CSHIPP
– Clean Shipping Project Platform

By Jan Boyesen, Head of Development, MDC
May 29th 2019, Copenhagen

CSHIPP brings together transnational projects and their key actors

CSHIPP
Clean Shipping Project Platform

- 14 Partners from 7 countries (Finland, Estonia, Sweden, Norway, Poland, Germany, Denmark, Russia)
- 13 Associated Partners
- Project time: 10/2018 - 09/2020 (24 months)
- Total budget: 1.1 million €

Aim: effective use, better durability and transferability of projects' results

Priority area: Sustainable transport

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Baltic Sea Region
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

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Projects

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EnviSuM: measurement and modellng strategies: costs, health and environmental effects of ship emissions related to IMO emission regulations 2015 (BSR Interreg)

BONUS SHEBA: holistic view on environmental effects of shipping; modeling current and scenarios on shipping emissions to air and water

ECOPRODIGI: towards eco-efficiency in shipping by creating and piloting digital solutions in close cooperation with industry end-users and research organisations. (BSR Interreg)

GoLNG: Increasing adoption of LNG as a clean fuel for ships in the BSR (BSR Interreg)

BalticLines: shipping routes and energy corridors in Maritime Spatial Plans (MSP) (BSR Interreg)

BSR Electric: e-mobility solutions in urban areas in the BSR, focusing particularly on e-ferries and implementation in urban transport to reduce carbon dioxide emissions (BSR Interreg)

Smartup Accelerator: consumer cleantech ecosystems, new business models to reduce the environmental burden of consumption. (BSR Interreg)

Objectives

- ✓ Compile results of clean shipping projects
- ✓ Target groups may better use and profit from clean shipping related information
- ✓ We aim to
  - increase uptake of scientific information in **policymaking**
  - enhance co-operation between **maritime industry and academia**
  - Foster co-operation between **platform partners**

Photo: Tapio Karvonen

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Main contents

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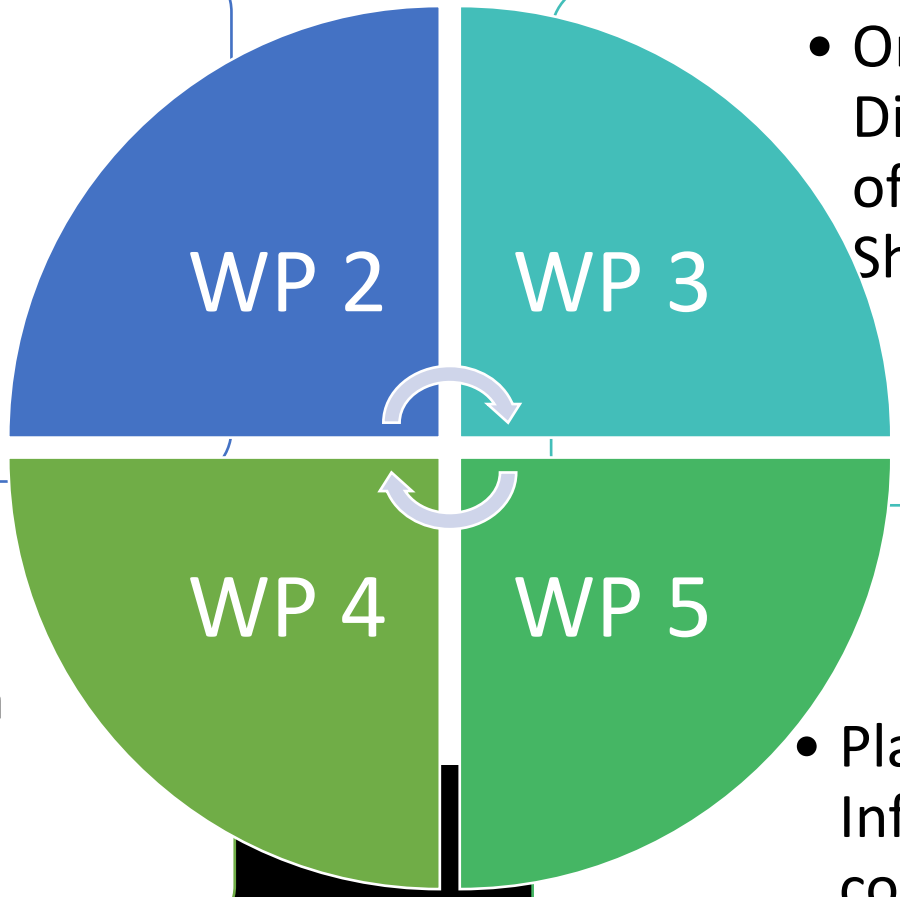
- Research-to-Policy Clean Shipping Activities



- Online Dissemination of the Clean Shipping Data

- Business Potential in New Clean Shipping Technology

- Platform Influence, communication

- Environmental effects and performance of shipping in the BSR
- Business potential of shipping in the BSR

Knowledge and information

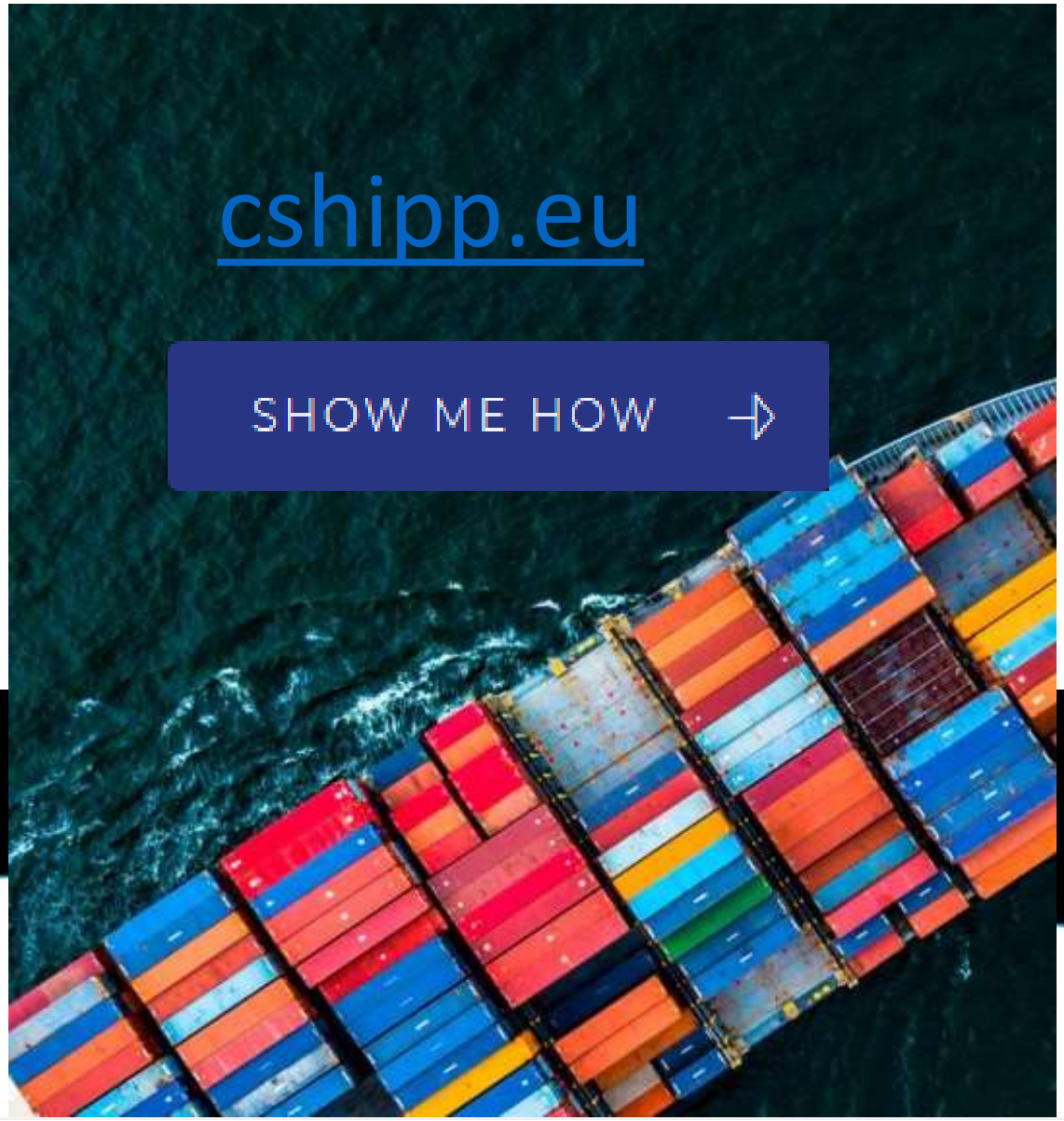
- Environmental impacts of shipping (air, water, noise) for different emission scenarios
- Report on IMO regulation compliance on BSR
- Analysis of knowledge gaps, stakeholder needs
- Best practice manual on clean shipping financing

Synthesis reports, policy briefs, best practice manuals

CSHIPP online - environmental and economic effects of clean shipping

- Clean Shipping E-platform for wider audience (story map)

- Website on effects of shipping on air and water quality:



#CSHIPP

Dialogue and co-operation

CSHIPP – workshop at BSR Interreg Programme conference, April 9-10, 2019, Lübeck

European Maritime Day 2019, Lisbon
Workshop, The green course towards decarbonization: winning the challenge was arranged by WATERBORNE, NABU, CSHIPP.

Gothenburg, September 2019

- Policy workshop in connection with GREEN TEAM meeting, September 4, in the morning (invitation-based)
- Symposium on Scenarios and Policy Options for

FIND EVENTS

- Donsö Shipping Meet, stand

cshipp.eu

Contact

Lead Partner:
University of Turku, Centre for Maritime Studies of Brahea Centre

Project manager: Riitta Pöntynen
riitta.pontynen@utu.fi

Communication manager:
Emilia Tuominen, Centrum Balticum Foundation
emilia.tuominen@centrumbalticum.org

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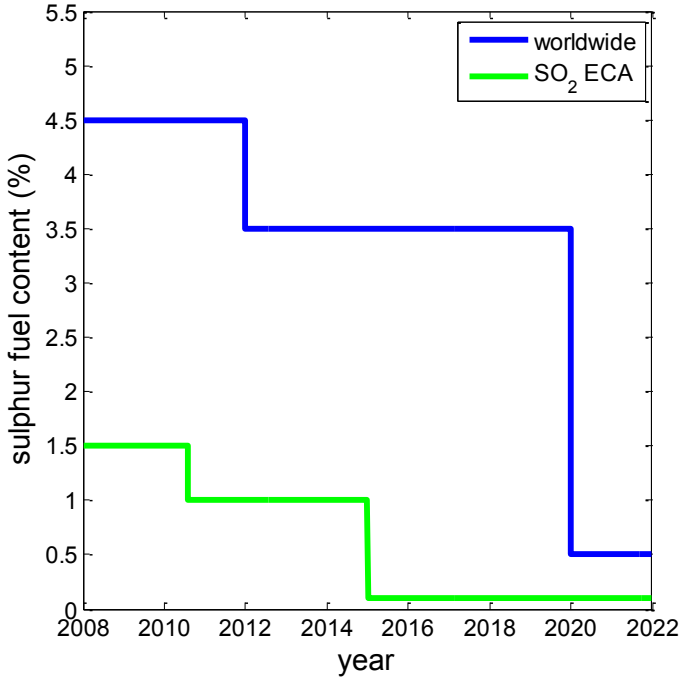
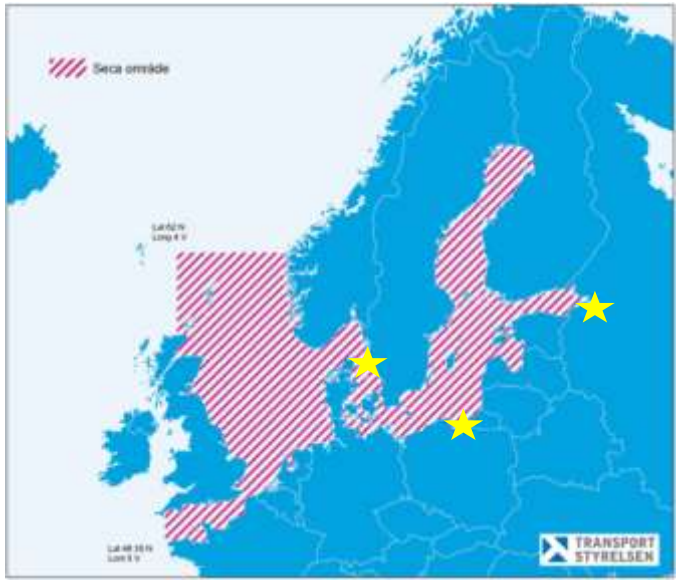
EnviSuM

Technical efficiency and socio-economic impact of the clean shipping in focus: Recommendations benefiting the environment and health, and supporting the maritime industry and economic growth

Limit of **sulfur fuel content** for ships (IMO, MARPOL Annex VI) and EU directive 2012/33/EU





Sulfur Emission Control Area (SECA)

PROJECT PARTNERSHIP

Turun yliopisto
University of Turku

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

AKADEMIA MORSKA SZCZECIN

HELCOM

TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY

UNIVERSITY OF GOTHENBURG

CHALMERS

BALTICMARINECONSULT
Planungs- und Ingenieurbüro Prof. Dr. Lüsch & Partner

City of Gothenburg

Norwegian Meteorological Institute

MDC MARITIME DEVELOPMENT CENTER

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Emission measurements
(Remote and onboard measurements)

Emission modelling of all individual ships on Baltic Sea

Air quality modelling of annual average concentration of PM and NOx

Health and environmental impact
(Extra deaths per year)

- Influence of ship emissions (SO_x, NO_x, particles) on health and air quality
- Benefits of SECA and EU sulfur directive
- Compliance measurements (SO_x, NO_x) (equal playing field)
- Studied areas
  - Full Baltic Sea
  - Gdansk/Gdynia (Poland)
  - Göteborg (Sweden)
  - Sankt Petersburg (Russia)

Is clean shipping a good business?

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EnviSuM

Conclusion

- Studies before SECA enforcement predicted dramatic impacts in BSR
- After more than 4 years of SECA the EnviSuM project revealed
  - Neither a mode change nor a significant change in BSR logistics patterns appeared
  - Logistics prices in BSR did not change due to SECA compliant fuel use
  - Most ship owners complied by using low Sulphur fuel
  - New business models appeared due to SECA rules
  - Avant-garde situation makes BSR to test lab for global ECA implementation with positive impact on innovation sector
  - SECA investment decision tool assesses abatement technology economics
- Strategic problem

  Postponement of abatement investment decisions maneuvered BSR ship owners

  Into a strategic trap in times of increasing fuel prices
- Result: Until now, SECA did not deploy economic disadvantages for BSR

EnviSuM emission measurements

Ship emission activities in Envisum by Chalmers

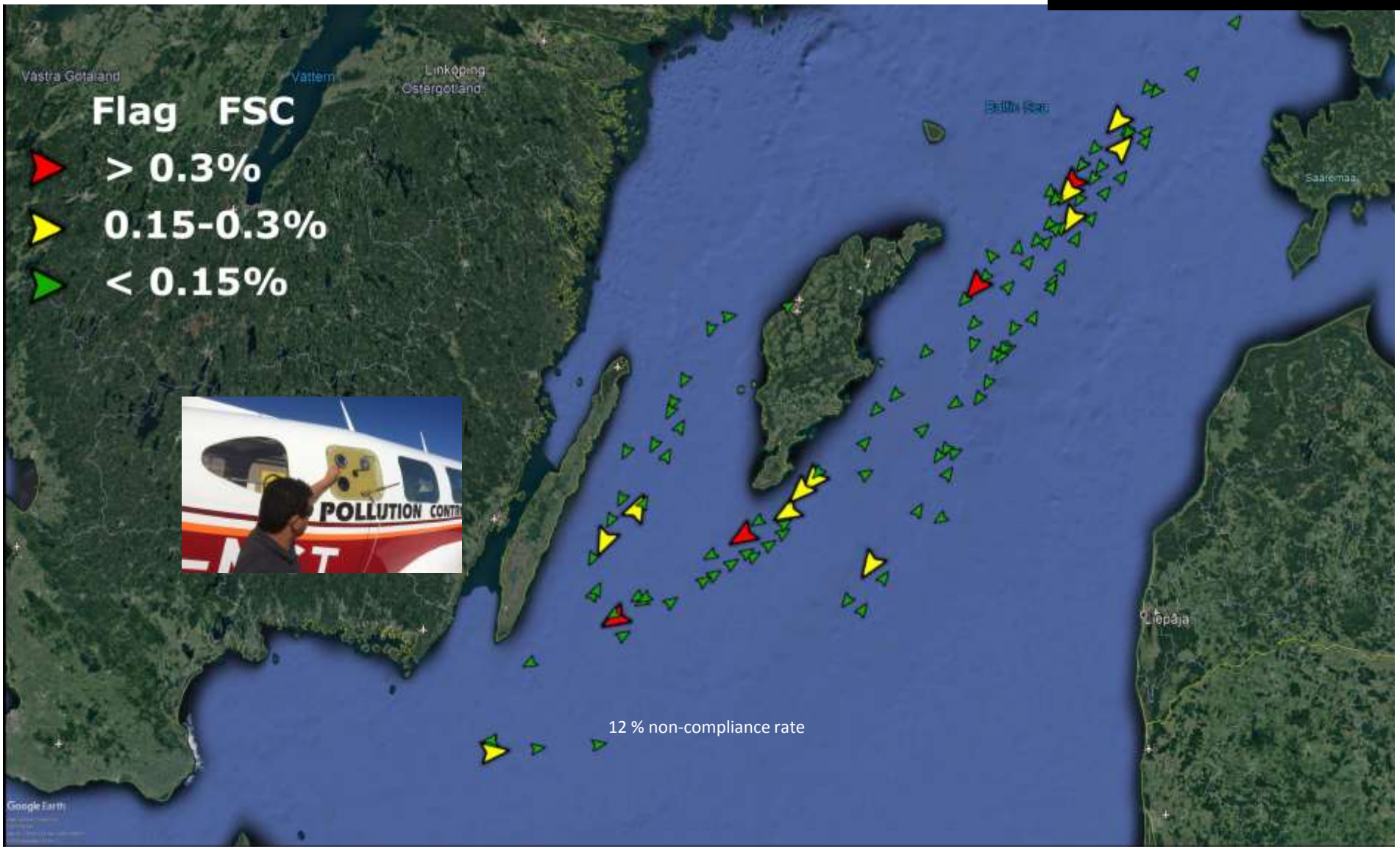
Göteborg and Great Belt , fixed measurements 2016-2018

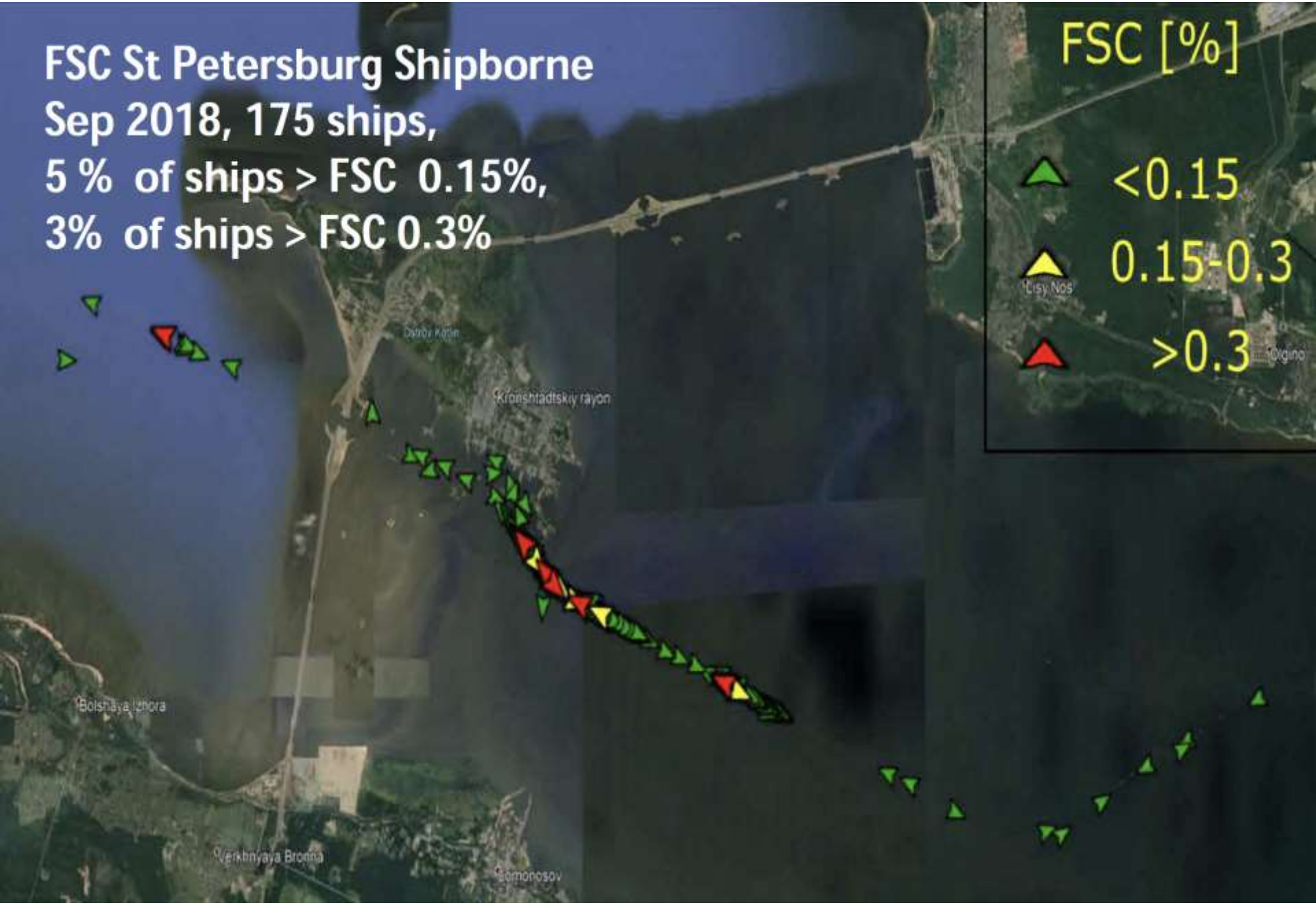
Airborne campaign midell of of Baltic sea Sep 2017

Campaign TriCity Oct 2017

Campaign Sankt Petersburg Sep 2018

Airborne measurements Baltic sea Aug 14-20 2017. Fuel sulphur content derived from the measured SO2/CO2 ratio in 116 ships




FSC St Petersburg Shipborne
Sep 2018, 175 ships,
5 % of ships > FSC 0.15%,
3% of ships > FSC 0.3%
FSC [%]
<0.15
0.15-0.3
>0.3
Kronshtadtskiy rayon
Bolshaya Izhora
Verkhnyaya Bronka
Lomonosov

Summary for Compliance monitoring of sulphur

	Time period	Non compliance	Uncertainty threshold	Ships	Project
Göteborg harbor, inlet	2014-2017	1-2%	>0.18%	~12000	Envisum, CompMon, Swedish EPA
Öresundbridge	2016-2017	1-2%	>0.18%	~150	CompMon
Great Belt bridge	2016-2017	5 %	>0.18%	~8000	Danish Epa, Envisum
Denmark, near coast	2015-2016	6-8 %	>0.2 %	~1000	Danish EPA
SECA border English Channel	Sep 2016	13 %	>0.2%	~75	CompMon
Middle Baltic Sea	Aug 2017	13 %	>0.2%	~114	EnviSum
Tri-city	Sep 2017	0 % prel	>0.18%	30	EnviSum,
Sankt Petersburg	*Oct 2018*	*5% prel*	*>0.18%*	*156*	*EnviSum*

Threshold corresponds to 95% confidence limit

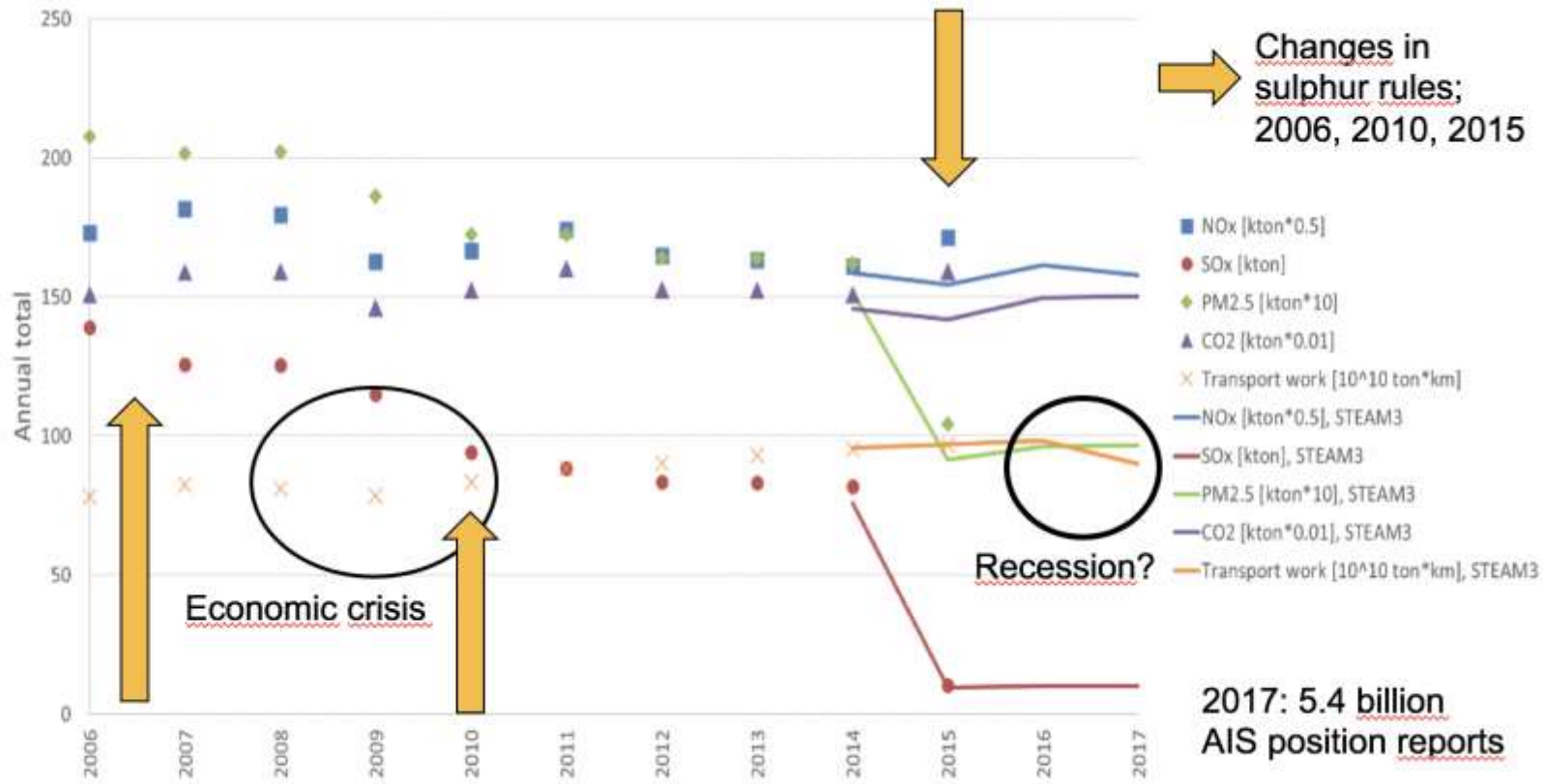
Emissions measurements

Some Findings (scientific papers in manuscript)

- SO2 Compliance generally better than 95% or better with exception at SECA border.
- Approx 2-3% of ships shows gross non compliance (>0.3%).
- Compliance rate appears to have improved between 2016 and 2018
- NO_x emission factors rather similar in all studied areas
  - highest values on the open sea
  - lowest values ships at berths.
- For NOx the STEAM model is generally higher by 10-30% than measurements (median) and shows less variability. For ships at berth overestimation 50% . MUS model shows higher variability and is higher by 30% than measurements.
- PM emission (BC) exceptionally high for service vessels (barges).
- Negative correlation of emission factor and speed
- Higher BC for auxillary engines than in operation
- Large fraction (90%) of small particles (<0.5 μm) appears to be BC

Emissions modelling

Air emissions from ships in the Baltic Sea area 2006-2017



Health effects

Morbidity (non-fatal diseases)

- In a similar way as for premature deaths, the number of extra cases due to Baltic shipping was calculated for myocardial infarction (ischemic heart disease) and stroke.

Country	Extra cases of IHD 2014	Extra cases of IHD 2016	Reduction (n)	Extra cases of stroke 2014	Extra cases of stroke 2016	Reduction (n)	Reduction (%)
Sweden	208	134	74	180	116	64	35%
Norway	13	8	5	18	11	7	39%
Denmark	210	158	52	169	127	42	25%
Finland	93	50	44	100	53	46	47%
Germany	521	379	142	465	338	127	27%
Poland	231	155	76	254	170	83	33%
Estonia	34	19	15	36	20	16	45%
Latvia	28	17	11	47	28	19	40%
Lithuania	44	29	16	58	37	21	36%
Russia*	166	91	75	228	125	103	45%
SUM/MEAN	1 548	1 039	510	1 555	1 026	528	37%

Health effects

… therefore the total number of premature deaths will also be higher in countries with large populations

Country	Premature deaths 2014	Years of life lost in 2014	Premature deaths 2016	Years of life lost in 2016	Reduction (%)
Sweden	187 – 421	1812 – 4092	120 – 272	1167 – 2635	35
Norway	12 – 28	127 – 287	8 – 17	78 – 176	39
Denmark	173 – 390	1901 – 4293	130 – 294	1431 – 3231	25
Finland	75 – 169	775 – 1750	40 – 90	414 – 935	47
Germany	471 – 1063	4940 – 11155	342 – 773	3634 – 8206	27
Poland	236 – 532	2868 – 6476	158 – 358	1922 – 4340	33
Estonia	30 – 68	346 – 781	17 – 38	191 – 431	45
Latvia	37 – 83	414 – 935	22 – 50	249 – 562	40
Lithuania	47 – 105	514 – 1161	30 – 68	330 – 745	36
Russia*	245 – 553	2977 – 6722	134 – 302	1625 – 3670	45
Sum	1511 – 3413	16674 - 37651	1001 – 2261	11041 – 24932	37

The number of years of life lost depends on a) the number of deaths and b) at what age people are assumed to die.

Two numbers are given for each country and year. They reflect two different "exposure-response" functions – that is two different estimates of the increased number of prematue deaths for 1 µg/m3 of PM2.5.

The higher number is more updated and somewhat more likely.

Health effects

Summary

- Particulate air pollution (PM) increases the risk of premature death, cardiovascular disease and lung disease.
- Shipping emissions is not the largest source, but contributes to PM.

- The EnviSuM project estimates that the Baltic Sea SECA has ”saved” annually 500 – 1000 premature deaths, 500 non-fatal myocardial infarctions, and 500 cases of stroke.
- Shipping in the Baltic Sea has the largest impact on air quality in Denmark, but the largest total impact on health in countries with larger populations.

- Global fuel sulfur reductions will cause additional health benefits, also in Norhtern Europe.

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Economic effects

- Compliance costs 550 M€, mortality benefits 625 M€, environmental benefits 145 M€
- SECA effects on transport costs only a small detail in natural market variation
- On a short term increase in incremental innovations:
  - SECA has created markets for emission abatement technologies and motivated investments
- Administrative costs negligible (annually 260 000 €) and modal shift not detected
- According to a survey, SECA improved the reputation of the area

Source: DNV GL (2017). Illustration by Nina Viesnes