



Meeli Roose, Tua Nylén, Hanna Uusitalo and Harri Tolvanen

## **Deliverable D. T3.6.1 Maps visualizing first versions of blue growth scenarios**

**Results of Delphi panel and scenario workshop**

30.10.2017



## SUMMARY

These maps are **intermediate products** of the project's scenario-building phase.

The first section of the map collection presents collected spatial data from Delphi-questionnaire round (input 1). Experts determined five blue economy sectors' (Energy, Marine cluster, Blue bio-economy, Tourism, Sub-sea resources) future activity locations in online participatory mapping exercise. Maps illustrate where activities of certain sector should be increased or decreased, claim new areas or to be totally banned by 2050. The next phase of scenario construction encompassed complementing and assessing the Delphi results. Three stakeholder working groups identified the five blue economy sectors' future use development in 2050. Mapping exercise was executed by applying Lego blocks and drawing with pen on a canvas map (input 2). Combined result maps from two sources, Delphi and working groups, present synergies and conflicts of the project area and illustrate the anticipated future activities for each blue economy sector in the project area.

First versions of blue growth scenarios are implemented in collaboration with WP T1-T2 in meetings in 2017: August 20-21 in Tallinn, September 5-9 in Helsinki, September 19 in Turku, and October 3 in Pori.

This WP T3 deliverable D. T3.6.1 *Maps visualising first versions of blue growth scenarios* presents each blue economy sector's offshore activities' intensity areas projected to the year 2050. The maps indicate the sector potential/non-potential development in the project area.

These scenarios will be finalized after Tallinn workshop in January 2018.

All maps are designed to appear in sizes corresponding to full A4 to A3 paper. Therefore, their size in this document may not be optimal. A report of the participatory spatial data collection, utilised in creating these maps, is available in WP T1 combined deliverable T1.4.1 and T1.5.1 "Setting of Blue Growth Scenarios, Qualitative analysis based on expert opinions".

### **This document should be cited as follows:**

Roose, M., Nylén, T., Uusitalo, H., Tolvanen H. (2017) *Maps visualizing first versions of blue growth scenarios*. Plan4Blue report D.T3.6.1.

# CONTENTS

<b>1. MATERIALS AND METHODS</b> .....	<b>4</b>
1.1. Collecting expert opinions by Delphi questionnaire (Input 1).....	4
1.2. Collecting expert opinions in stakeholder workshop (Input 2).....	4
1.3. Combination maps for each blue economy sector.....	4
1.4. First versions of blue growth scenario maps.....	5
<b>2. INPUT 1: DELPHI-QUESTIONNAIRE AND MAPPING EXERCISE</b> .....	<b>6</b>
2.1. Energy.....	6
2.2. Maritime cluster.....	6
2.3. Blue bio-economy and subsea resources.....	7
2.4. Tourism.....	7
<b>3. INPUT 2: STAKEHOLDER MEETING AND MAPPING EXERCISE</b> .....	<b>8</b>
3.1. Group 1.....	8
3.2. Group 2.....	9
3.3. Group 3.....	10
<b>4. COMBINATION MAPS FOR EACH BLUE ECONOMY SECTOR</b> .....	<b>11</b>
4.1. Energy.....	11
4.2. Maritime cluster.....	12
4.3. Blue bio-economy and subsea resources.....	13
4.4. Tourism.....	14
<b>5. FIRST VERSIONS OF BLUE GROWTH SCENARIO MAPS</b> .....	<b>15</b>
5.1. Energy.....	15
5.2. Maritime cluster.....	16
5.3. Blue bio-economy and sub-sea resources.....	17
5.4. Tourism.....	18
<b>REFERENCES</b> .....	<b>19</b>

# 1. MATERIALS AND METHODS

## 1.1. Collecting expert opinions by Delphi questionnaire (Input 1)

To collect expert opinions about the spatial distribution of future maritime activities, two on-line Delphi questionnaire rounds were launched during the spring and summer 2017. The first questionnaire was open from April 24 to May 23, and the second from June 13 to July 12. The questionnaire was made with Harava GIS tool (see: <https://dimenteq.fi/en/services/harava/>).

In total 47 panelists answered the Delphi questionnaires (for details, see: Pöntynen et al. 2018). Most of the panelists answered some of the questions, but nobody answered all of them. As a consequence, the number of answers varies with each question.

In the questionnaire, experts were asked to indicate the areas where blue economy activities would occur by the year 2050. Panelists could indicate locations as points (not lines or areas). They were also asked to consider whether different activities would:

- increase,
- decrease,
- be totally banned or
- claim new areas.

These variables were used in later phases of the work, and they were not visualized in the Delphi questionnaire results presented in Figures 1–4.

## 1.2. Collecting expert opinions in stakeholder workshop (Input 2)

In the stakeholder workshop on June 15–16 2017 in Helsinki, expert groups were asked to indicate similar spatial development expectations as individual experts in the on-line Delphi questionnaire. In the workshop, the expert groups could indicate locations as points, line features or areas on large printed background maps (for details, see: Pöntynen et al. 2018).

The workshop produced input data from 3 working groups. All groups had previously defined themes on which they based their work.

- Group 1: Potential blue economy sector developments by 2050.
- Group 2: Synergies and conflicts of blue economy sectors.
- Group 3: Main drivers for sustainable blue economy sectors.

In total of 40 participants attended to the workshop. The groups were divided so, that both authorities and private sector were represented. The results, photographs of actual map sheets and the spatial data digitized based on them, are presented in Figures 5–10.

## 1.3. Combination maps for each blue economy sector

The aim was to combine the Delphi questionnaire results (Input 1) with the map exercise materials from the Helsinki workshop (Input 2). By rearranging the results, four maps were produced, each representing one of the blue economy sectors. The blue economy sectors were previously defined by experts to five categories; Energy, Maritime cluster, Bio-economy, Tourism and Sub-sea resources. But, because bio-economy and sub-sea resources sectors both yielded little input, they were combined.

The data collection methods were somewhat different between the questionnaire and the workshop, and this caused some issues in analysis. Also the aim to fit all results to four sectors required some rearrangement of the data. Some subsectors were combined (e.g. in the tourism sector all offshore water sports were classified into one category) to visualise the information more clearly without losing information. Also some polygon features from the workshop materials were combined as larger and more coherent entities.

The combination maps (Figures 11–14) are sector-wise compositions of the Delphi questionnaire results (Input 1) and the digitized workshop results (Input 2). They show experts' opinions and the locations of actives within each blue economy sector anticipated for the year 2050.

#### 1.4. First versions of blue growth scenario maps

The combination maps (Figures 11–14) show the expert opinions in great spatial detail. As the project goals require understanding of the spatial dynamics of future development trends in different blue economy sectors, the expert input data needed to be analysed as spatial trends.

The expert input data included only a few indications of *decreasing* activities or *total ban areas*. They were omitted from further analyses, and only categories *increase* and *claim new area* were used from the combination maps.

To convert the locations of expected increasing economic activities into indication of spatial distribution trends, the input data were calculated into intensity heatmaps. For this, the input data needed to be in point format only. Thus, the line features were excluded, because the lines (e.g. traffic/transport routes) cannot be representatively converted to points. Polygons were converted to points by calculating the centroid for each polygon.

The analysis was carried out in ArcGIS software using Kernel Density tool (KDT), which is one of the most used density analysis tools for point data (Silverman 1986). KDT analyses the neighbourhood of the data points, and the intensity is determined within a defined neighbourhood radius from each point.

The KDT allows the user to weight the input point features differently. For example, the polygon centroids could have been emphasised, because the polygons cover more area than points. This option was not used, because it would have distorted the result: the Delphi tool allowed only points, whereas the workshop method allowed also areas, and it is impossible to determine, which Delphi point was actually representing an area, and which was representing a point location.

The KDT results are heatmaps (Figures 15–18), which represent the first versions of the blue economy scenarios. They show the future intensity centres of sector-related activities in the year 2050.

## 2. INPUT 1: DELPHI-QUESTIONNAIRE AND MAPPING EXERCISE

### 2.1. Energy

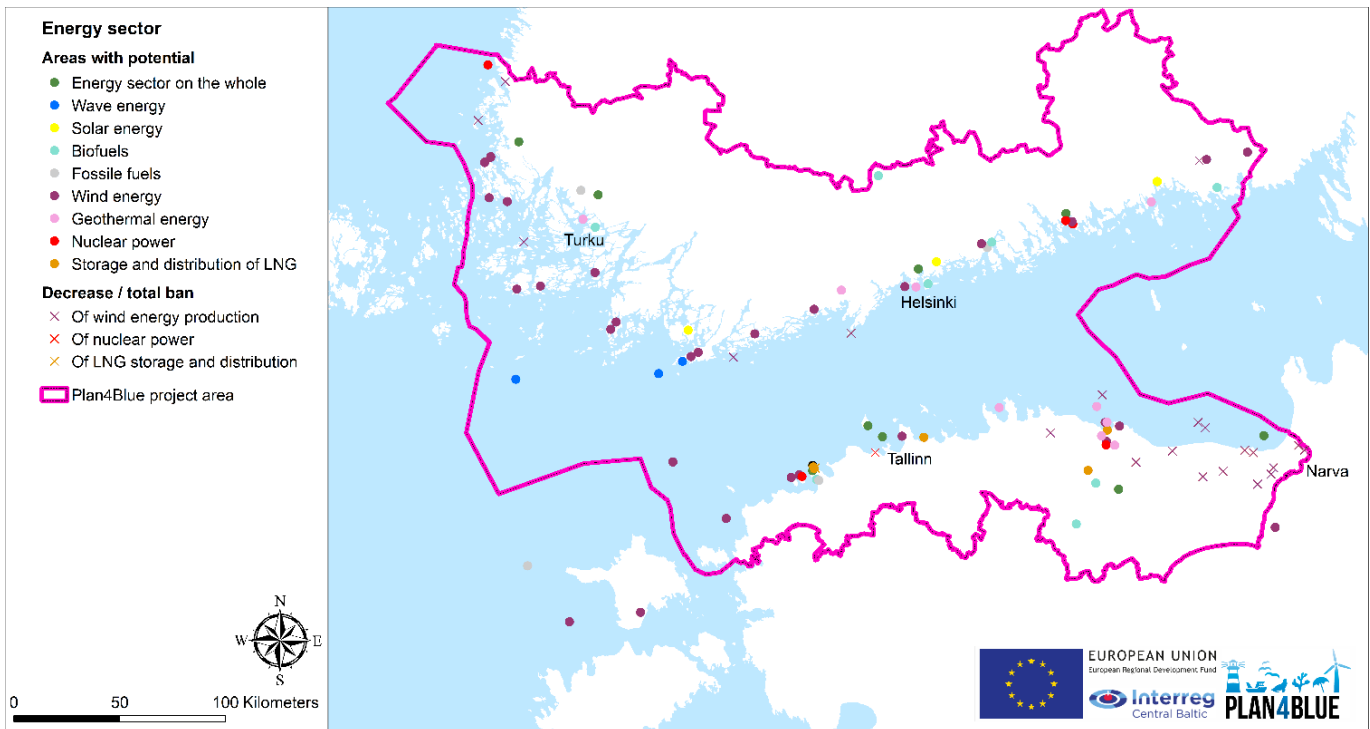


Figure 1. Energy sector in 2050: blue growth related activities alternative locations in the Plan4Blue project area. Potential future areas represent places where certain activities should be increased or to claim new area. Locations where certain activities should be decreased or totally banned are referred as conflict areas.

### 2.2. Maritime cluster

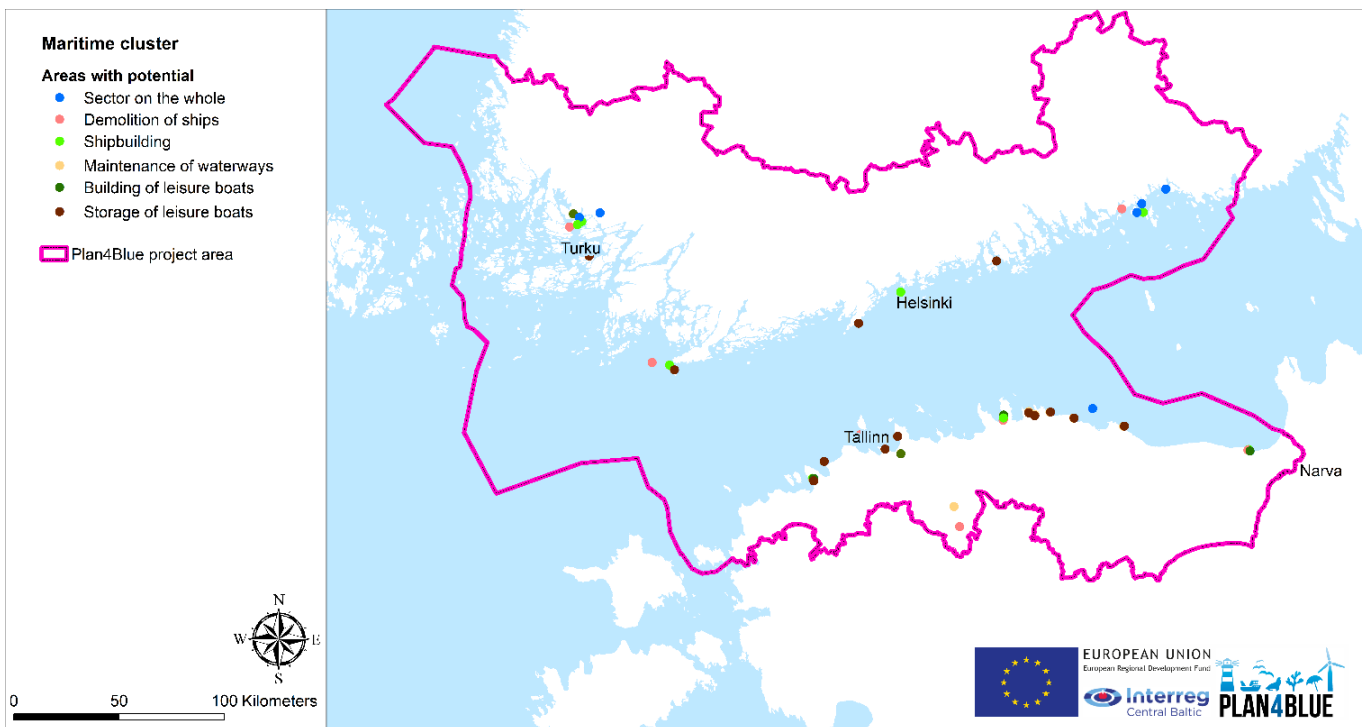


Figure 2. Maritime sector in 2050: blue growth alternative locations in the Plan4Blue project area. Potential future areas represent places where certain activities should be increased or to claim new area. Locations where certain activities should be decreased or totally banned are referred as conflict areas.

### 2.3. Blue bio-economy and subsea resources

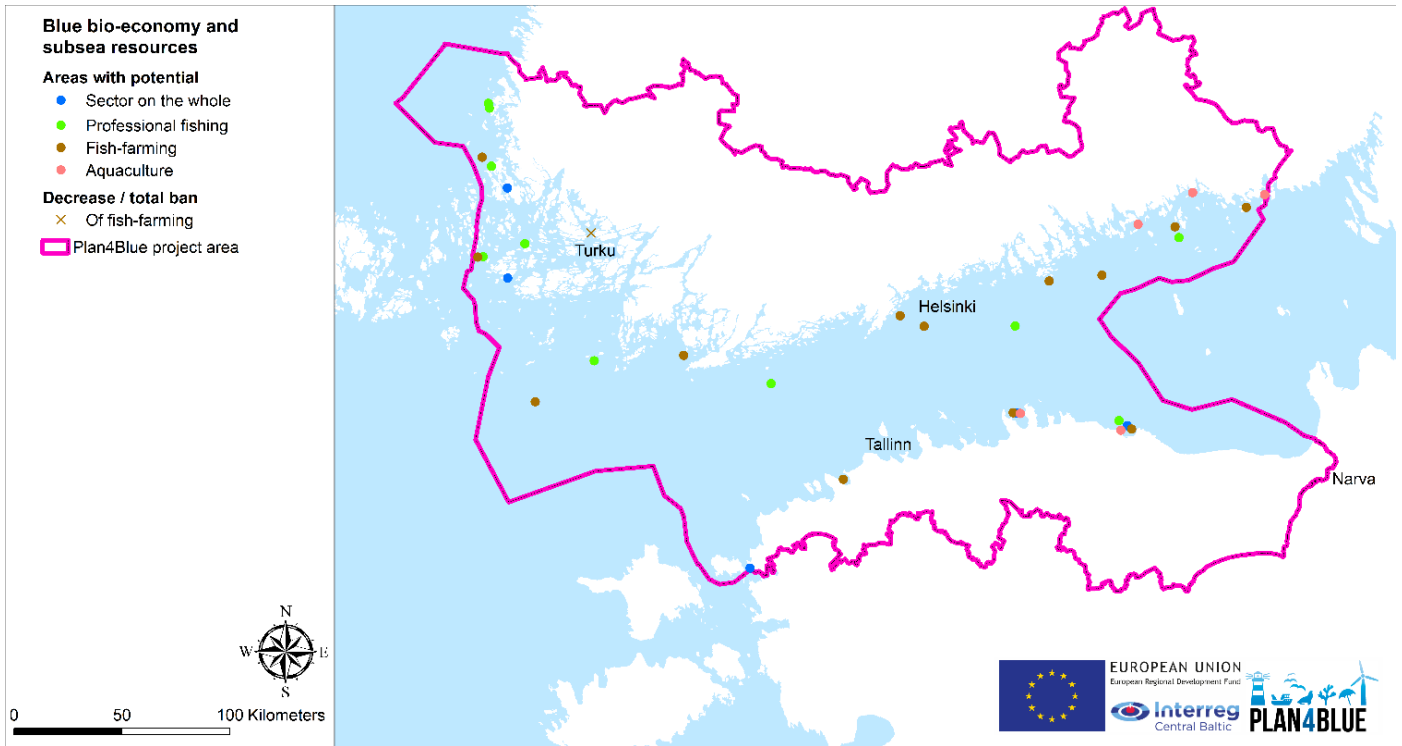


Figure 3. Blue bio-economy and subsea resources sector in 2050: blue growth alternative locations in the Plan4Blue project area. Potential future areas represent places where certain activities should be increased or to claim new area. Locations where certain activities should be decreased or totally banned are referred as conflict areas.

### 2.4. Tourism

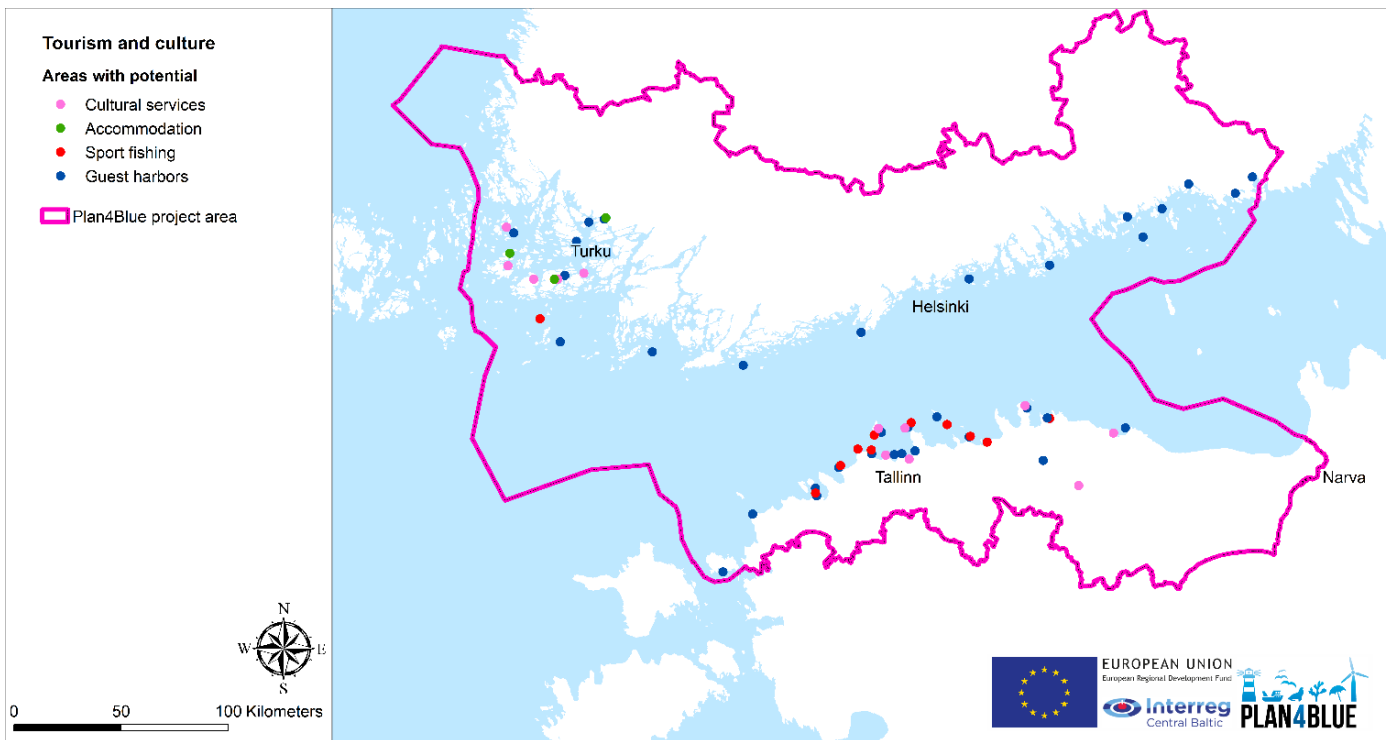


Figure 4. Tourism sector in 2050: blue growth alternative locations in the Plan4Blue project area. Potential future areas represent places where certain activities should be increased or to claim new area. Locations where certain activities should be decreased or totally banned are referred as conflict areas.



### 3. INPUT 2: STAKEHOLDER MEETING AND MAPPING EXERCISE

#### 3.1. Group 1

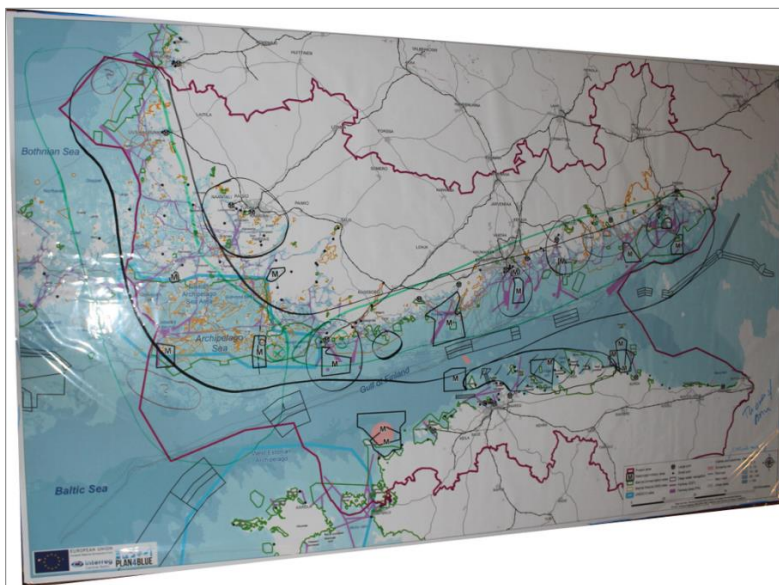


Figure 5. Canvas map of workshop group 1 participants' views of sea use in 2050: blue growth alternative locations in the Plan4Blue project area. Potential future activities are distinguished with following color scheme: blue - blue bio-economy, green - maritime cluster, red - energy sector, black - tourism, culture and services for leisure activities (Pöntynen et al. 2017).

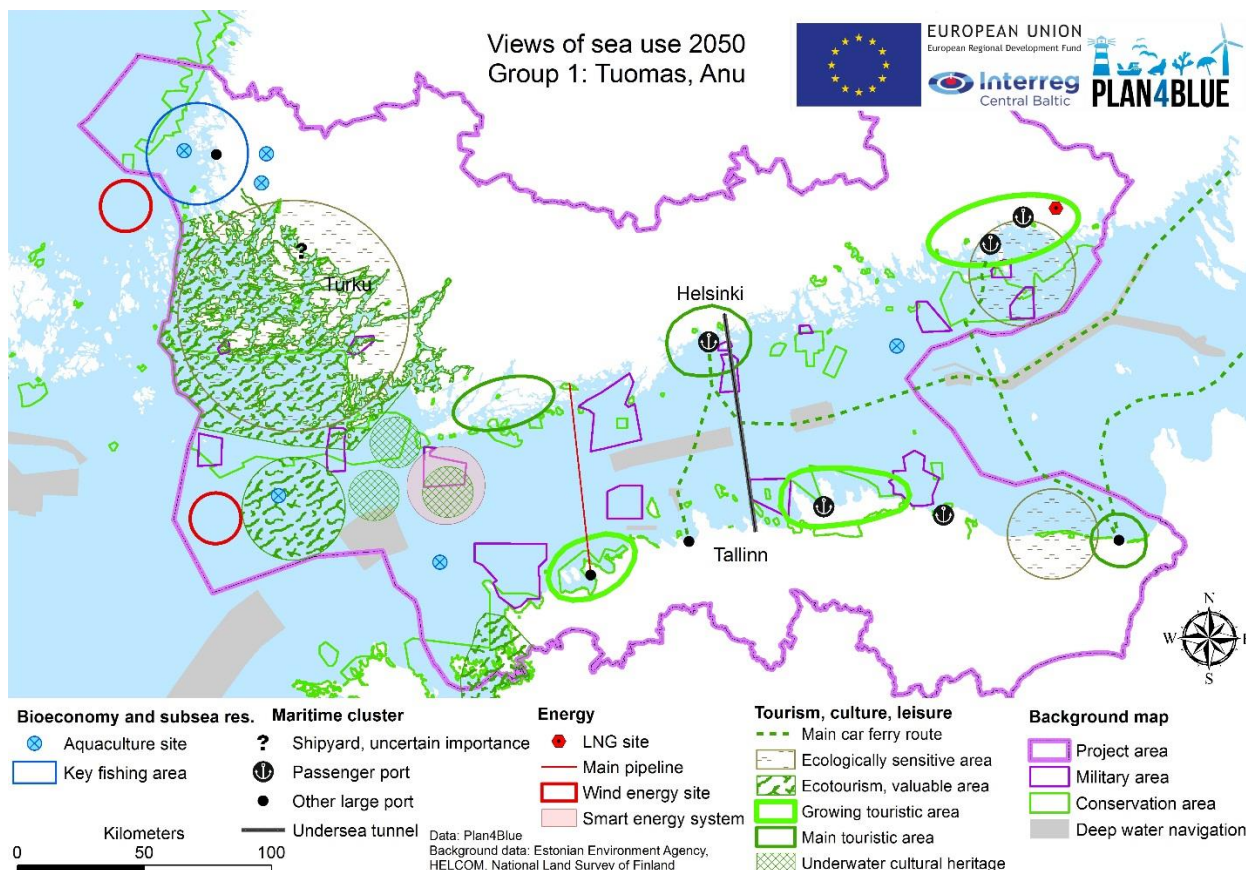


Figure 6. Digitized maps of workshop group 1 blue growth alternative locations (Fig. 5) in the Plan4Blue project area. Potential future areas are divided in four main categories by sub-sectors/activities. Digitizing plan consists following color scheme: blue - blue bio-economy sector, black - maritime sector, red - energy sector, green – tourism, culture and services for leisure activities cluster. No sub-sea resources sector markings.



### 3.2. Group 2



Figure 7. Canvas maps of workshop group 2 participants' blue growth alternative locations in the Plan4Blue project area. Potential future activities are distinguished with following color scheme: blue - blue bio-economy, green - maritime cluster, red - energy sector, black - tourism, culture and services for leisure activities (Pöntynen et al. 2017).

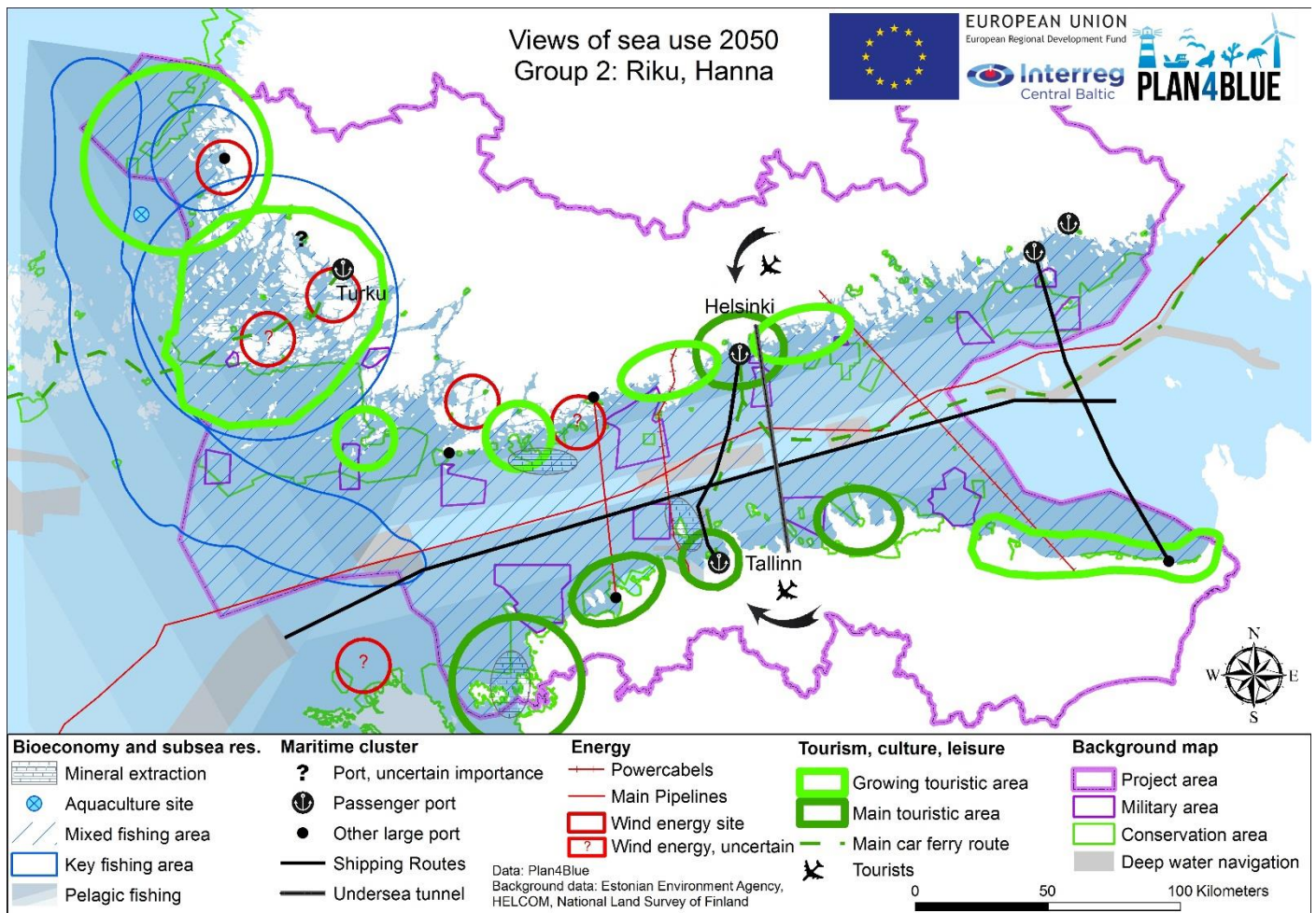


Figure 8. Digitized map of workshop group 2 blue growth alternative locations (Fig. 7) in the Plan4Blue project area. Potential future areas are divided in four main categories by sub-sectors/activities. Digitizing plan consists following color scheme: blue - blue bio-economy sector, black - maritime sector, red - energy sector, green - tourism, culture and services for leisure activities cluster.



### 3.3. Group 3

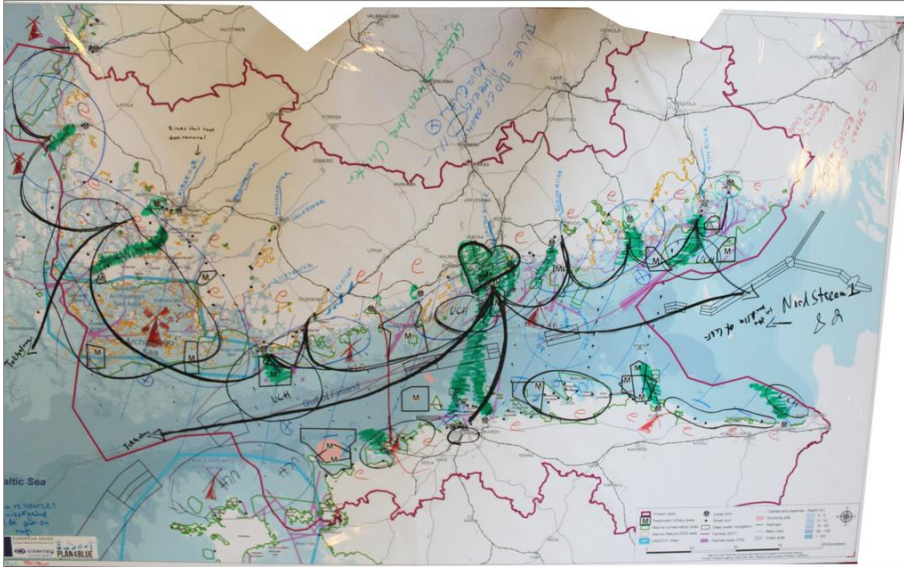


Figure 9. Canvas maps of workshop group 3 participants' blue growth alternative locations in the Plan4Blue project area. Potential future activities are distinguished with following color scheme: blue - blue bio-economy, green - maritime cluster, red - energy sector, black - tourism, culture and services for leisure activities (Pöntynen et al. 2017).

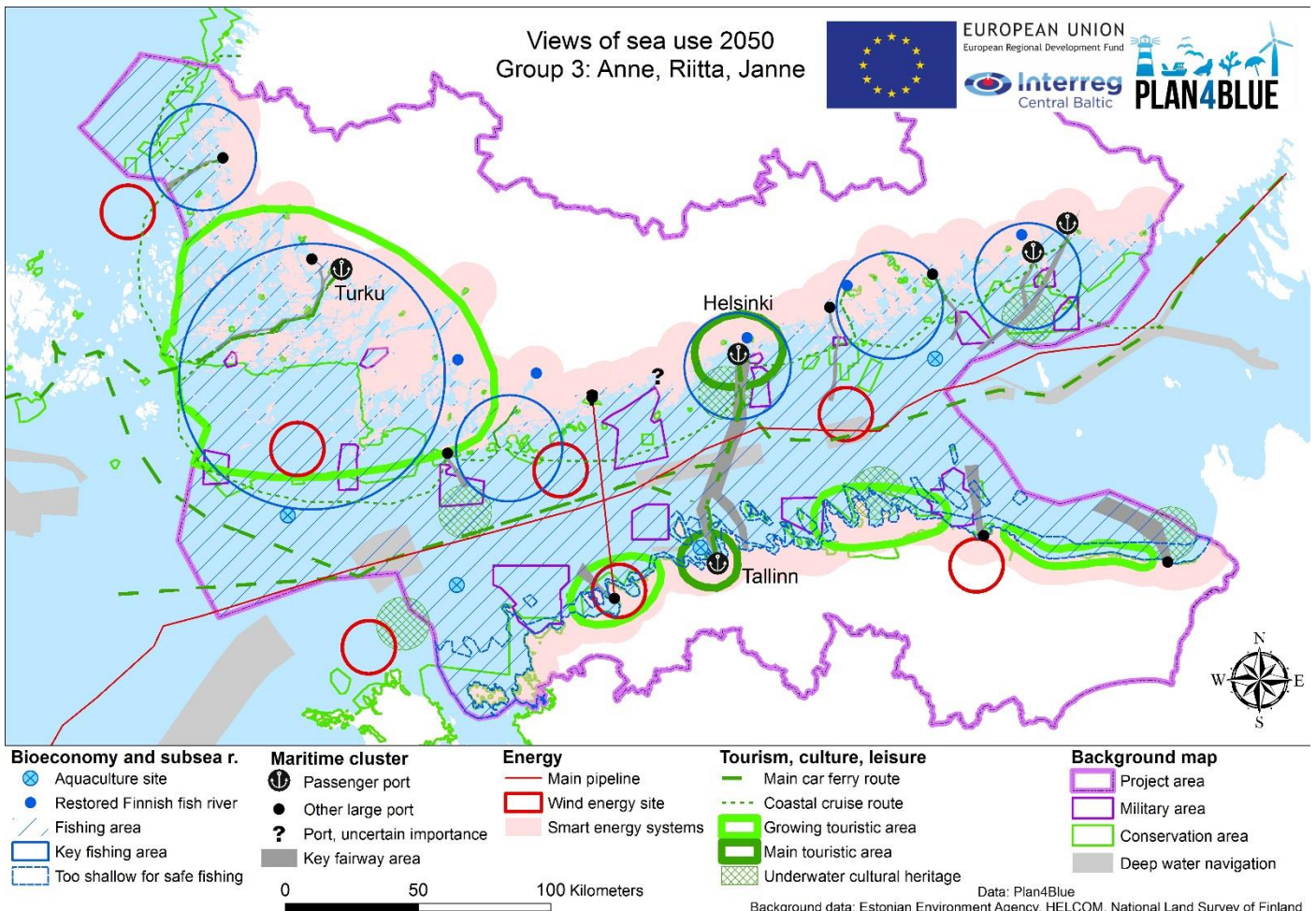


Figure 10. Digitized map of workshop group 1 blue growth alternative locations (Fig. 9) in the Plan4Blue project area. Potential future areas are divided in four main categories by sub-sectors/activities. Digitizing plan consists following color scheme: blue - blue bio-economy sector, black - maritime sector, red - energy sector, green – tourism, culture and services for leisure activities cluster.

## 4. COMBINATION MAPS FOR EACH BLUE ECONOMY SECTOR

### 4.1. Energy

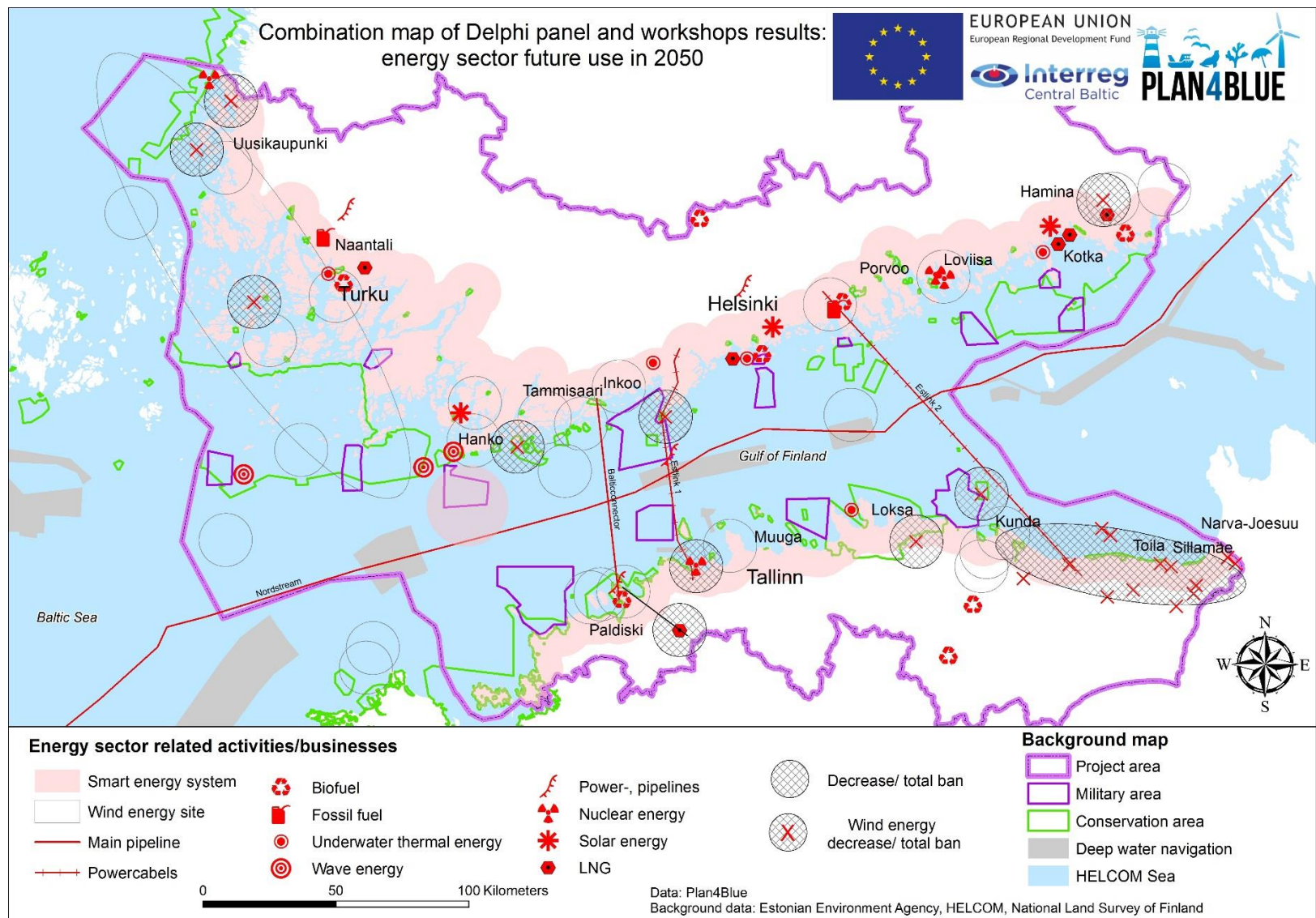


Figure 11. Combined Delphi- and results map of three working groups' synergies/conflicts. Energy sector future sea use in 2050 for is grouped with symbols and restrictions area is circled with crosshatched pattern (decrease/total ban).



## 4.2. Maritime cluster

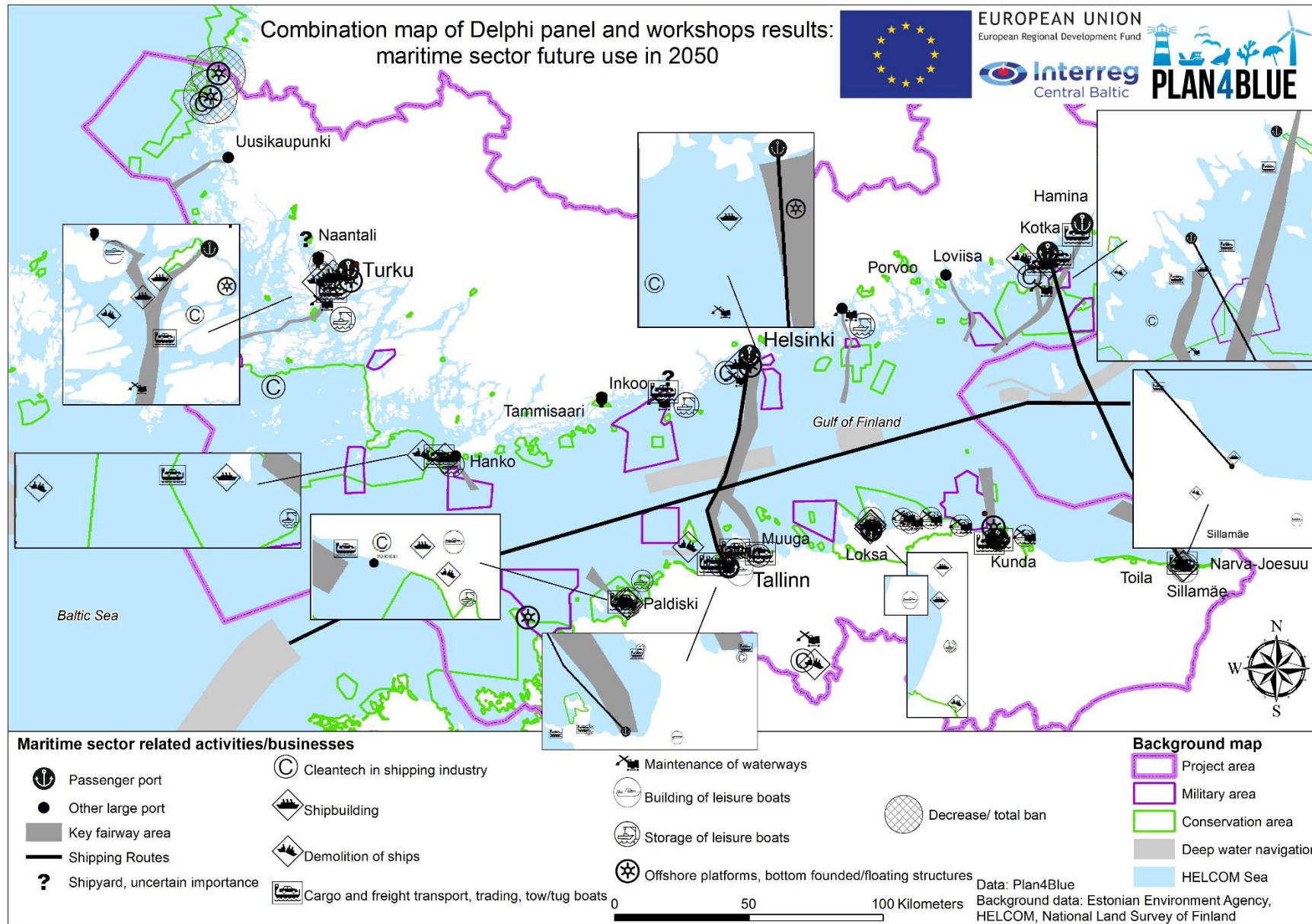


Figure 12. Combined Delphi- and results map of three working groups' synergies/conflicts. Maritime sector future sea use in 2050 for is grouped with symbols and restrictions area is circled with crosshatched pattern (decrease/total ban).

### 4.3. Blue bio-economy and subsea resources

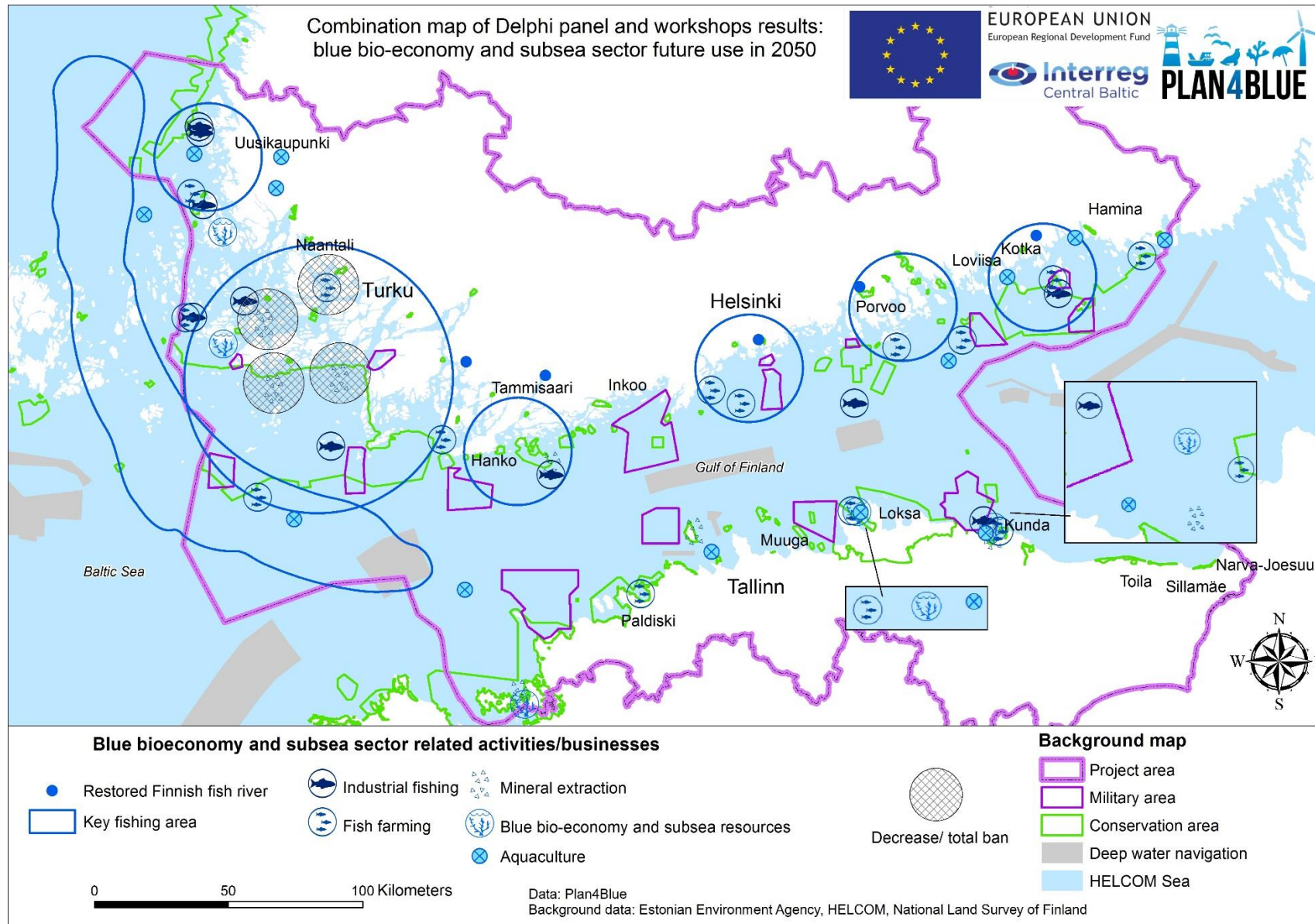


Figure 13. Combined Delphi- and results map of three working groups' synergies/conflicts. Blue bio-economy and subsea resources sector future sea use in 2050 is grouped with symbols and restrictions area circled with crosshatched pattern (decrease/total ban).



#### 4.4. Tourism

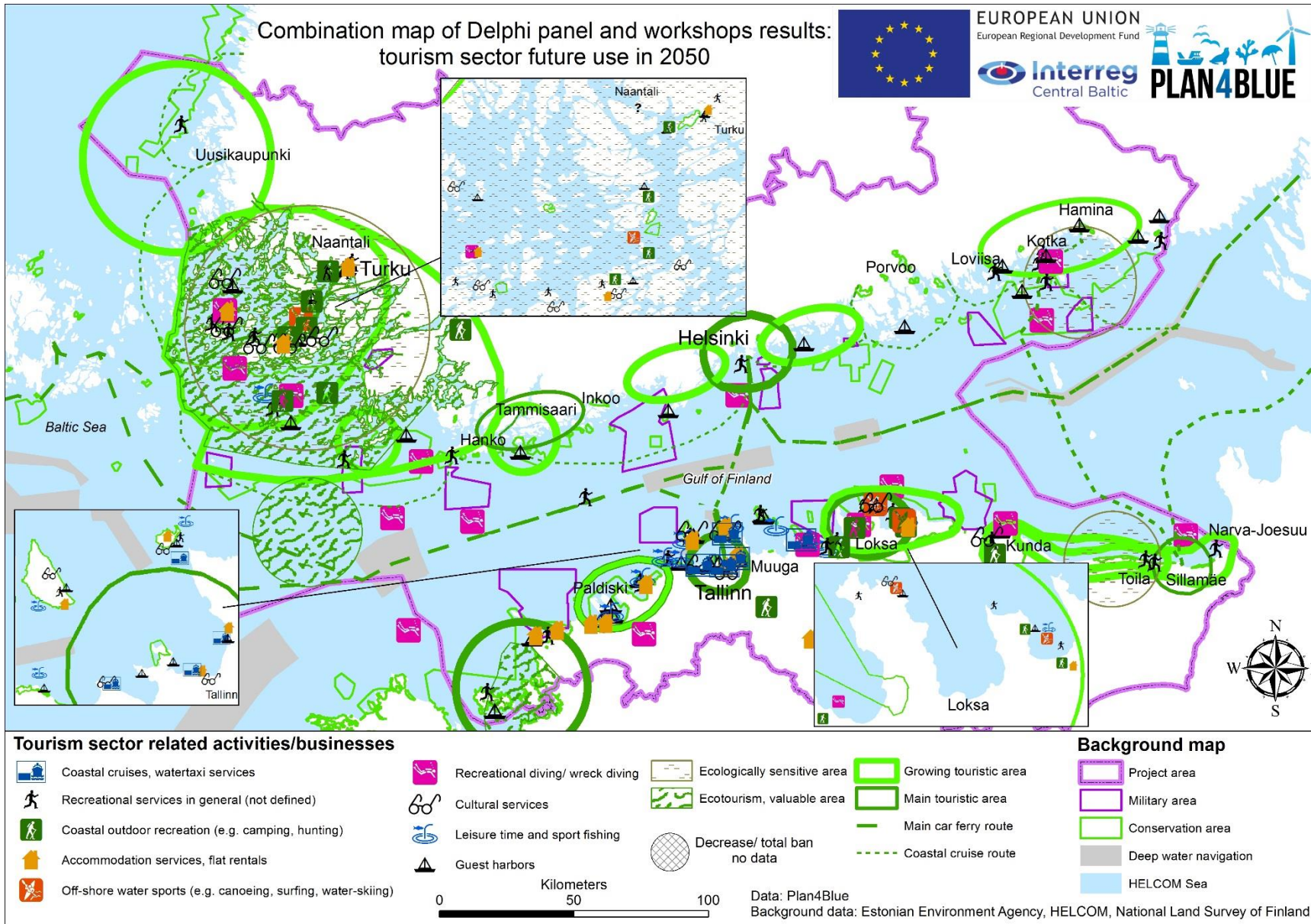


Figure 14. Combined Delphi- and results map of three working groups' synergies/conflicts. Tourism sector future sea use in 2050 is grouped with symbols and restrictions area is circled with crosshatched pattern (decrease/total ban).

## 5. FIRST VERSIONS OF BLUE GROWTH SCENARIO MAPS

### 5.1. Energy

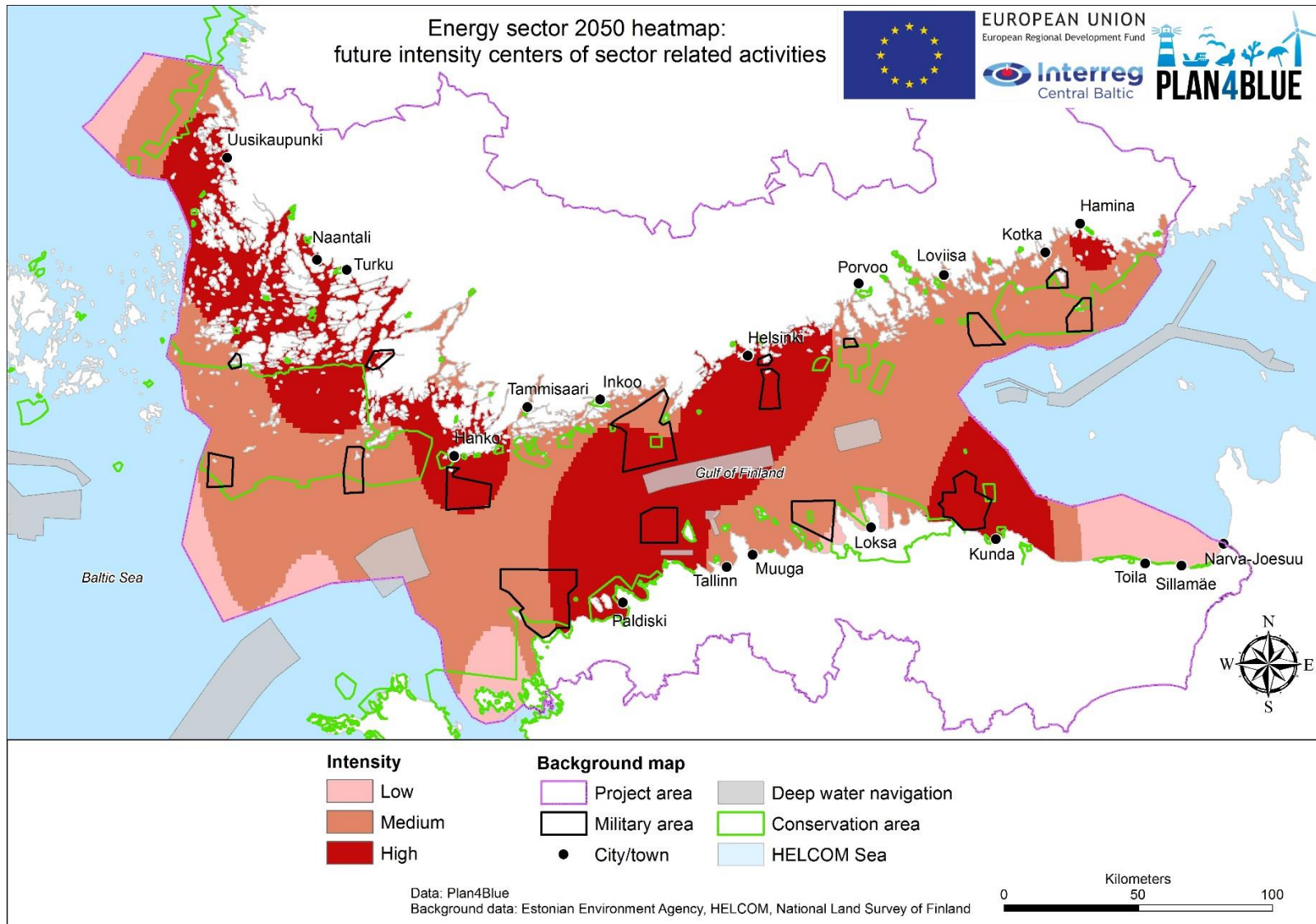


Figure 15. Energy sector future scenario map indicating the cluster uses, potential, synergies and conflicts in the project area: intensity center is marked with red color (high).



## 5.2. Maritime cluster

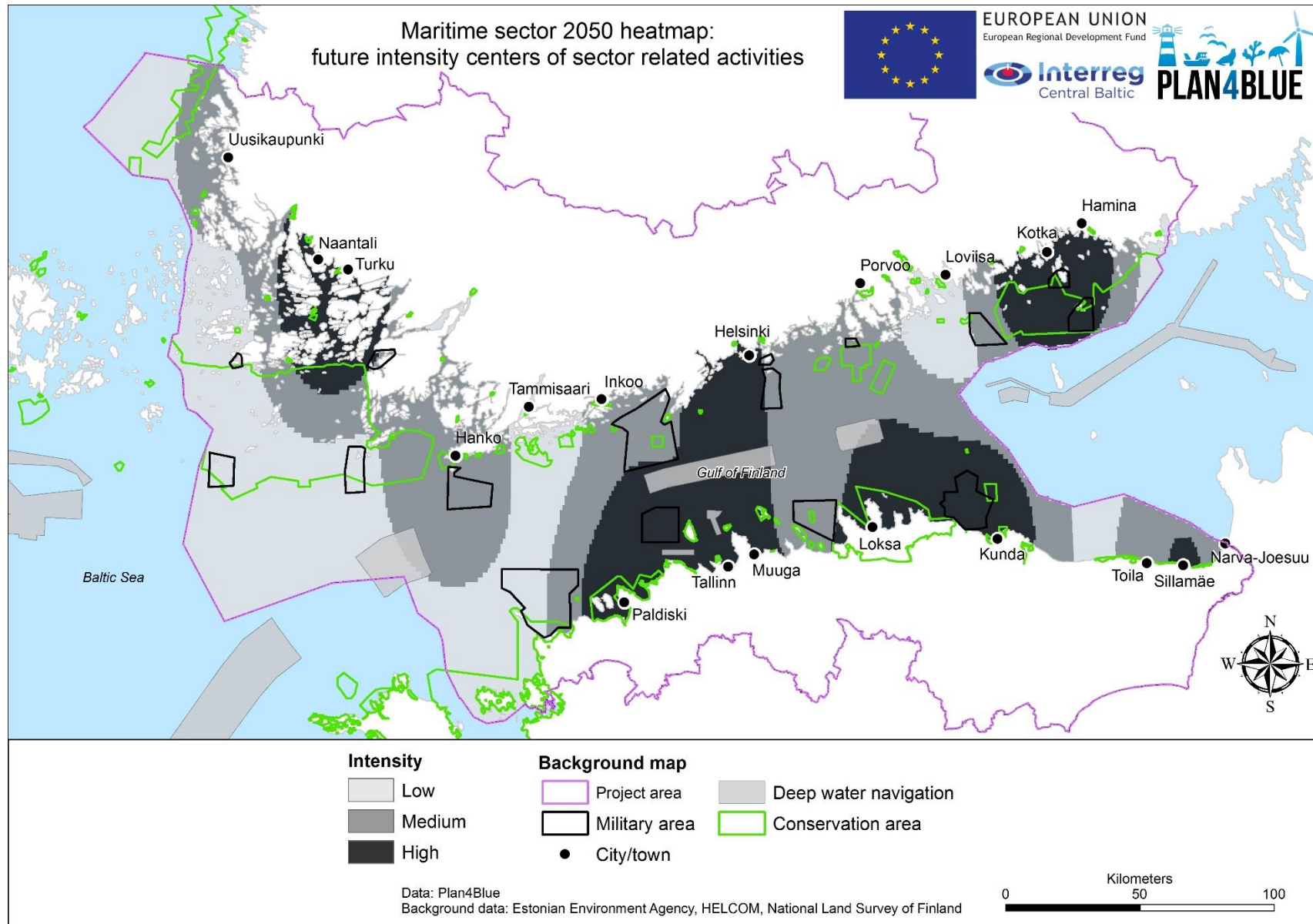
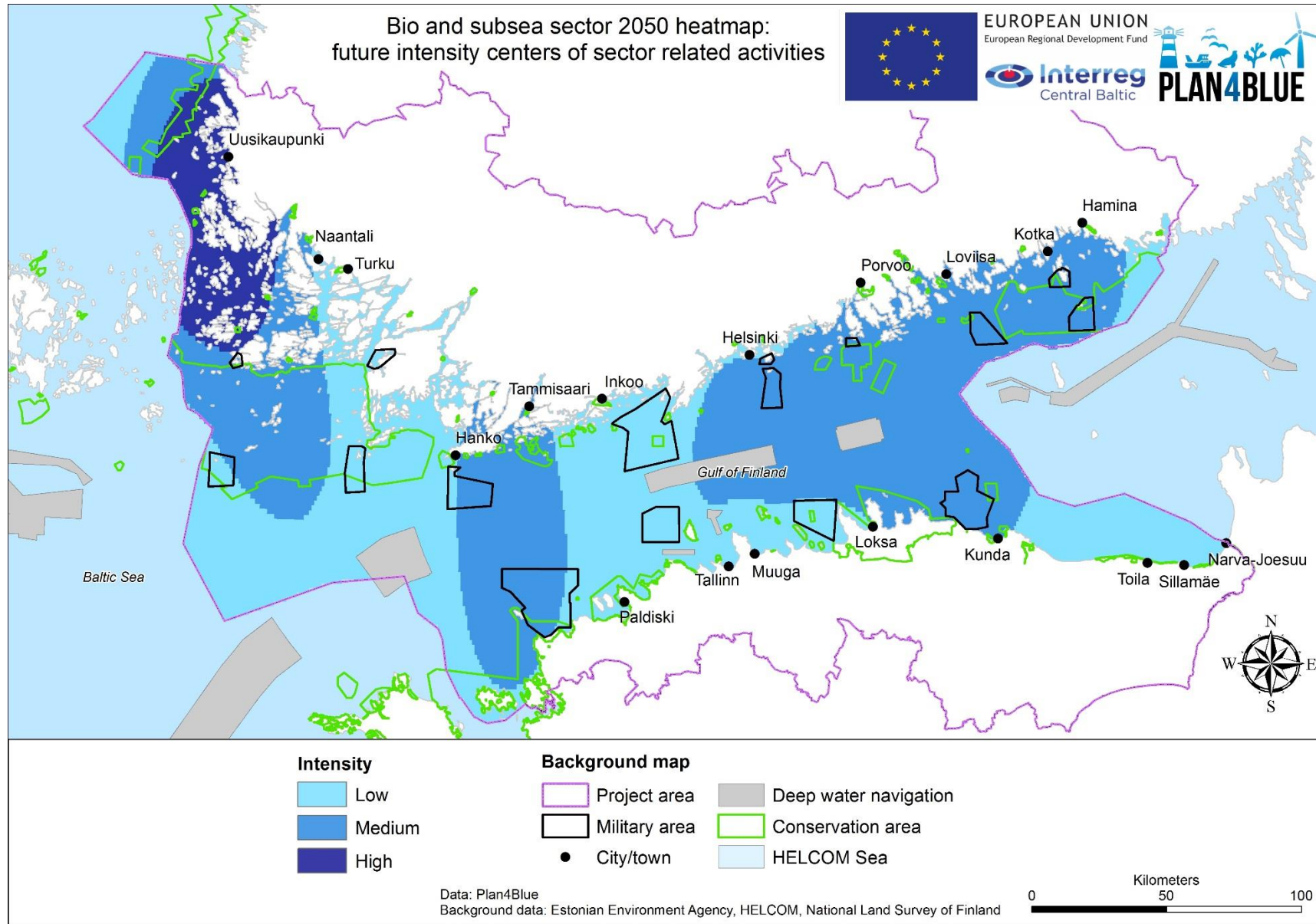


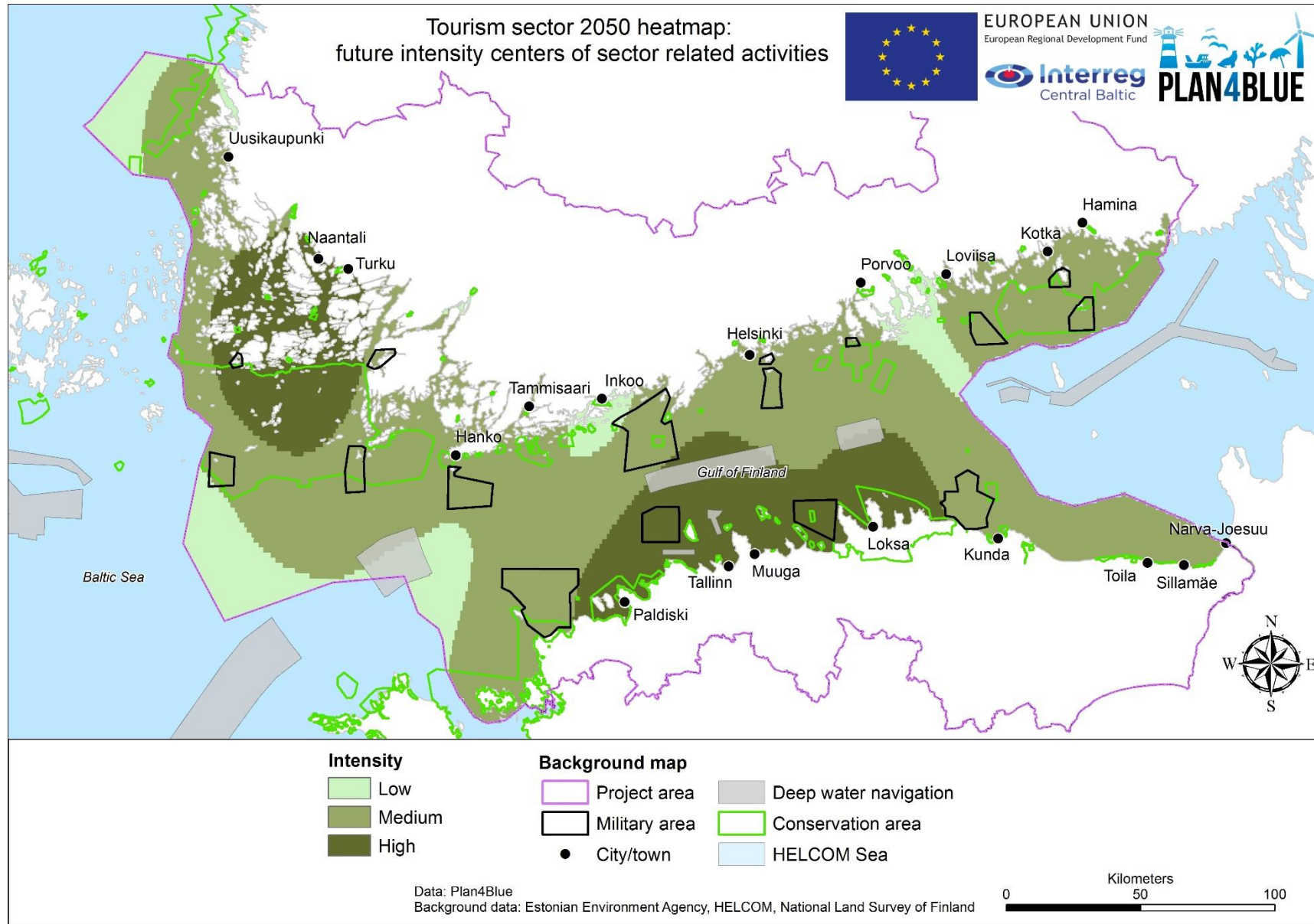
Figure 16. Maritime sector future scenario map indicating the cluster uses, potential, synergies and conflicts in the project area: intensity center is marked with black color (high).

### 5.3. Blue bio-economy and sub-sea resources



**Figure 17. Bio and sub-sea resources sector future scenario map indicating the cluster uses, potential, synergies and conflicts in the project area: intensity center is marked with dark blue color (high).**

## 5.4. Tourism



**Figure 18. Tourism sector future scenario map indicating the cluster uses, potential, synergies and conflicts in the project area: intensity center is marked with dark green color (high).**



## REFERENCES

Pöntynen, R., Erkkilä-Välimäki, E., Nylén, T. (2018). Plan4Blue report Deliverables D.T1.4.1 and D.T1.5.1 "Setting of Blue Growth Scenarios, Qualitative analysis based on expert opinions".

Silverman, B. W. (1986). Density Estimation for Statistics and Data Analysis. New York: Chapman and Hall.



European Regional Development Fund

European Union



[SYKE.FI/PROJECTS/PLAN4BLUE](https://syke.fi/projects/plan4blue)