Meeli Roose, Tua Nylén, Harri Tolvanen and Anne Erkkilä-Välimäki

Output O.T3.2 Map visualisations of Plan4Blue MSP case studies

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ABSTRACT

Title: Map visualisations of Plan4Blue MSP case studies

Author(s): Tua Nylén, Harri Tolvanen, Anne Erkkilä-Välimäki, Meeli Roose

Abstract:

This output contains collection of maps visualising selected two Plan4Blue MSP options: Natura 200 and shipping. The set of maps and used data represent examples of a spatial data utilisation in a cross-border MSP.

The document should be sited as follows:

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CONTENTS

BACKGROUND

Plan4Blue maritime spatial planning cases aim to outline and map the marine space contemporary and potential requirements related to expected developments of sea area use. Maps are presenting case related human sea use pressures to environment and interaction analysis examples.

To account for the impact of current human activities and the potential changes in those activities on the Natura 2000 conservation objectives, MSP would benefit from spatial analysis methodology A preliminary examination of spatial data of the Plan4Blue project area (parts of Gulf of Finland and Archipelago Sea in Finland and Estonia) indicated that existing data may be insufficient for explicitly analysing the spatial interactions of human activities and the nature. Moreover, the final analyses should be carefully coordinated by spatial planning authorities to meet the particular needs of the national MSP process. However, the methodological principles and illustrative results are reported here. The analysis should consider following principles:

- Consider each Natura 2000 site as a unique unit with different conservation objectives and different forms of interactions with human activities
- Be based on appropriate spatial data and analysis methods, evaluated according to scientific standards
- Consider the impacts of human activities on Natura 2000 conservation objectives not only inside the Natura 2000 sites but also from outside

We propose that the analysis consists of following steps:
1. Identifying the key conservation objectives (protected species and natural habitat types) of each Natura 2000 site
2. Identifying the critical human activities that have important interactions with the key conservation objectives (step 1) and the interaction processes
3. Identifying appropriate spatial data of the key conservation objectives (step 1) and the critical human activities (step 2)
4. Identifying appropriate geospatial analysis methods for quantifying the interaction processes (step 2)
5. Performing, documenting and reporting the analysis and visualising the results on maps
6. "Weighting" the spatial results of human-nature-interactions based on different criteria, e.g. rareness of a species or natural habitat type
7. Combining the analyses of individual Natura 2000 sites into a cumulative impact surface
8. Transforming the analysis results into spatial recommendations: "implications of the interaction between human activities and conservation objectives in the Natura 2000 site"

When evaluating the influence of a human activity on Natura 2000, MSP should consider the entire site network. In other words, steps 1–6 should be repeated individually for all marine Natura 2000 sites and the results combined to produce a cumulative impact surface (step 7). This procedure ensures that both the individual characteristics of the Natura 2000 sites and the entire site network are taken into account.

Illustrative results of human-nature-interaction analyses are given in section 4.3 (for three example sites to illustrate the methodology more clearly). For each of the three exemplary Natura 2000 sites, one key natural habitat type and one critical human activity (shipping in all examples) were selected. In each case, the propagation of ship-induced disturbance was analysed using simple visibility analysis. The analysis identified the source areas of ship-induced waves and other disturbances for the Natura 2000 site. Moreover, the analyses weighted the impact of different parts of the source area based on the shipping density (based on AIS data from 2016 available via HELCOM data portal) and distance to the Natura 2000 site. The weighted impact was translated into spatial recommendations by subjectively classifying the marine area into three classes: 1. no conflicts regarding the examined Natura 2000 site (outside way source area), 2. increased shipping not recommended (distant parts of the wave source area and/or areas with low shipping density) and 3. shipping requires special attention (wave source areas close or inside the Natura 2000 site and with high shipping density) (Lusenius et al. 2019).

The Gulf of Finland sea area is characterized by sensitive environment, heavy maritime traffic and the multi-use of marine space. According to IMO, the Baltic Sea Area has some of the densest maritime traffic in the world.

This set of maps for shipping case is intended to present maritime transport case (Haanpää et al. 2019) core activities on the sea and related pressures. Accordingly, following example layout themes are selected to present current maritime transport status of the Plan4Blue project area in 2019:

- oil spills, shipping routes, economic zone and territorial water (Figure 2)
- oil spills, shipping routes and environmental damage unit (Figure 3)
- beach litter, shipping routes and nature protection areas (Figure 4)
- maritime traffic (commercial shipping and recreational boating) and environmental vulnerability profile (Figure 5)
- noise pollution and shipping routes (Figure 6)
- commercial shipping and fishing routes (Figure 7)
- commercial shipping and fishing routes overlap areas and accidents (Figure 8)

NATURA 2000 CASE

This chapter reviews the limitations set for human activities by the Natura 2000 designation in three Natura 2000 sites located in Estonia and Finland.
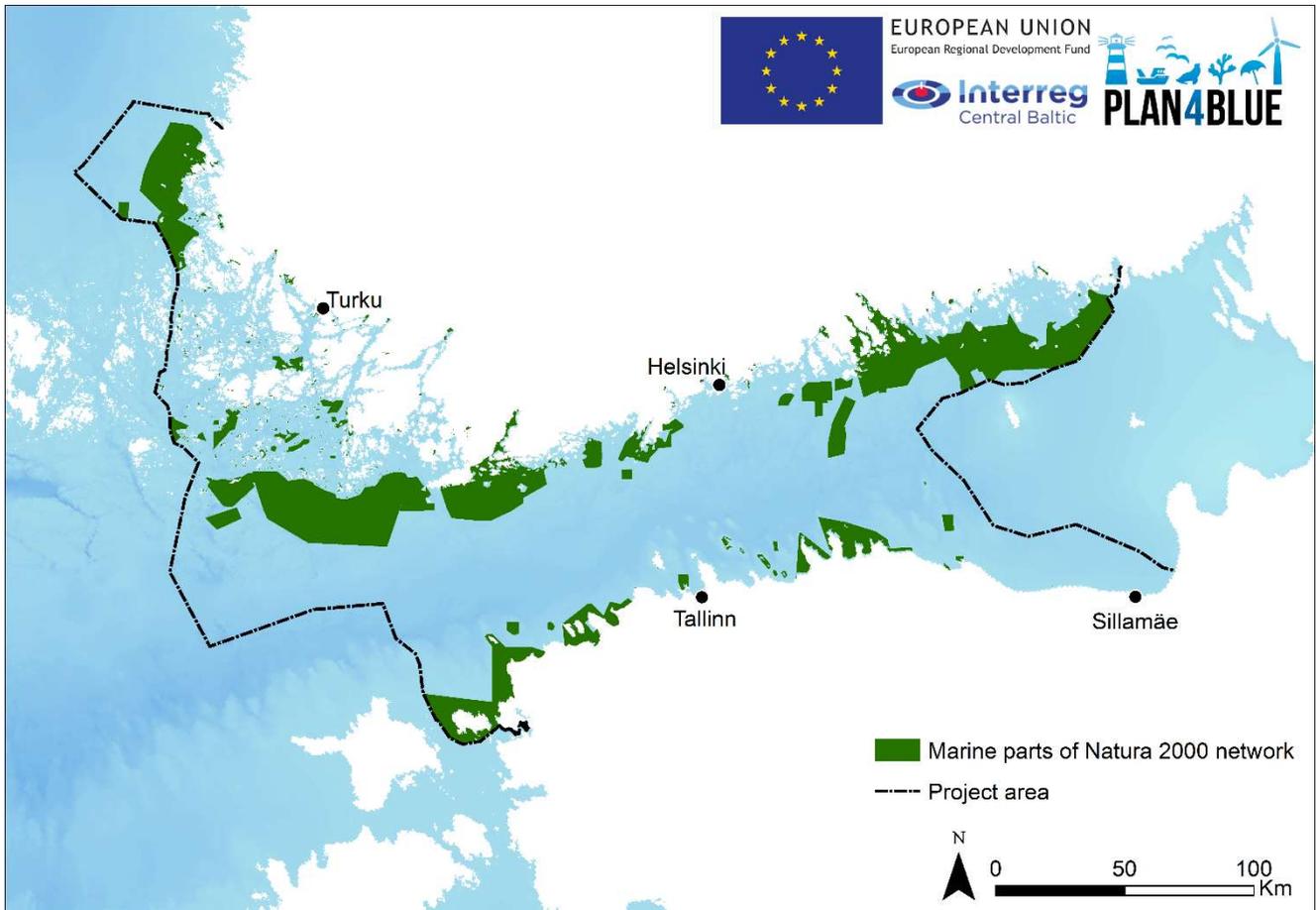
Figure 1. Marine parts of the Natura 2000 network within the Plan4Blue project area, in parts of the Gulf of Finland and the Archipelago Sea. Natura 2000 sites cover 20 % of the marine project area.
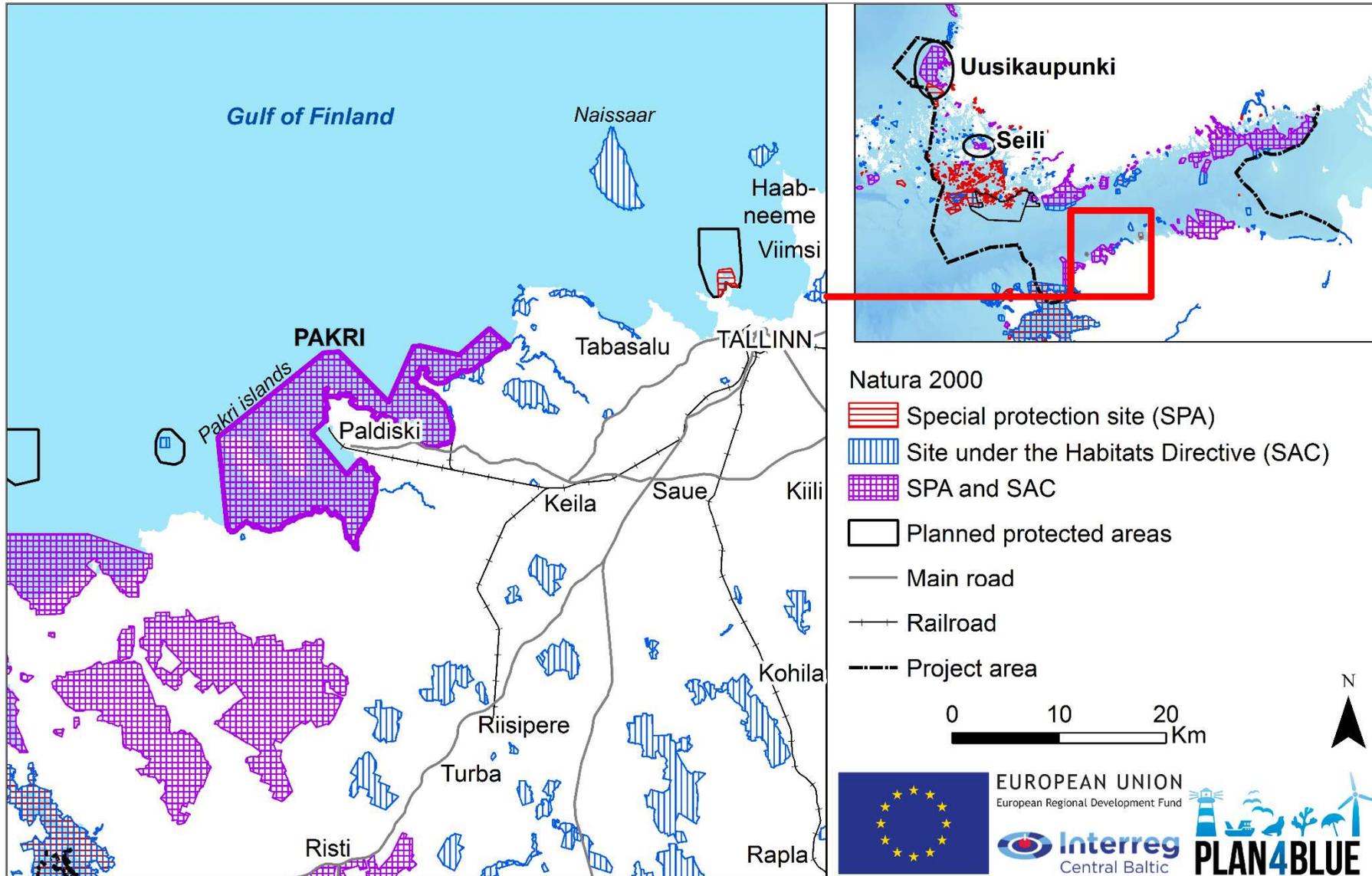
Pakri, Estonia

Figure 2. The "Pakri" Natura 2000 site at the coast of Paldiski, Estonia (Data: European Environment Agency 2017, Estonian Environment Agency 2018, Estonian Environment Agency 2018 and Estonian Land Board 2018)

WORK FLOW FOR ANALYSING THE INTERACTION BETWEEN NATURA 2000 CONSERVATION CRITERION AND KEY MARINE ACTIVITY

1. Determining the distribution of a conserved nature value: submerged sandbanks (1110)

2. Determining a key interaction with marine activities: shipping-induced disturbance

3. Determining the distribution of the selected marine activity: shipping

Pakri Natura 2000 site
Sandy seabed
Sandy soils

0   25   50 Km

N

Data: Estonian soil map,
BALANCE Marine landscapes
(Estonian Land Board 2001, BALANCE 2008)
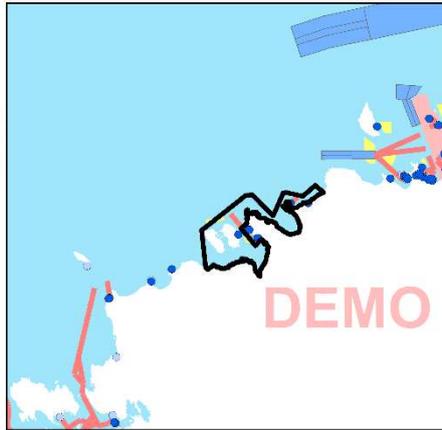
• Registered port
○ Harbour
— Recommended track
Deep water navigation areas
Inshore traffic zone
Anchorage area

Data: HELCOM,
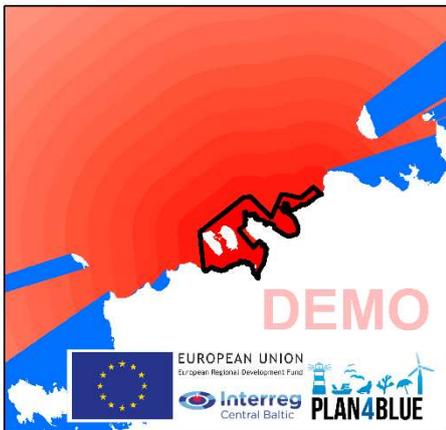Republic of Estonia Maritime Administration
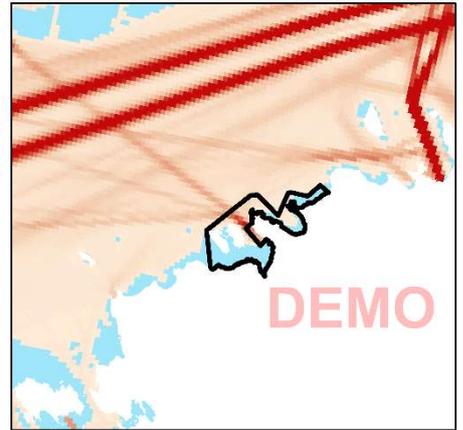
Shipping density 2016
High : 11626
Low : 0

Data: HELCOM AIS database
(HELCOM 2017; density of IMO registered ships passing each 1 km2 grid cell in 2016)

4. Modelling the spatial characteristics of the interaction: wave source areas

5. Identifying current conflict areas: high shipping density near the Natura site

6. Deriving recommendations for shipping in the vicinity of the Natura 2000 site

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Wave source areas for Pakri site
Outside source area
Source area
Closeness to Pakri site
High : 1
Low : 0
Analysis: Simple visibility analysis,
not accounting for wave refraction caused by
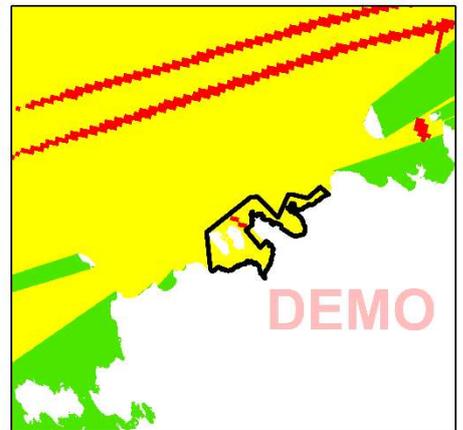bathymetry and shoreline geometry

Potential intensity of conflicts with Pakri site
High : 0.7
Low : 0.0
Distance zones

Analysis: Rescaled distance *
rescaled shipping density,
clipped with wave source area

Recommendations for shipping in the
vicinity of the Pakri Natura 2000 site
No conflicts regarding Pakri site
Increased shipping not recommended
Shipping requires special attention

Analysis: Subjectively reclassified wave
source area and negative interaction intensity

Figure 3. Exemplary work flow for analysing the interaction between a key conservation objective in the Pakri Natura 2000 site and a critical human activity. Data and analysis methods are indicated in the figure.
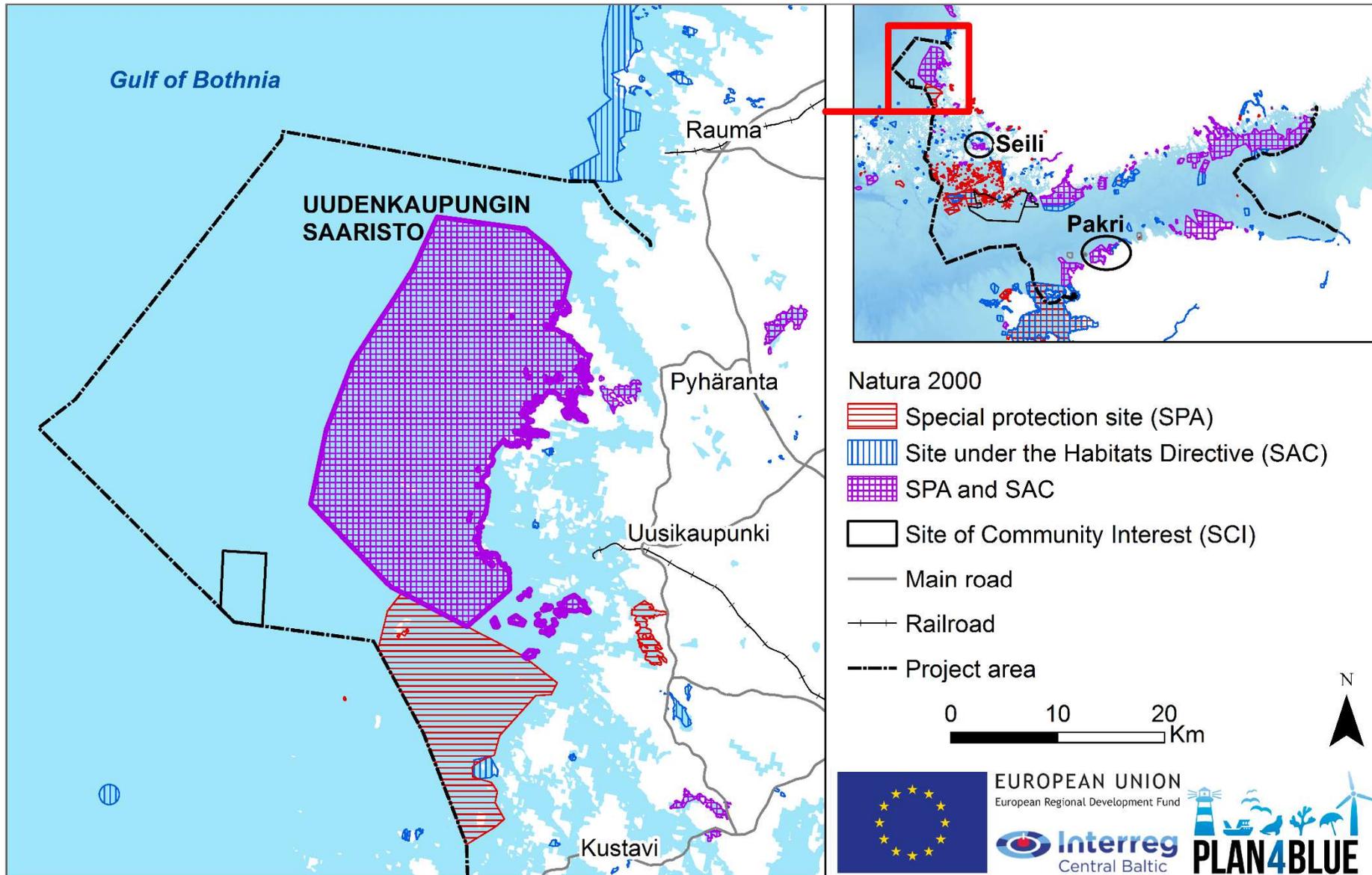
Archipelago of Uusikaupunki, Finland

Figure 4. The Uudenkaupungin saaristo (Archipelago of Uusikaupunki) Natura 2000 site at the coast of Uusikaupunki and Pyhäranta, Finland (Data: European Environment Agency 2017, Estonian Environment Agency 2018, Finnish Environment Institute 2018 and National Land Survey of Finland 2018)

WORK FLOW FOR ANALYSING THE INTERACTION BETWEEN NATURA 2000 CONSERVATION CRITERION AND KEY MARINE ACTIVITY
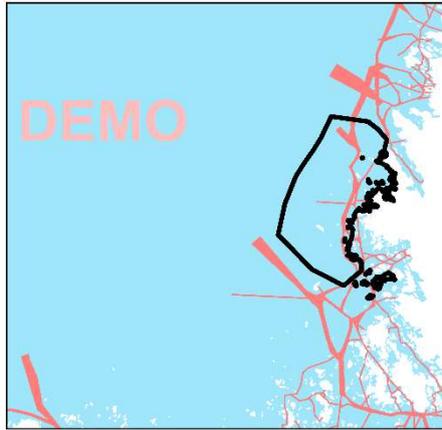
1. Determining the distribution of a conserved nature value: reefs (1170)
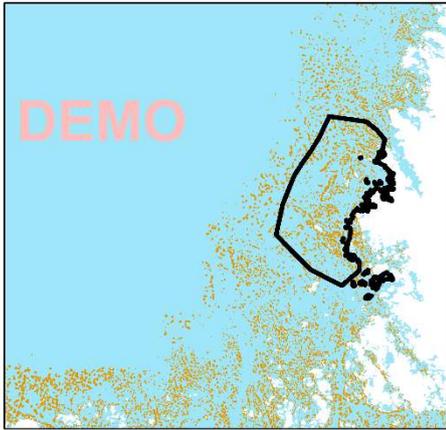
☐ Uudenkaupungin saaristo Natura 2000
■ Modelled potential reef habitat (1170)

Data: Marine habitat types
(Geological Survey of Finland 2015;
non-validated modelling results)

2. Determining a key interaction with marine activities: shipping-induced disturbance
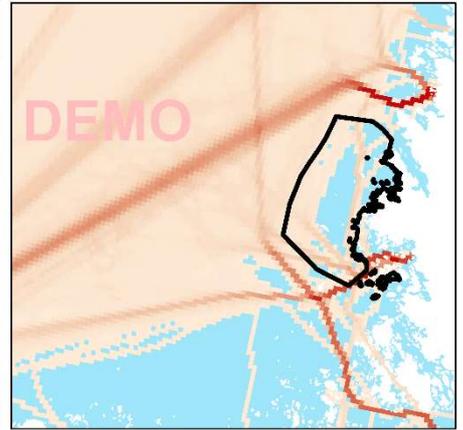
■ Fairway area

0   25   50
━━━━━━━━━ Km

N

Data: Maritime transport database
(Finnish Transport Agency 2017;
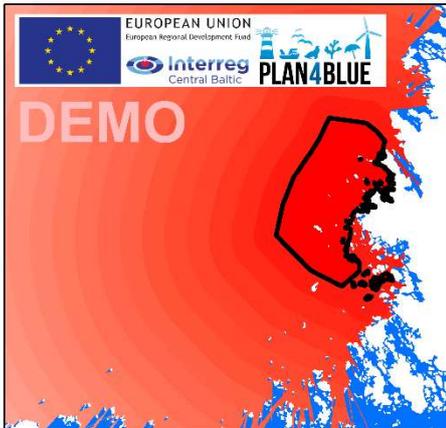official fairways)

3. Determining the distribution of the selected marine activity: shipping

Shipping density 2016
■ High : 7504
  Low : 0

Data: HELCOM AIS database
(HELCOM 2017; density of IMO registered
ships passing each 1 km2 grid cell in 2016)

4. Modelling the spatial characteristics of the interaction: wave source areas

Wave source areas for Uusikaupunki site
■ Outside source area
■ Source area
Closeness to Uusikaupunki site
■ High : 1
  Low : 0

Analysis: Simple visibility analysis,
not accounting for wave refraction caused by
bathymetry and shoreline geometry

5. Identifying current conflict areas: high shipping density near the Natura site

Potential intensity of conflicts
■ High : 0.3
  Low : 0.0

☐ Distance zones

Analysis: Rescaled distance *
rescaled shipping density,
clipped with wave source area

6. Deriving recommendations for shipping in the vicinity of the Natura 2000 site

Recommendations for shipping in the vicinity of
the Uudenkaupungin saaristo Natura 2000 site

■ No conflicts regarding Uusikaupunki site
■ Increased shipping not recommended
■ Shipping requires special attention

Analysis: Subjectively reclassified wave
source area and negative interaction intensity

Figure 5. Exemplary work flow for analysing the interaction between a key conservation objective in the Uudenkaupungin saaristo Natura 2000 site and a critical human activity. Data and analysis methods are indicated in the figure.

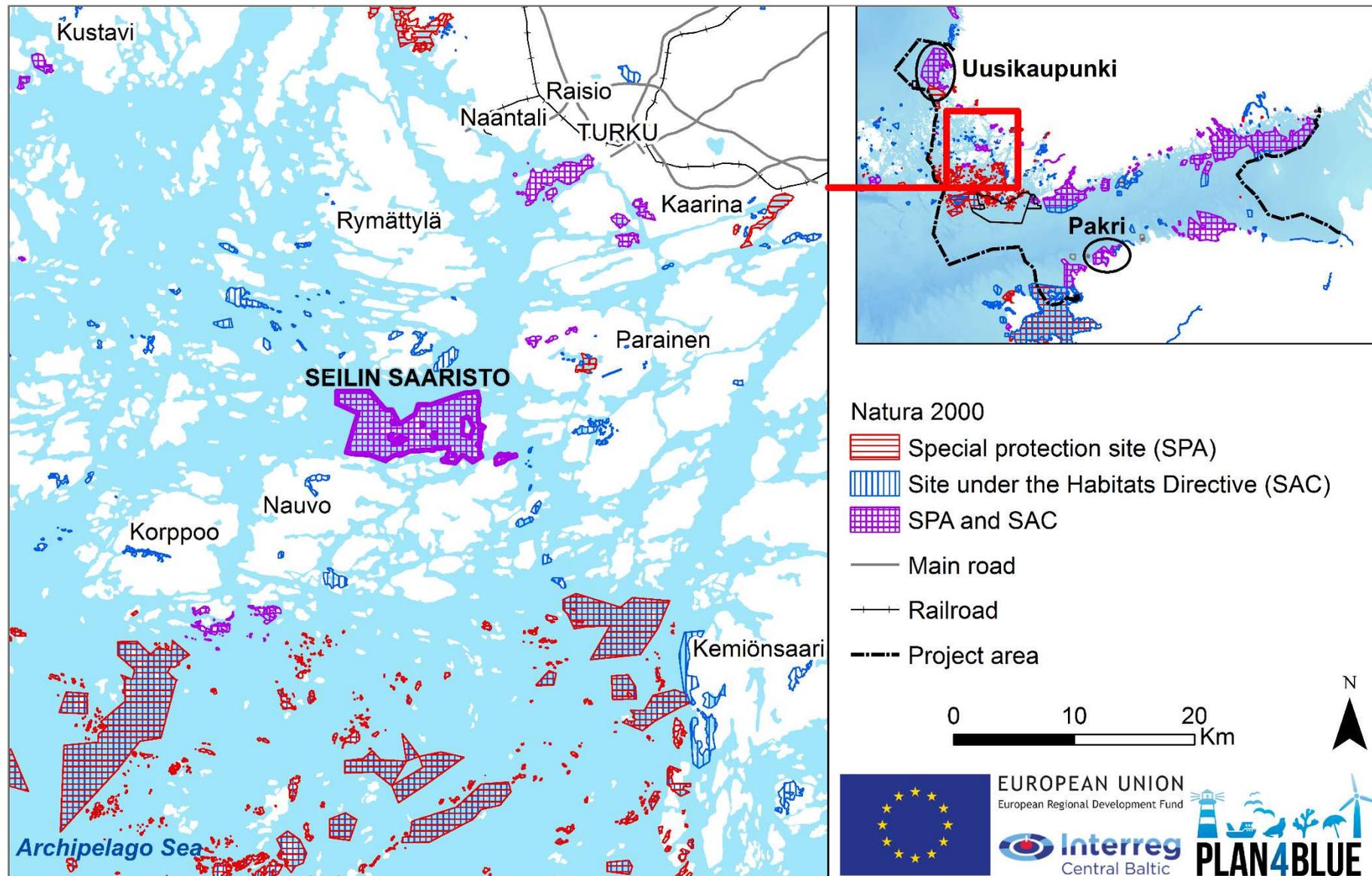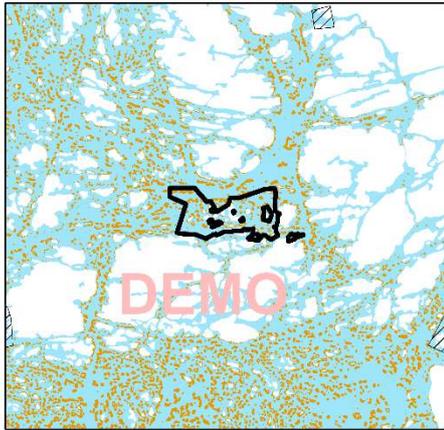## Seilin saaristo (Archipelago of Seili), Finland

Figure 6. The Seilin saaristo (Archipelago of Seili) Natura 2000 site at the coast of Turku, Finland (Data: Euro-pean Environment Agency 2017, Estonian Environment Agency 2018, Finnish Environment Institute 2018 and National Land Survey of Finland 2018).
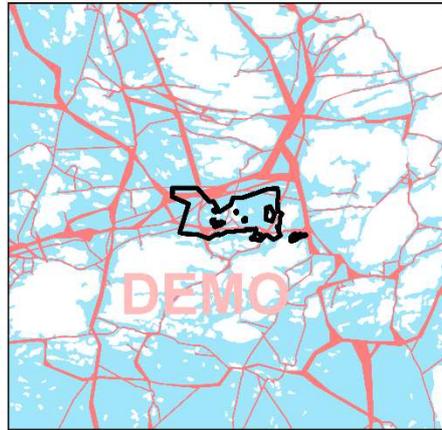
WORK FLOW FOR ANALYSING THE INTERACTION BETWEEN NATURA 2000 CONSERVATION CRITERION AND KEY MARINE ACTIVITY

1. Determining the distribution of a conserved nature value: reefs (1170)

☐ Seilin saaristo Natura 2000 site
🟧 Modelled potential reef habitat (1170)
▨ Military area, excluded from analysis

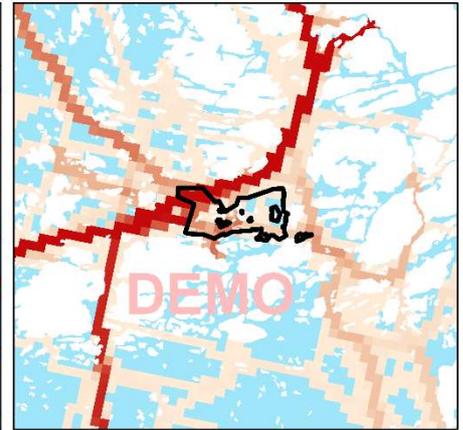Data: Marine habitat types (Geological Survey of Finland 2015; non-validated modelling results)

2. Determining a key interaction with marine activities: shipping-induced disturbance
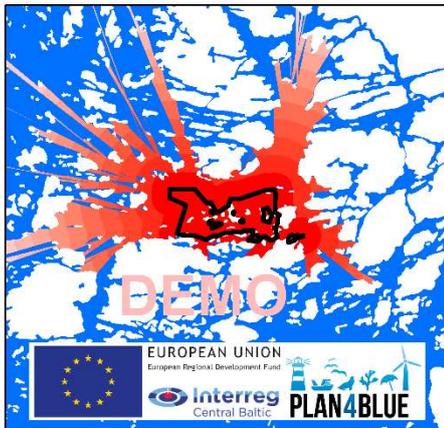
🟥 Fairway area

0 10 20 Km

N

Data: Maritime transport database (Finnish Transport Agency 2017; official fairways)

3. Determining the distribution of the selected marine activity: shipping

Shipping density 2016
High : 7147
Low : 0

Data: HELCOM AIS database (HELCOM 2017; density of IMO registered ships passing each 1 km2 grid cell in 2016)

4. Modelling the spatial characteristics of the interaction: wave source areas

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Wave source areas for Seili site
🟦 Outside source area
🟥 Source area
Closeness to Seili site
High : 1
Low : 0

Analysis: Simple visibility analysis, not accounting for wave refraction caused by bathymetry and shoreline geometry

5. Identifying current conflict areas: high shipping density near the Natura site

Potential intensity of conflicts with Seili site
High : 0.9
Low : 0.0

☐ Distance zones

Analysis: Rescaled distance * rescaled shipping density, clipped with wave source area

6. Deriving recommendations for shipping in the vicinity of the Natura 2000 site

Recommendations for shipping in the vicinity of the Seilin saaristo Natura 2000 site
🟩 No conflicts regarding Seili site
🟨 Increased shipping not recommended
🟥 Shipping requires special attention

Analysis: Subjectively reclassified wave source area and negative interaction intensity

Figure 7. Exemplary work flow for analysing the interaction between a key conservation objective in the Seilin saaristo Natura 2000 site and a critical human activity. Data and analysis methods are indicated in the figure

SHIPPING CASE

Oil spills

Figure 8. Map presentation of oil spills, main shipping routes, economic zone and territorial water.

Oil spills/ damage value
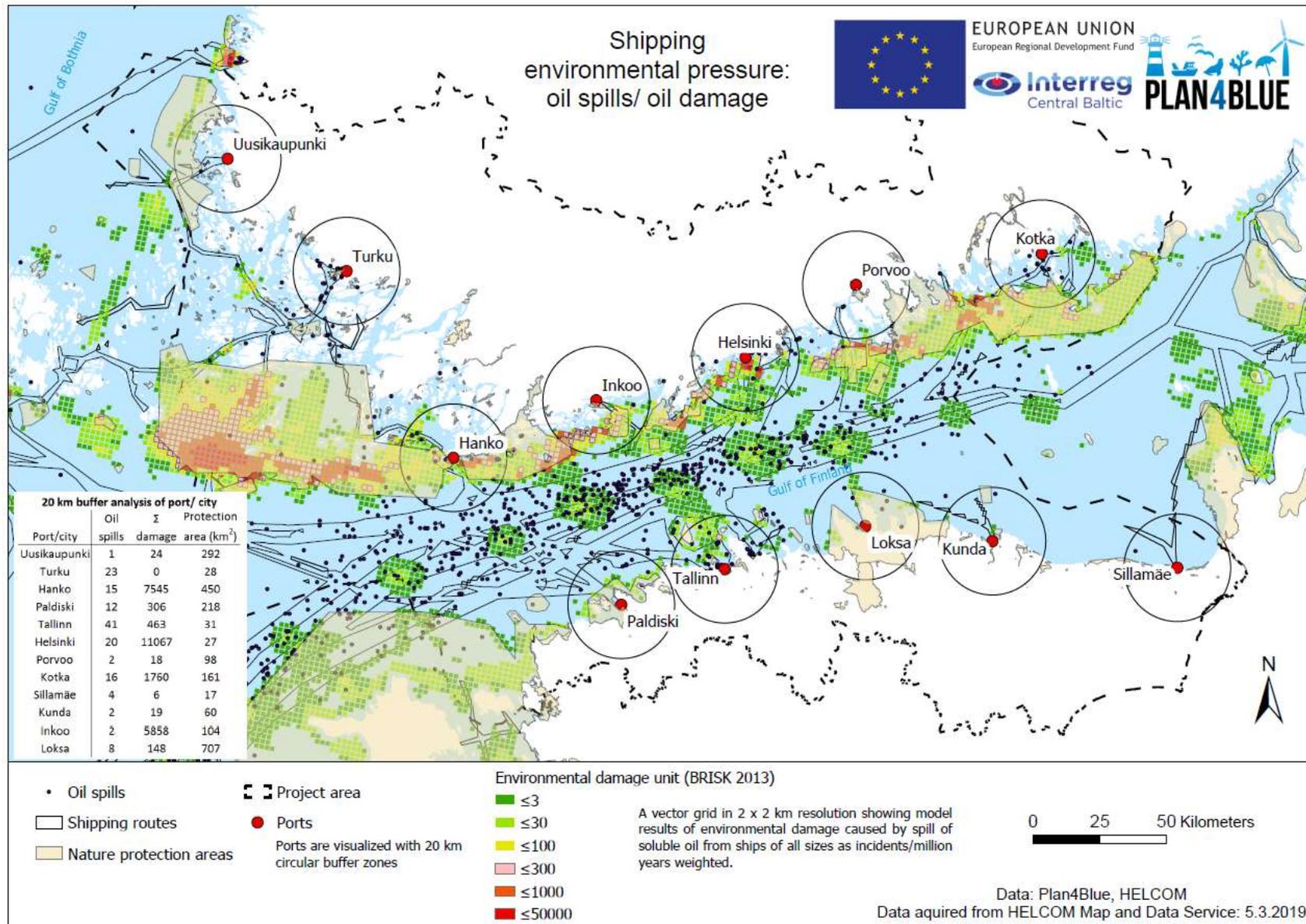
Figure 9. Map presentation of oil spills, damage value, protection areas.

The map contains the following embedded table:

20 km buffer analysis of port/ city
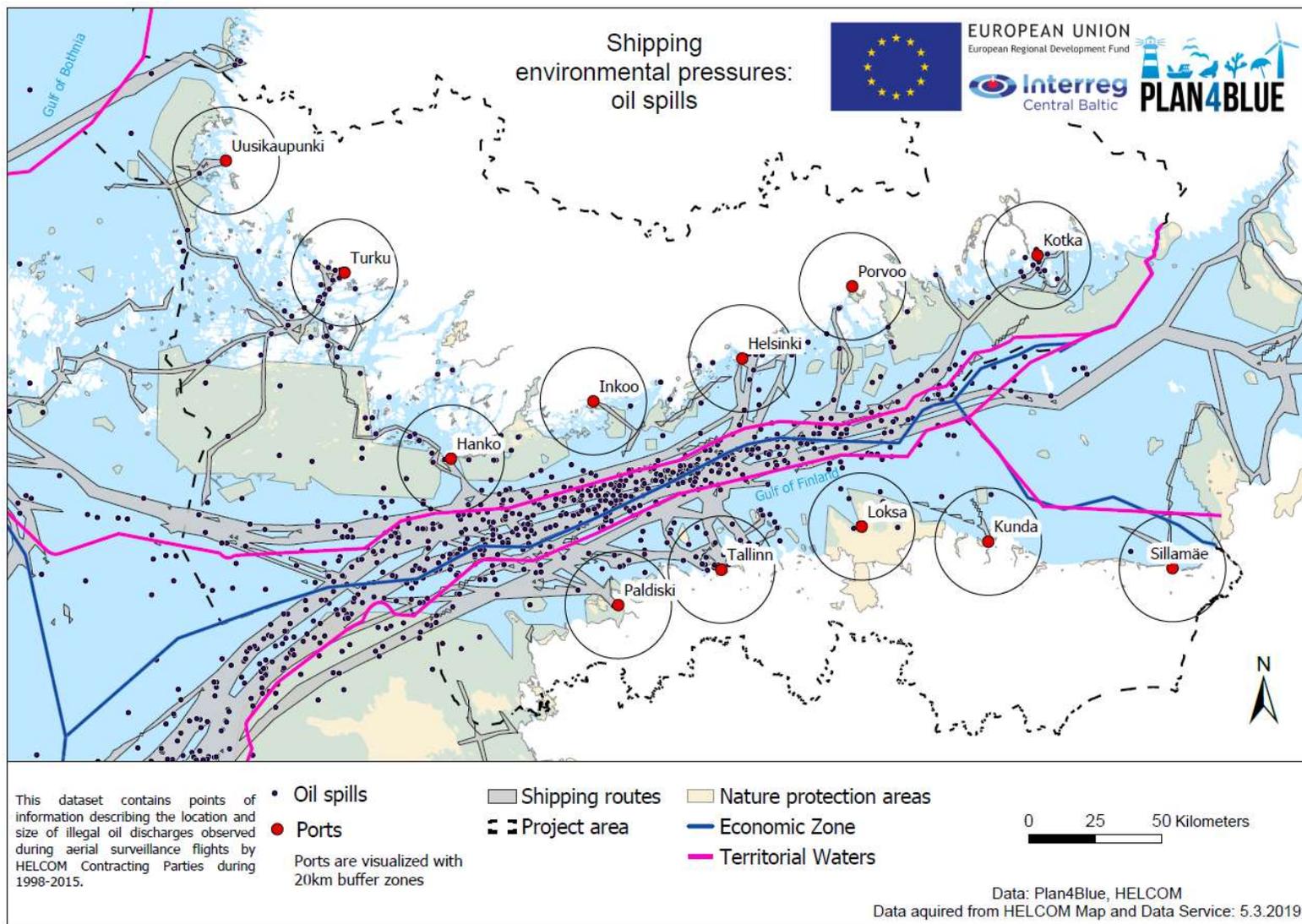
Port/city	Oil spills	Σ damage	Protection area (km²)
Uusikaupunki	1	24	292
Turku	23	0	28
Hanko	15	7545	450
Paldiski	12	306	218
Tallinn	41	463	31
Helsinki	20	11067	27
Porvoo	2	18	98
Kotka	16	1760	161
Sillamäe	4	6	17
Kunda	2	19	60
Inkoo	2	5858	104
Loksa	8	148	707

Legend:

- Oil spills
- Shipping routes
- Nature protection areas
- Project area
- Ports
- Ports are visualized with 20 km circular buffer zones

Environmental damage unit (BRISK 2013)

- ≤3
- ≤30
- ≤100
- ≤300
- ≤1000
- ≤50000

A vector grid in 2 x 2 km resolution showing model results of environmental damage caused by spill of soluble oil from ships of all sizes as incidents/million years weighted.

Data: Plan4Blue, HELCOM
Data aquired from HELCOM Map and Data Service: 5.3.2019
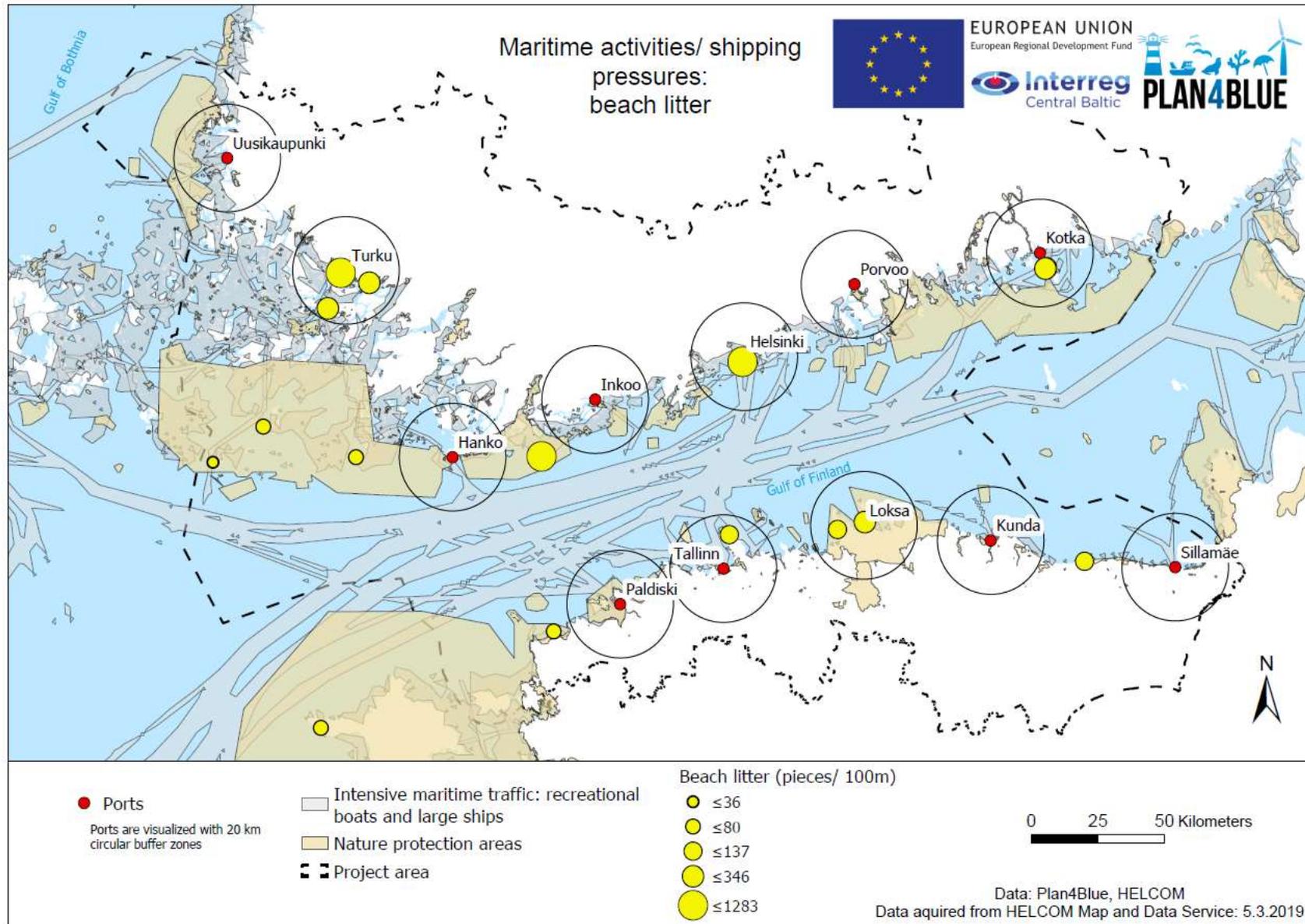
Beach litter

Figure 10. Map presentation of beach litter in the study area.
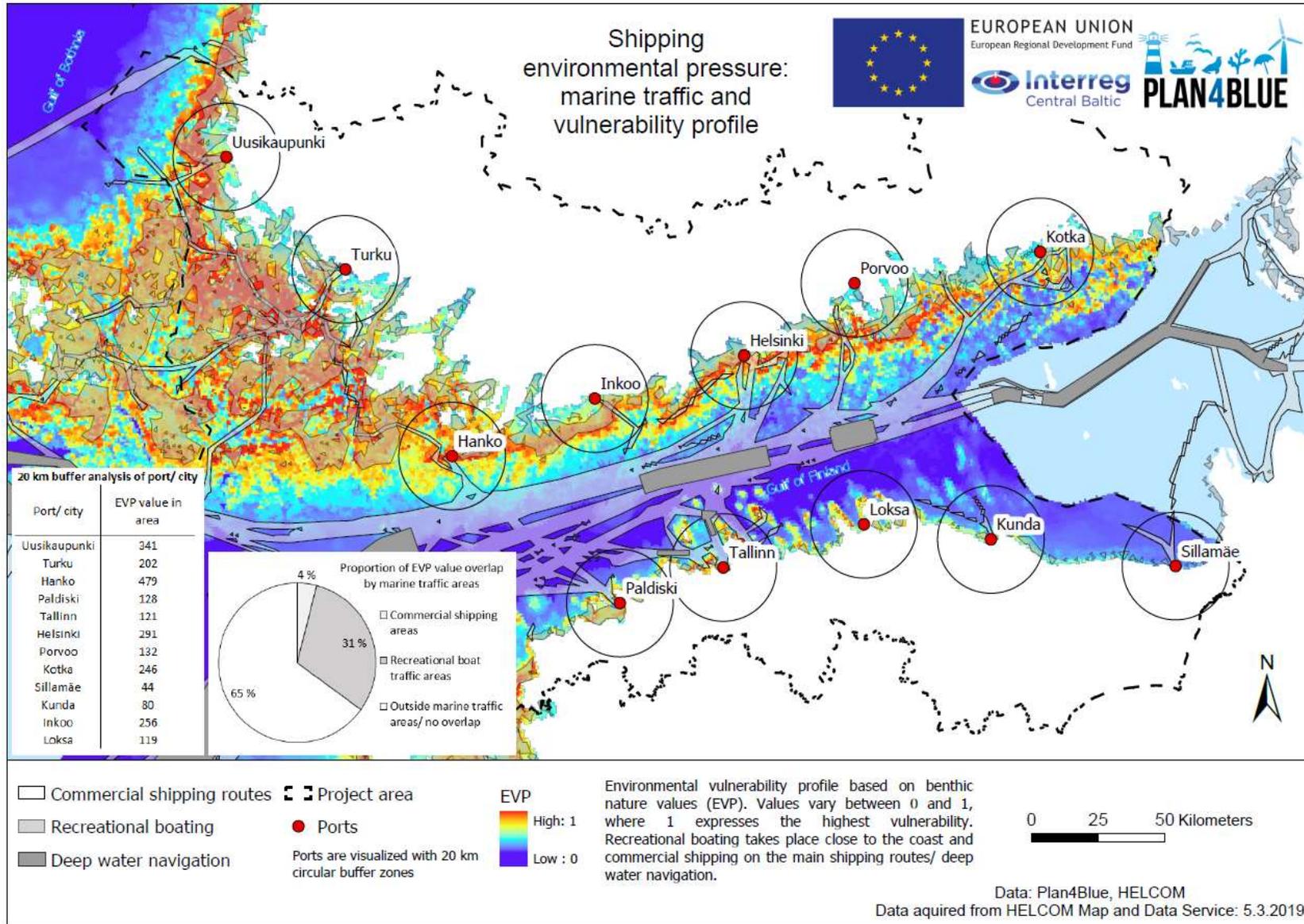
Marine traffic/ vulnerability

Figure 11. Map presentation of environmental vulnerability profile and marine transport pathways.
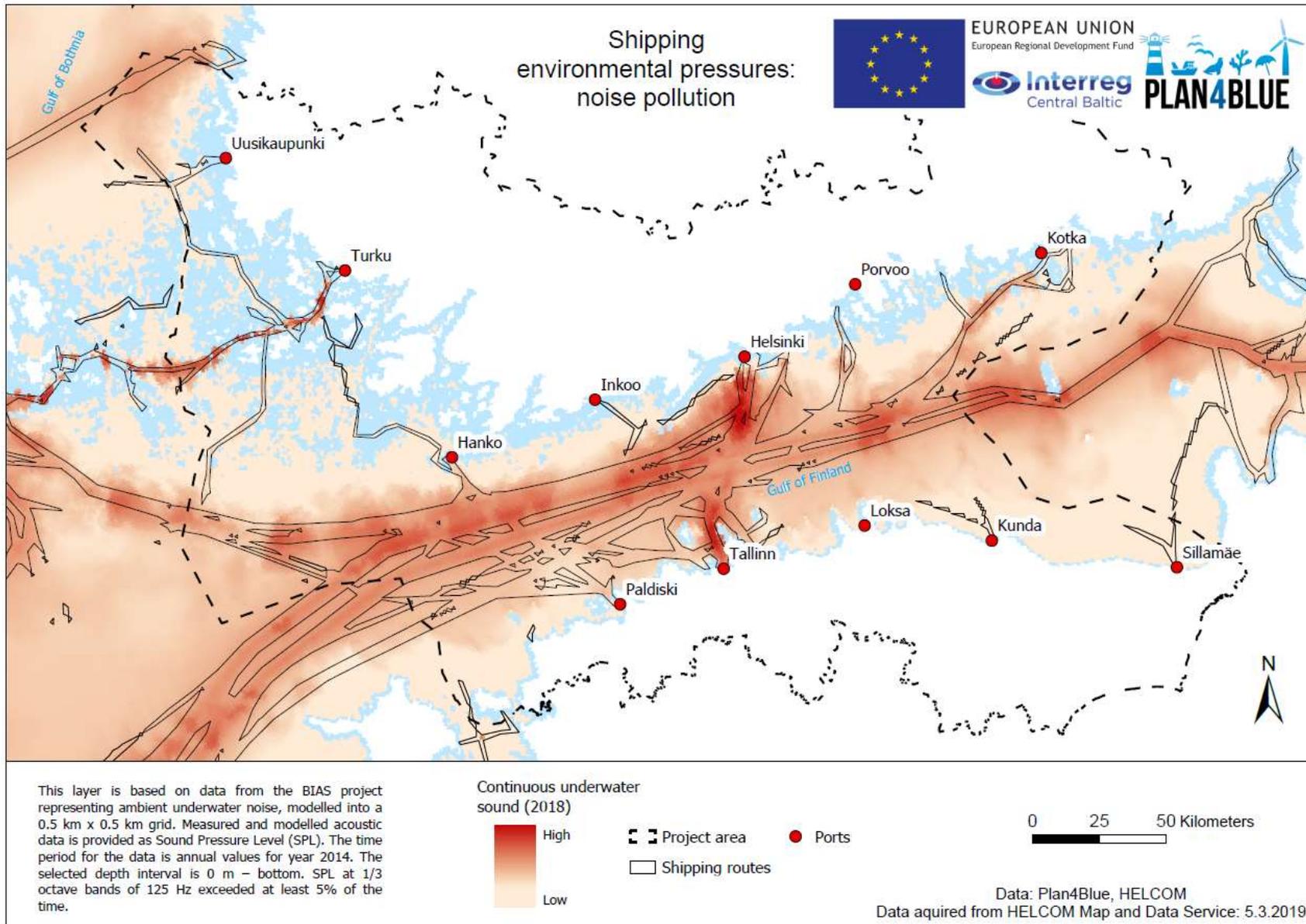
Noise pollution

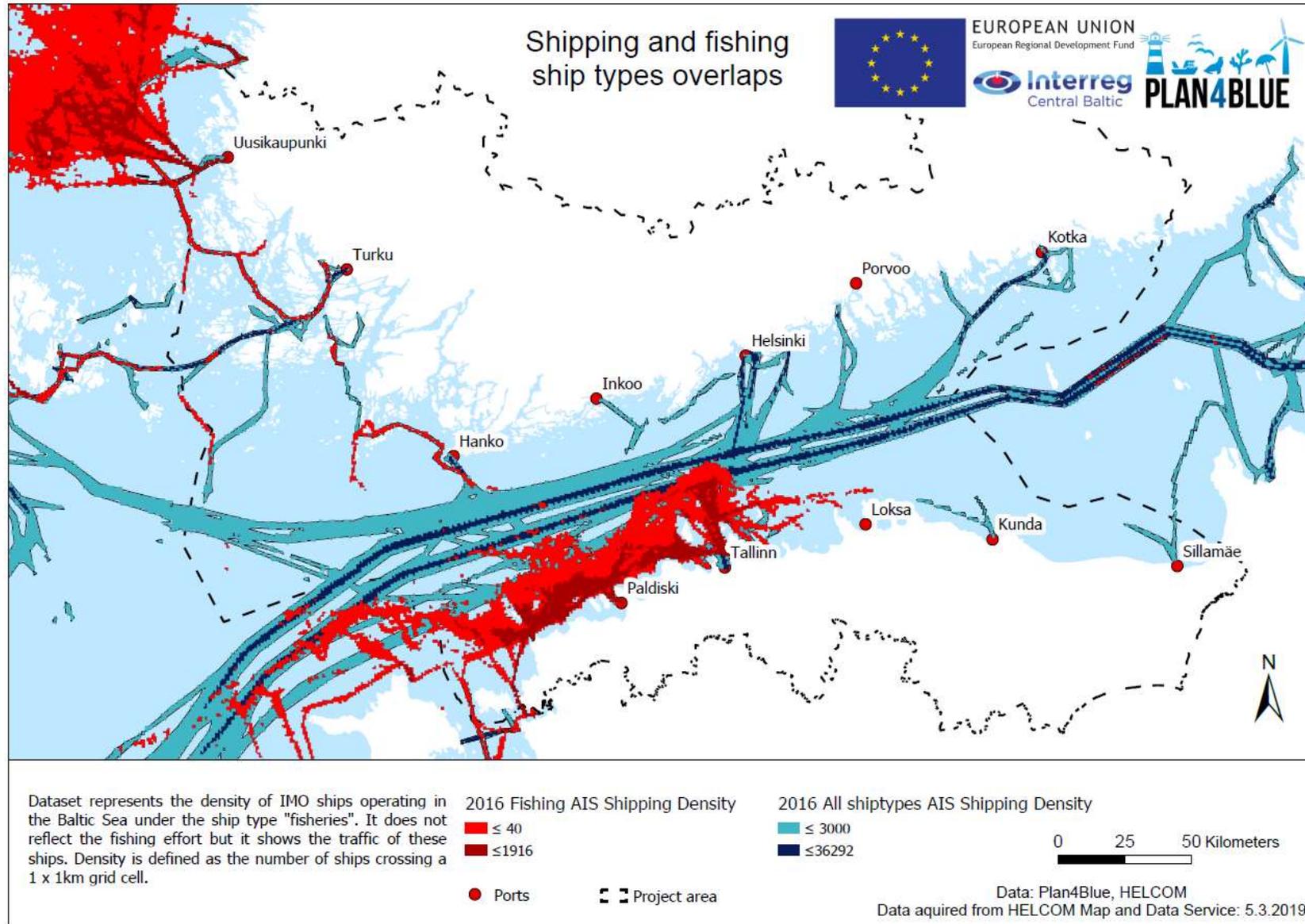**Figure 12. Noise pollution and shipping routes.**

Ship routes overlaps

Figure 13. Commercial shipping and fishing routes.

Shipping accidents

20 km buffer analysis of port/ city

Port/ city	Commercial shipping and fishing routes overlap (km²)	Shipping accidents count (n)
Uusikaupunki	33	8
Turku	17	14
Hanko	46	13
Paldiski	169	6
Tallinn	182	48
Helsinki	0	32
Porvoo	0	4
Kotka	0	24
Sillamäe	0	0
Kunda	0	0
Inkoo	0	5
Loksa	0	2

This dataset contains the ship accidents in the Baltic Sea during the period 1989 to 2017. It is constructed from the annual data collected by HELCOM Contracting Parties on ship accidents in the Baltic Sea. Reported accident types are collision, contact, fire, grounding, machinery/physical damage, pollution, grounding, sunk, technical failure, other.
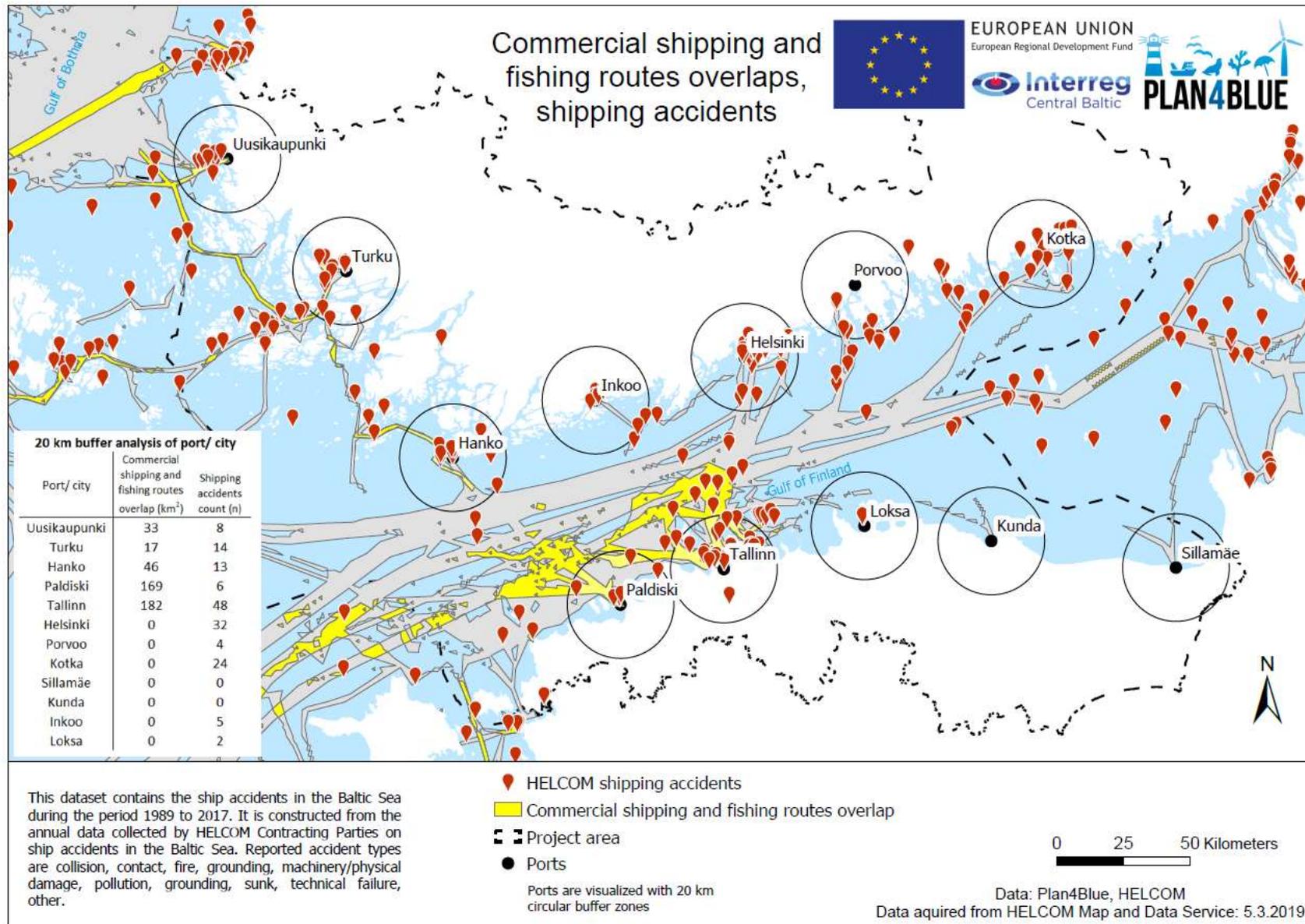
Figure 14. Commercial shipping and fishing routes overlap areas and accidents.

REFERENCES

Lusenius, H., Nylén, T., Kuris, M., Karvinen, V. & Vikström, S. (2019). *Marine Natura 2000 areas and Maritime Spatial Planning*. Plan4Blue report.

Haanpää, S., Lees, L., Roose, M., Vuorsalo, A. (2019). *Maritime transport and Maritime Spatial Planning.* Plan4Blue report

The maps presented in this report have been produced for illustration purposes only. They are partly hypothetical and do not represent the real situation or established view of the researchers, planners or stakeholders involved in the Plan4Blue project.

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