EnviSuM

Environmental Impact of Low Emission Shipping: Measurements and Modelling Strategies

PA Ship Steering Group meeting

Gdansk | Nov 7, 2017

Johanna Yliskylä-Peuralahti

EnviSuM

Environmental Impact of Low Emission Shipping:
Measurements and Modelling Strategies

- Progress of the project and selected results
- Presentation video: https://youtu.be/0Q9yByQdixQ

EU STRATEGY FOR THE BALTIC SEA REGION
FLAGSHIP

Interreg
Baltic Sea Region
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
EnviSuM

Project approach

Ship emissions' present and future
- Costs
- Health effects
- Environmental effects

ASSESMENT

Addressing, assessing, testing, investigating

Measurement and modelling strategies
- Measures
- Fuels
- Abatement techniques
- Etc.

Societal impact of emission reductions
- On city scale
- On regional scale

Benefitting environment and health

Supporting maritime business and economic growth

Tested and analyzed tools and recommendations

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

EUROPEAN REGIONAL DEVELOPMENT FUND EUROPEAN UNION

EnviSuM

	Completed tasks
WP2	• On board measurements (ships with scrubbers) completed, vessels with LNG on-going • Fixed site measurements with “sniffer” • Ship and fixed site measurement campaign Gdansk/Gdynia • Flight campaign over Baltic Sea Aug 2017 • A workshop and a study visit aimed for maritime stakeholders • Analysis of measurement results on-going
WP3	• Regional air-quality modelling and reference simulations 2014-2016 • Air quality assessments in Tri-Cities and Gothenburg 2014
WP4	• Urban and regional health impact analysis on-going • Environmental impact analysis in progress • Political influencing: Video, infographics and 2 policy briefs produced
WP5	• Survey and interviews on the impacts of SECA done • Modelling for decision support tool (aimed for shipowners) in progress • Data gathered in order to analyse how SECA impacts on innovation

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM

WP 2 – Emissions and abatement strategies

WP2 Efficiency of scrubbers and related particle emissions Extensive testing will be performed upon newly installed or retrofitted scrubber systems and highlighted practical issues: system efficiency, the operational safety and reliability. The testing of the scrubber installations under real operating conditions will be performed onboard of six ships, assuming full set of engine service performance data and exhaust gas emission analysis.

Estimated number of scrubber units on board	
In Service	843
Keel laid	13
Launched	16
On order and not commenced	21
Under construction	2
Total	895

Source: IHS Maritime 2017

- SECA restrictions did not result in a dramatic increase in scrubber installations.
- Low fuel prices and high investments cost of EGCS on ships has pushed owners to low sulphur fuel oil option
- Global SOx emissions reductions in 2020 may contribute to the increased interest and cost-effectiveness of EGCS.
- The results of the surveys SR1 conducted on ships equipped with EGCS indicate a number of technical aspects requiring modification and improvement. For this reason, ship owners are not willing to give consent to continuation of such research. Even if they agree, they still reserve the right to disclose unfavourable results.

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM

Dias nummer 5

SR1 measurements
Sari Repka; 19-10-2017

WP 2 – Results on compliance with SECA regulation

- The sniffer method is fully operational – demonstrated for fixed sites and airborne measurements also in the coldest winter.
- On the English Channel 13 % of the ships were doing too early fuel switching starting at 4W when leaving the SECA .
- Around Denmark and southern Baltic and North sea there is in general good compliance rate, 96 % at great Belt bridge, 94 % from airborne.

- Some specific shipowners/lines are often encountered with high emissions (flag less important)
- Several ferry lines have been operating with malfunctioning scrubbers.
- Some cruiser lines makes long term tests with permission from non SECA flagtest.

- Enforcement is still insuffecient

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

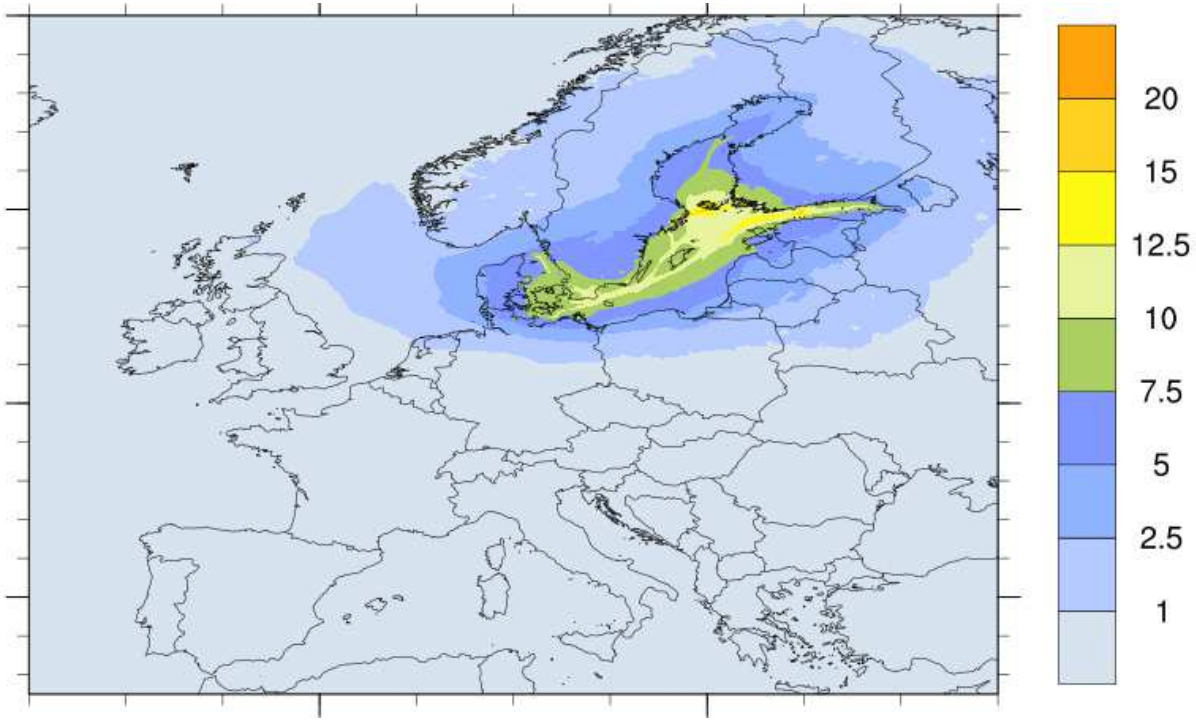
Interreg Baltic Sea Region

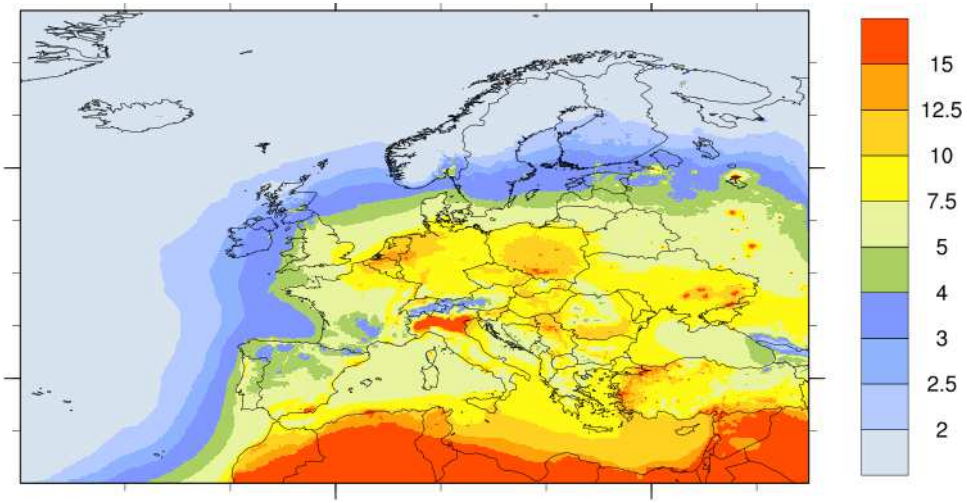
EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM

WP 3 – Air Quality and Deposition in regional scale (2014)

Model runs with 2014 emissions (Met. 2014 - 2016)
with/without Baltic Sea emissions





Percentage contribution from the Baltic Sea, PM2.5

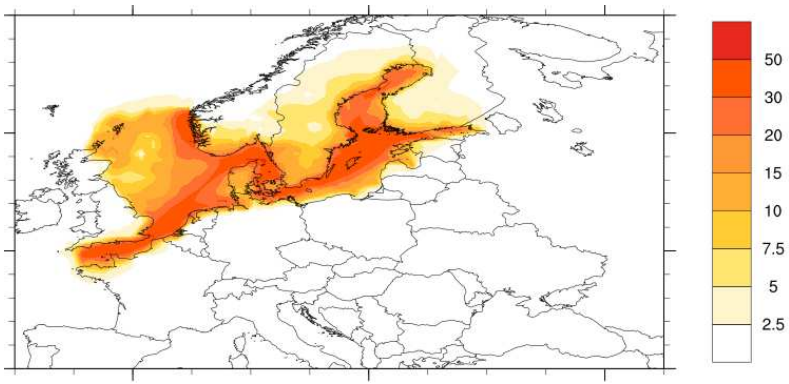
EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

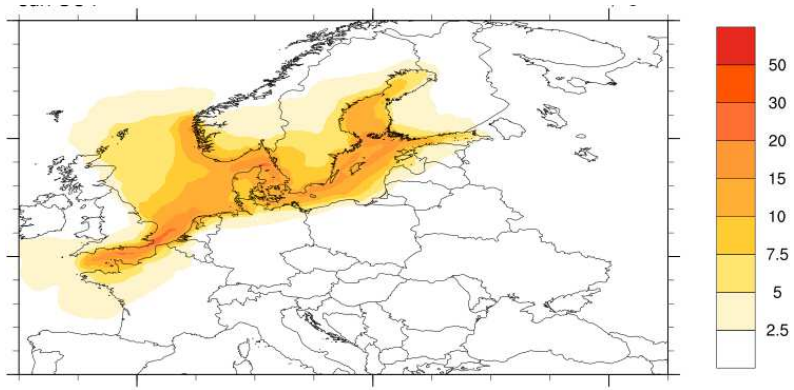
EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM

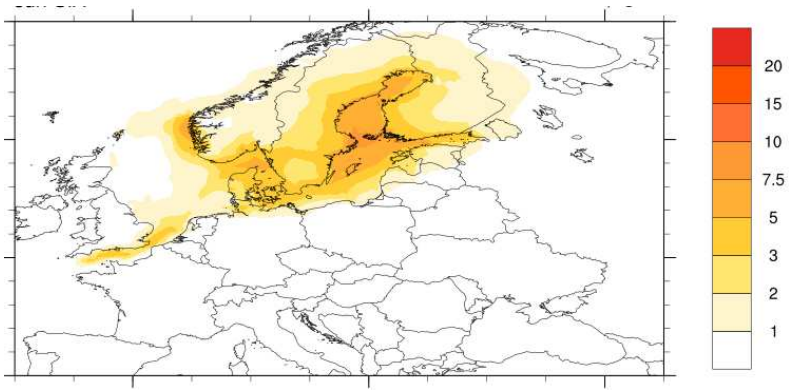
WP 3 – Air pollution avoided (2015)



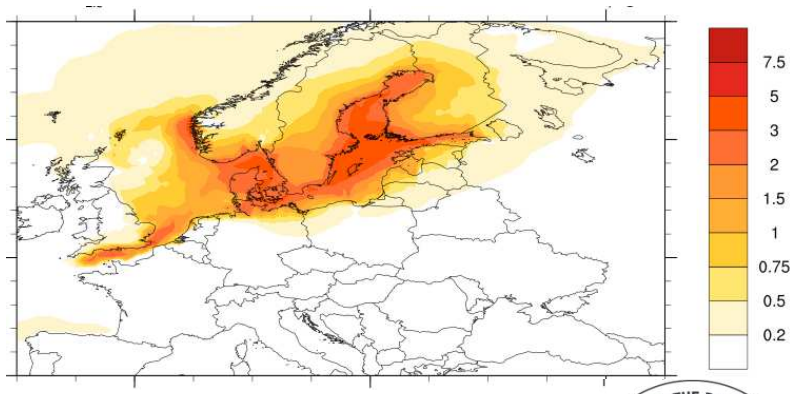
SO_2



SO_4



SIA



PM2.5

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

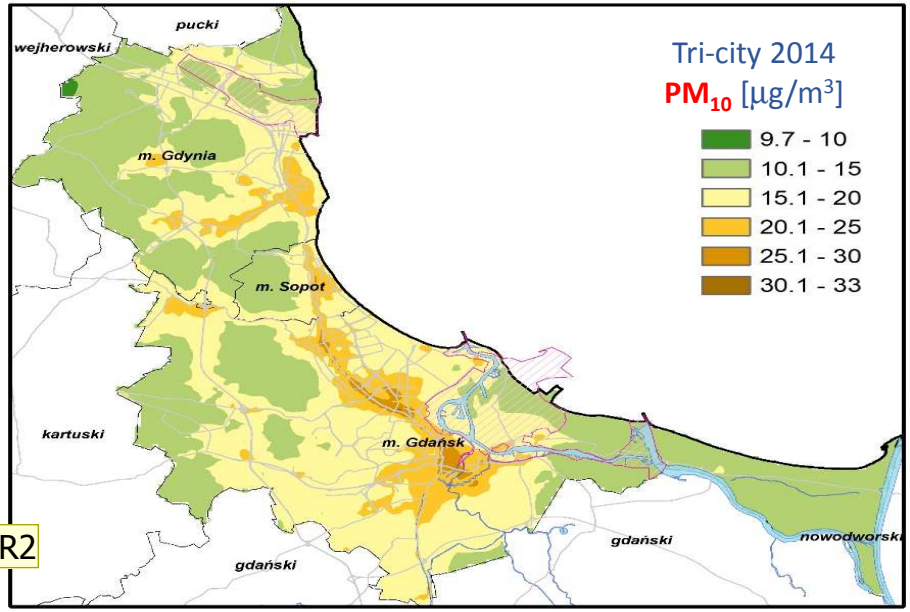
EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

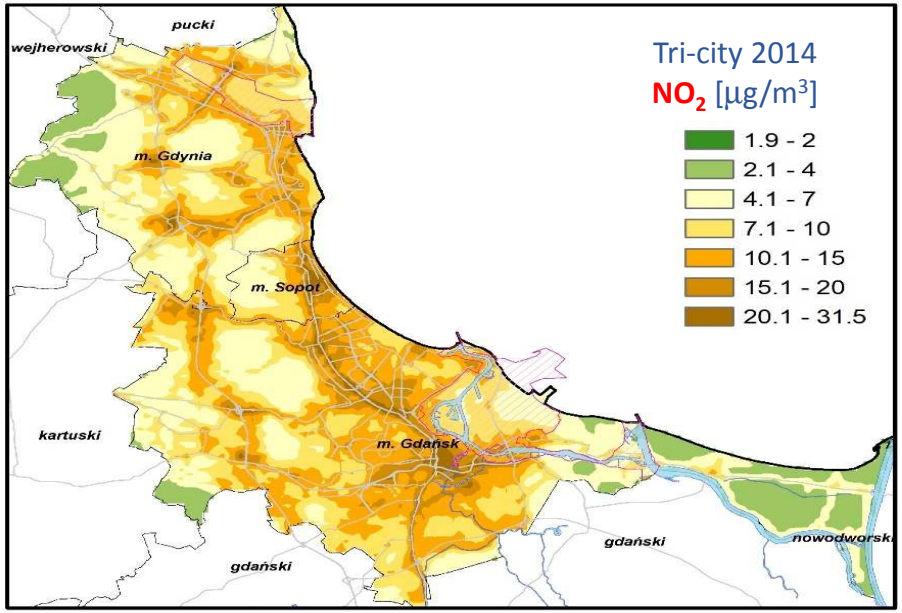
EnviSuM

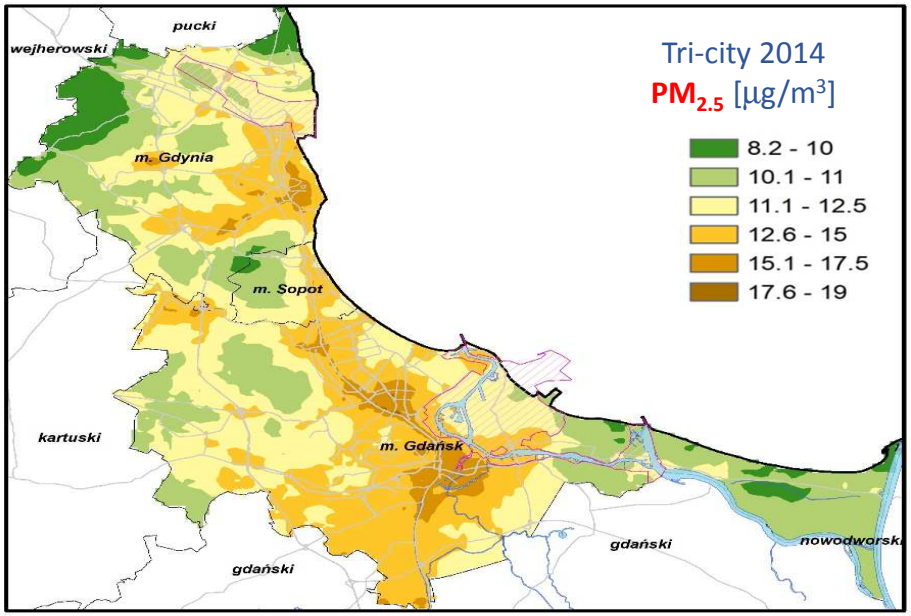
Local model calculation results

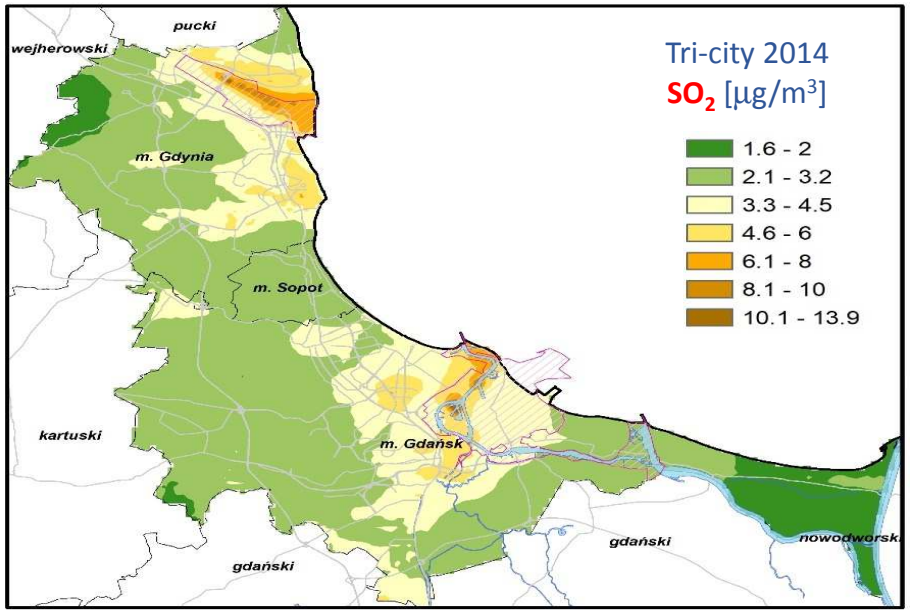
Tri-City pollutant total concentrations

SR2







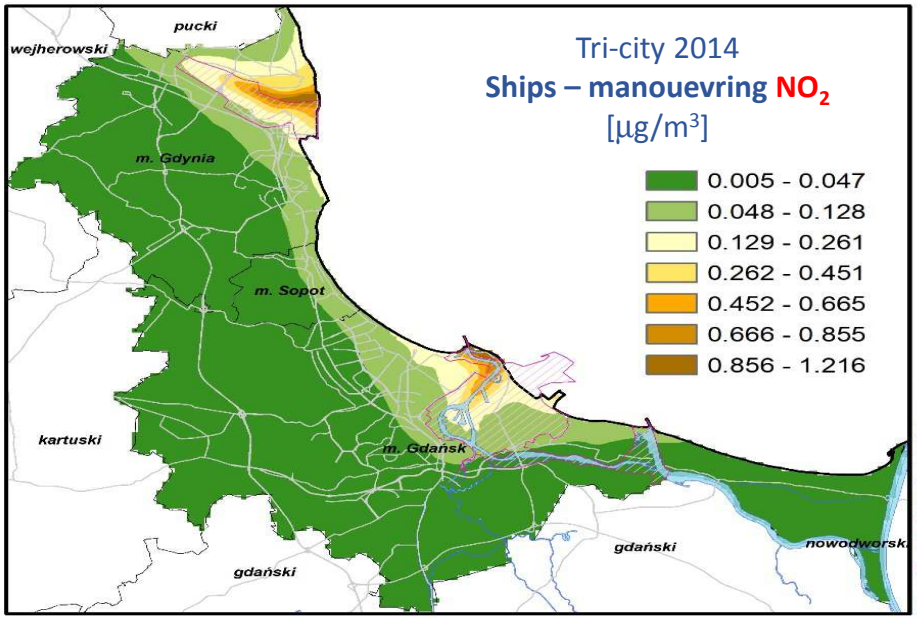


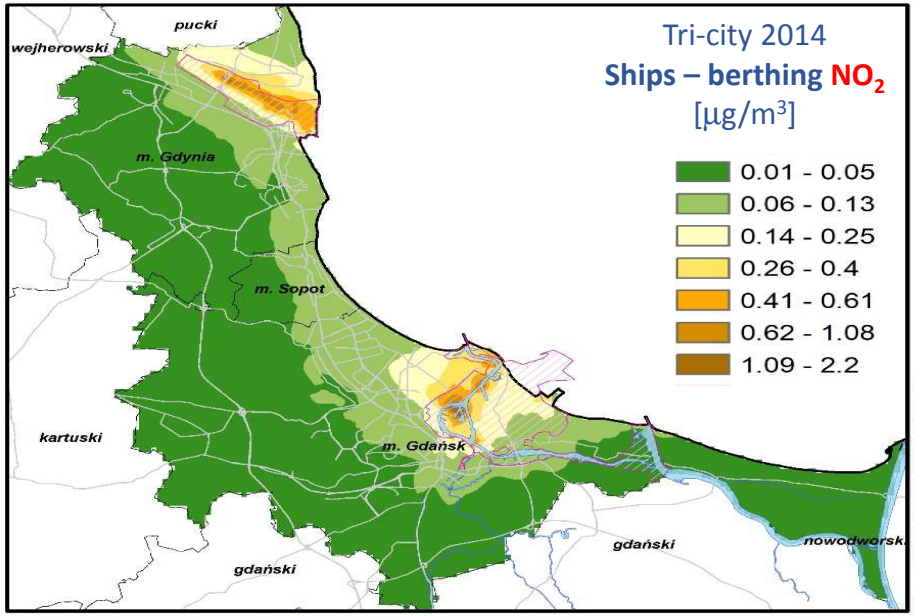
Dias nummer 9

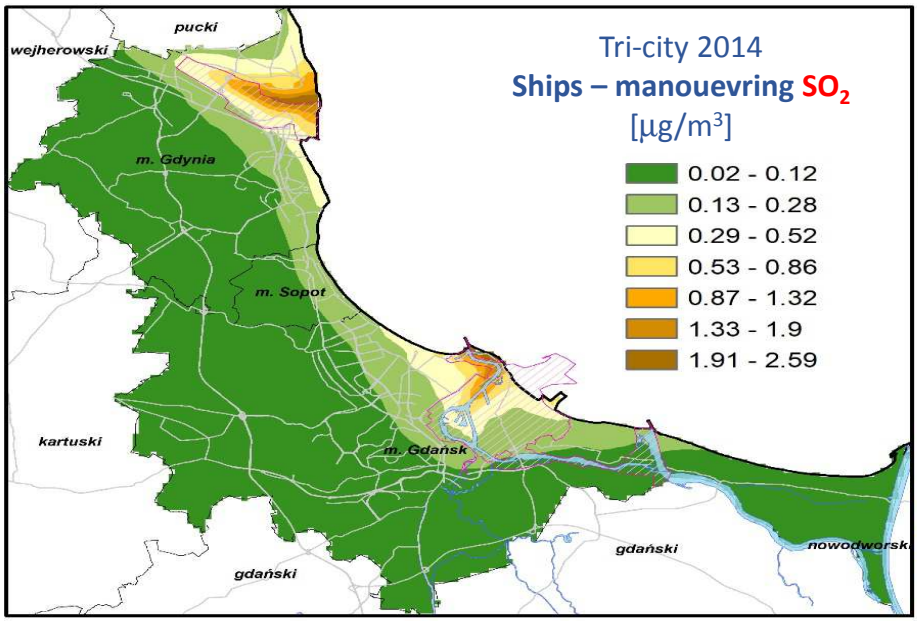
SR2 Näissä voisi sanoa että ensimmäinen kerta Puolassa kun tehdään emission inventory in ports. Sanallinen siis riittää
Sari Repka; 19-10-2017

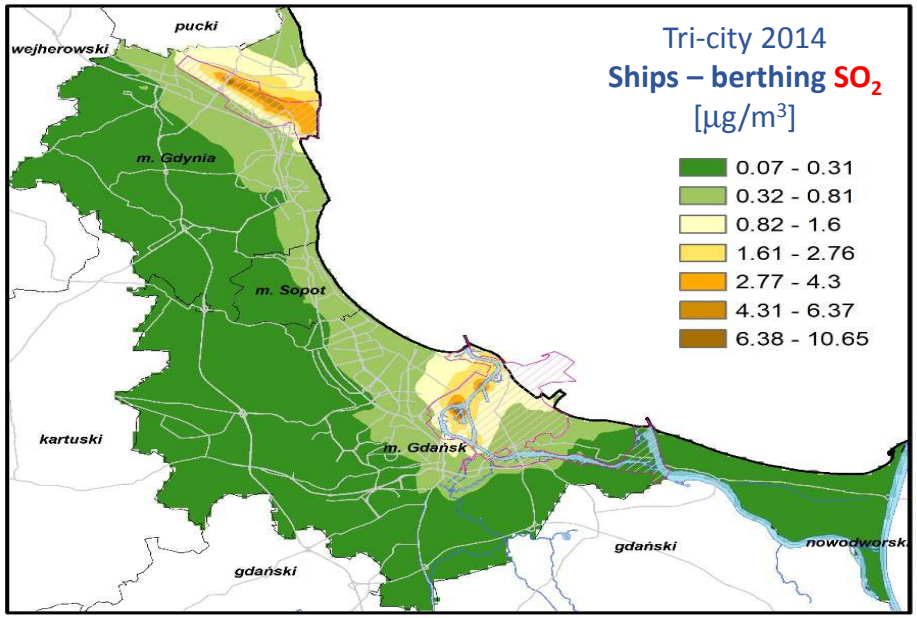
Local model calculation results

Tri-City pollutant concentrations resulted from port operation









WP 4 – Social and Political Impact

- Health impact calculations still ongoing but are expected to be significant
- Environmental impacts will concentrate on SOx, NOx and ozone
- Even though emissions have been decreasing, critical loads for acidification are exceeded around the Baltic Sea and the North Sea
- Critical loads for eutrophication are exceeded throughout most of Europe, including most of the land areas around the Baltic and the North Sea
- Ozone affects plants in several ways negatively, a commonly-used threshold for calculating effective dose is 40 ppb

WP 5 – Economic Impacts of SECA

- Low bunker prices alleviated economic costs of SECA
- BSR is in forefront of clean shipping campaigns, but

- Some maritime companies are struggling with the consequences of change in maritime fuel
- Traditional fuel companies will not be able to cope with the decreasing demand for HFO because their major product will no longer be marketable

- The economic effects of SECA are spread unevenly

- Negative consequences on regional growth and cohesion on smaller regions where jobs and income is closely dependent on maritime companies and/or their cargo-owner industries

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

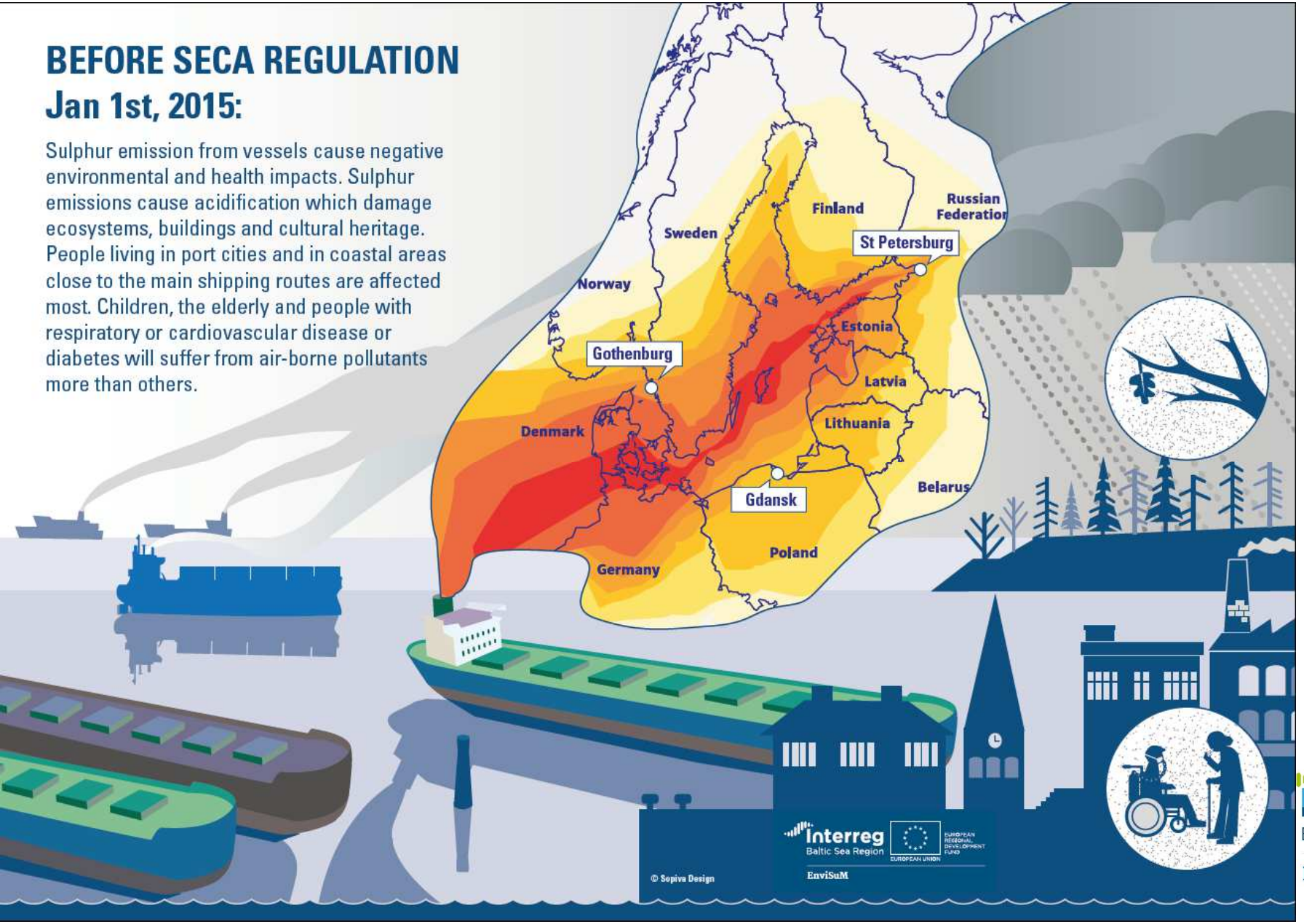
Interreg Baltic Sea Region

EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM

BEFORE SECA REGULATION
Jan 1st, 2015:

Sulphur emission from vessels cause negative environmental and health impacts. Sulphur emissions cause acidification which damage ecosystems, buildings and cultural heritage. People living in port cities and in coastal areas close to the main shipping routes are affected most. Children, the elderly and people with respiratory or cardiovascular disease or diabetes will suffer from air-borne pollutants more than others.



EU STRATEGY FOR THE BALTIC SEA REGION
FLAGSHIP

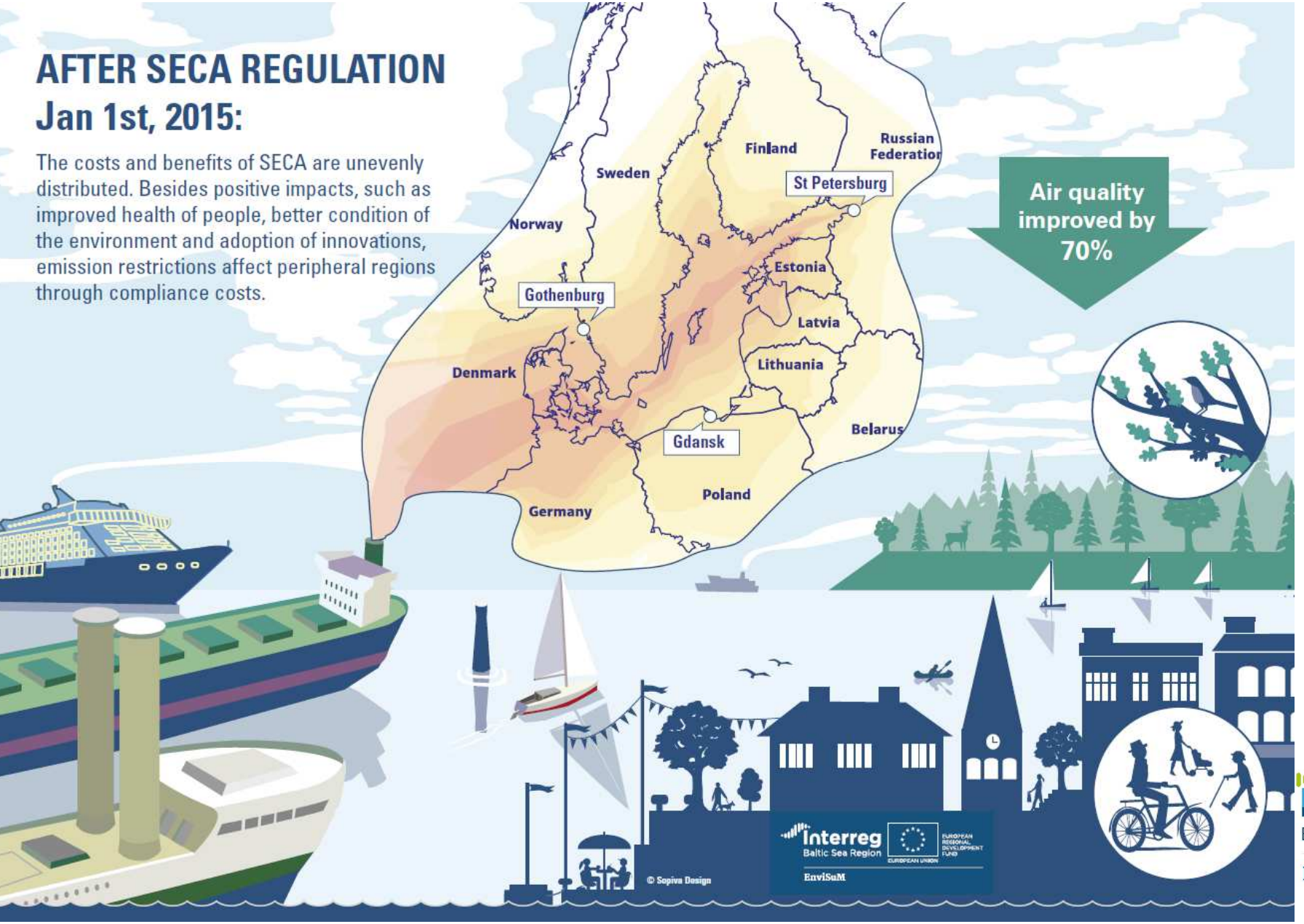
Interreg
Baltic Sea Region

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM

AFTER SECA REGULATION
Jan 1st, 2015:

The costs and benefits of SECA are unevenly distributed. Besides positive impacts, such as improved health of people, better condition of the environment and adoption of innovations, emission restrictions affect peripheral regions through compliance costs.



EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM

FURTHER INFORMATION

Project Manager, PhD Sari Repka
Project Manager
University of Turku, Finland
Tel. +358-40-8019206
E-mail: sari.repka@utu.fi

Johanna Yliskylä-Peuralahti
Ph.D, Project Manager
University of Turku, Finland
mobile:+358-40-154 5936
e-mail: joylpe@utu.fi
http://mkk.utu.fi/en/

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM

PROJECT PARTNERSHIP

Turun yliopisto
University of Turku

ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

HELCOM

CHALMERS

TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY

AKADEMIA MORSKA SZCZECIN

Maritime Development Center of Europe

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

UNIVERSITY OF GOTHENBURG

Norwegian Meteorological Institute

Nordkalk

City of Gothenburg

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

EnviSuM