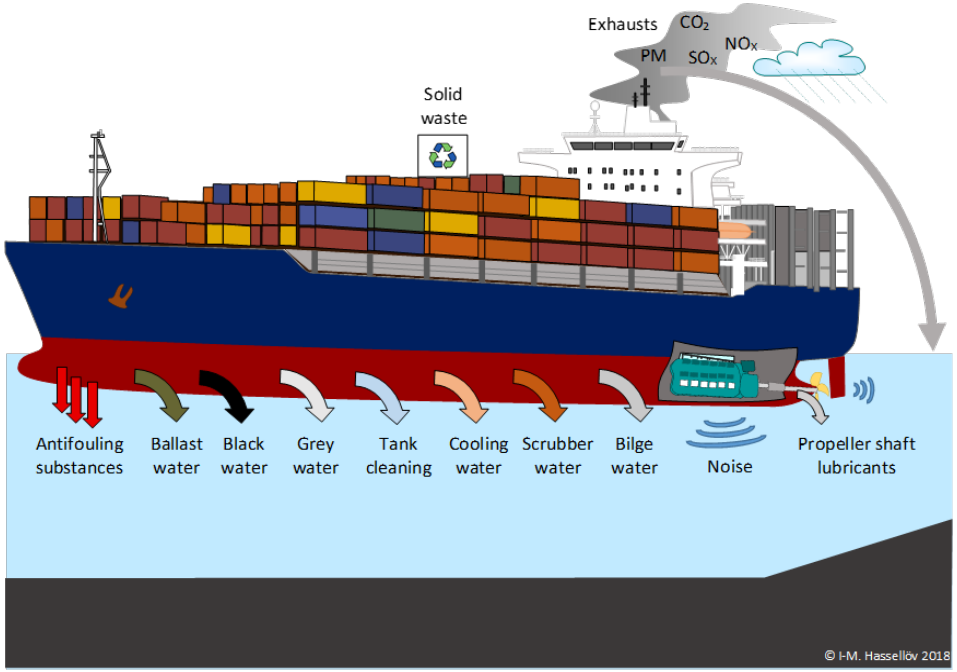
The impact of NO_X emissions



1. Nutrients

2. Contaminants

3. Air pollutants

4. Green-house gases

Ytreberg, Åström and Fridell, J. Env Man. 2020

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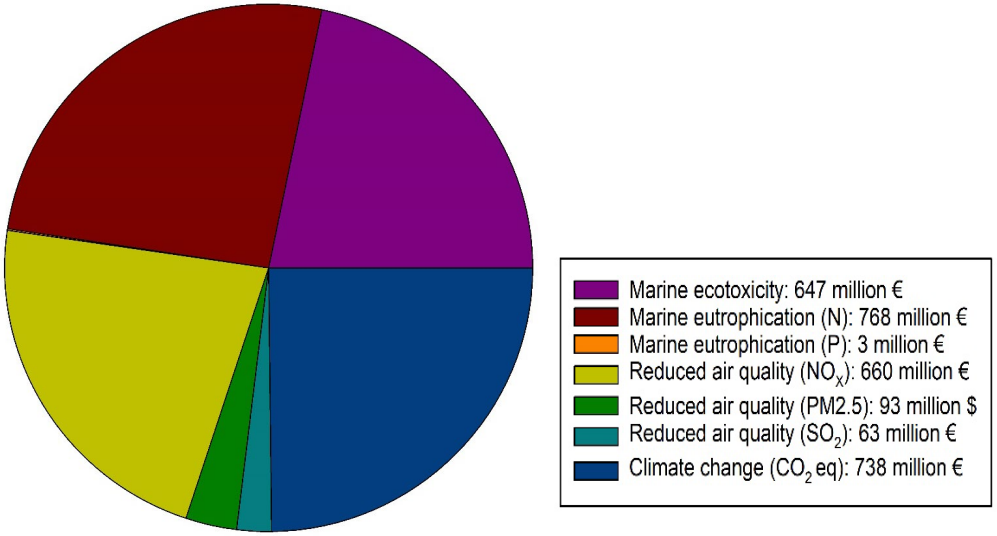
Annual damage costs of Baltic Sea shipping year 2018



Total annual damage cost:
3.0 billion $€_{2010}$ (95%-CI 2.0 – 3.9)

Damage costs on the marine environment in the same range as reduced air quality and climate change

NO_X the biggest factor

Ytreberg, Åström and Fridell, J. Env Man. 2020

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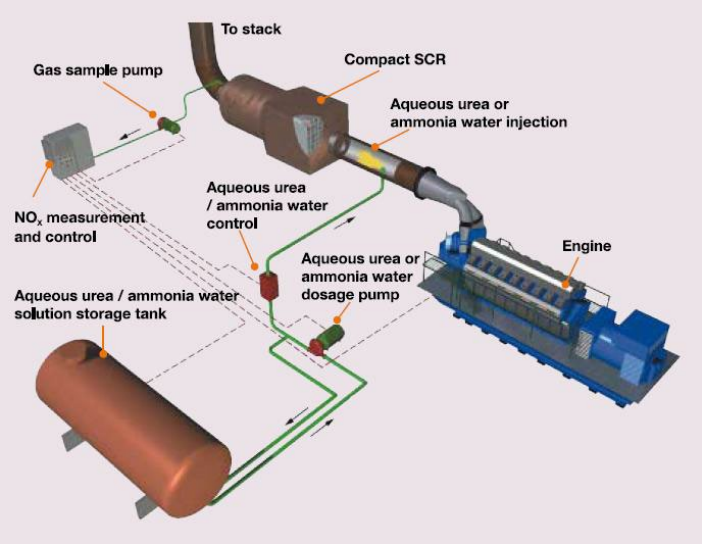
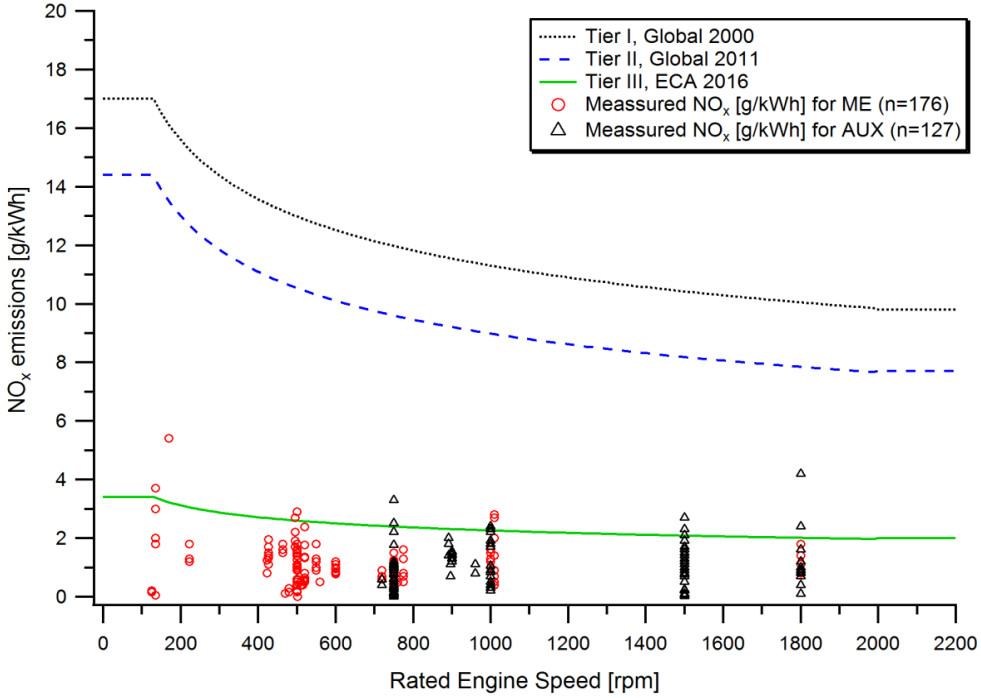
How to comply with Tier III?

- Aftertreatment: Selective Catalytic Reduction
- Engine technology: EGR
- Other fuels: LNG, methanol,..



Data from Swedish ships with SCR



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SCR:

- how to control functionality with time
- ammonia slip
- low load – low temperature problem

- Monitoring
  - Onboard sensors
  - Remotely (Shore, aircraft, drones)
  - Intermittent onboard measurements or inspection

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Some identified gaps, related to NO_X:

- Control procedures to discover SCR deactivation are insufficient - the systems may not work properly.
- Regulation on ammonia slip over time after SCRs are lacking – increased ammonia emissions.
- Functioning in port areas and other close to shore locations are not well covered by the regulation – expected improvement in air quality may not be reached.
- Emissions of NO_X from the operational phase are not monitored – difference in emissions between test cycles and real world.
- Regulatory prescribed approaches to the use of remote sensing technology for NO_X emissions is lacking – how to deal with high emitters?

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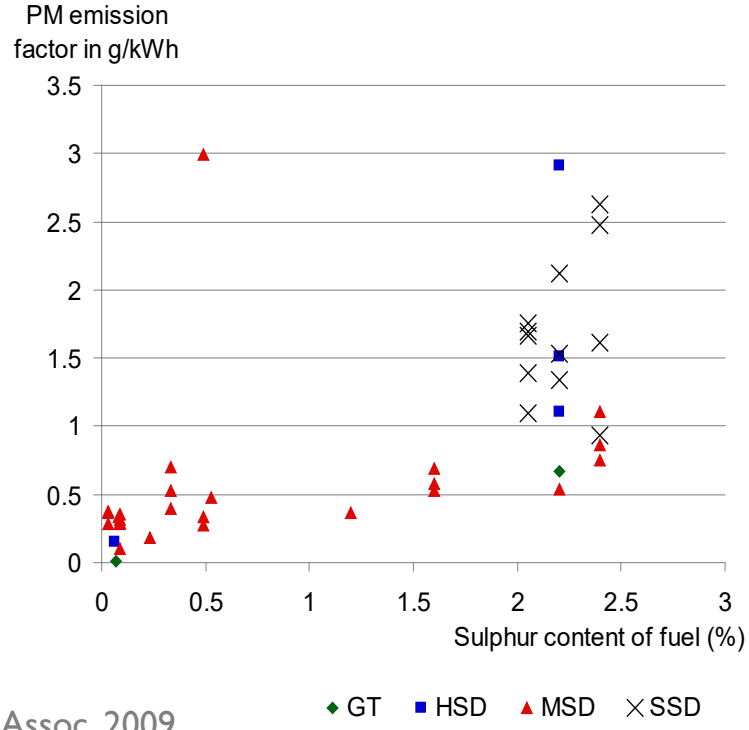
Sulphur in fuel => Particle emission

PM formation vs fuel sulphur



Winnes and Fridell, J. Air & Waste Man Assoc, 2009

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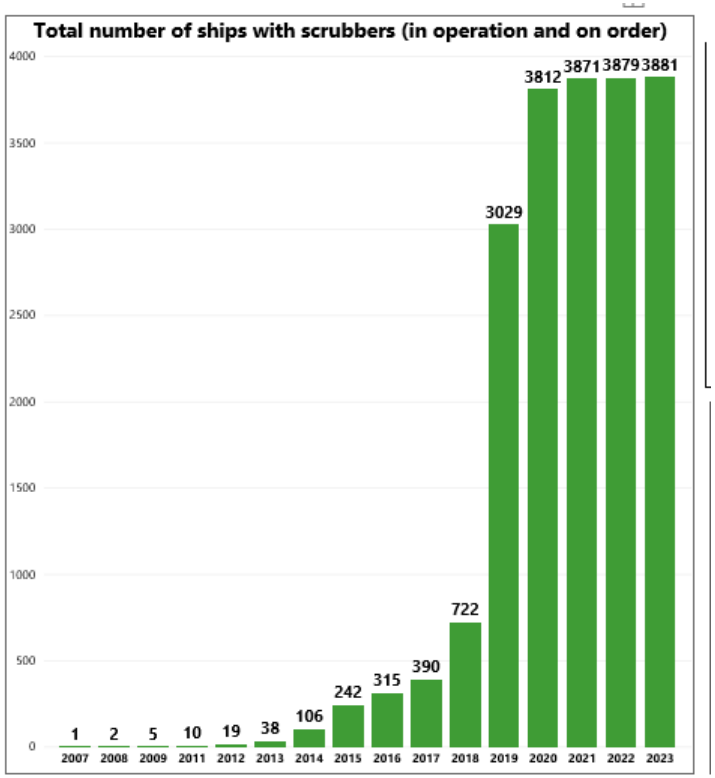
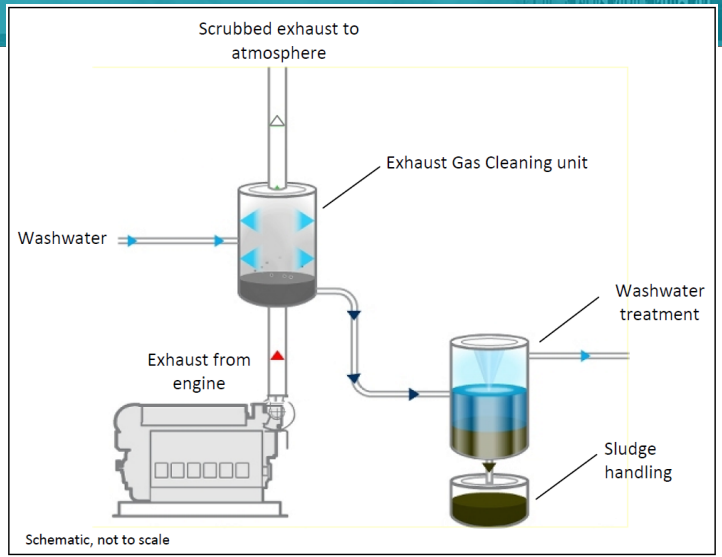
Scrubbers





- Impact on the sea from scrubber water? New criteria to be developed
- PM emissions after scrubber unclear
- Research project EMERGE

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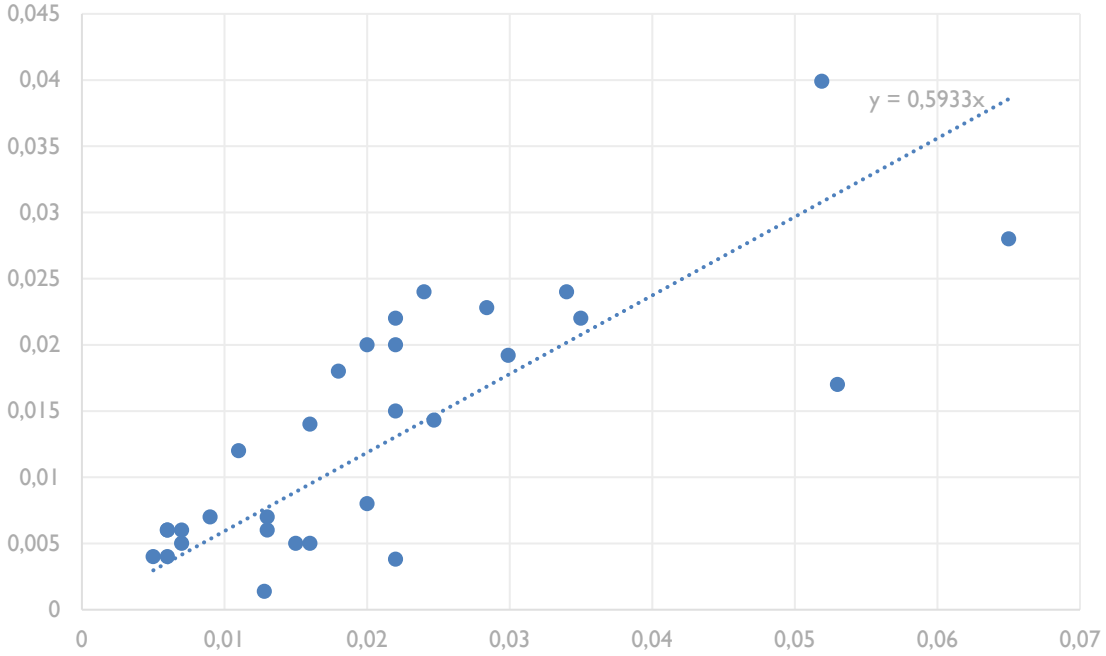
BC/EC data after vs. before scrubber (g/kWh) (literature data)



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Identified gaps, Sulphur:

- Regulations on other fuel characteristics than S-content are lacking – mixed fuels with problems with toxicity and emissions.
- Regulated limits on PM are lacking – expected reduction in PM emissions not reached.
- Regulated limits of emission of the non-volatile particulate fraction BC are lacking. – health risks and green-house effect.
- Regulations on negative side effects of EGCS are insufficient – toxic scrubber water

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Some conclusions

- Regulatory prescribed approaches to the use of remote sensing
- Sensor technology development
- Procedures to certify proper operation of abatement equipment in field conditions
- Regulate emissions of particles, ammonia and methane
- Regulate secondary effects of scrubbers
- Risk that the sulphur- and NOX-regulations will not give the expected improvements in air quality

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Thank You

Contact information
Email:
Telephone:
Website: www.scipper-project.eu

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