Ecosystem Services of European Wetlands – Overview of Current Situation and Future Perspectives

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Outline

- Intro
- SCENES project & wetlands there
- Method
    - set of wetlands
    - ecosystem services
    - modelling
    - thresholds
    - analysed scenarios
- Results
- Conclusions

Intro – considered wetland types

P – precipitation
Q – flow

Intro – a scenario overview

Boundaries
- Spatial
- Thematic
- Temporal

Key Dimensions
- Variables

Current Situation
- Historic context
- Institutional description
- Quantitative accounts

Driving Forces
- Trends
- Processes

Critical Uncertainties
- Resolution alters course of events

Plot
- Captures dynamics
- Communicates effectively

What is NOT a scenario?

Scenarios are not **forecasts**, **projections**, or **predictions**.

K. Kok

Intro – 6 FP Scenes project

To develop and analyze a set of **scenarios** of Europe's freshwater futures up to 2050

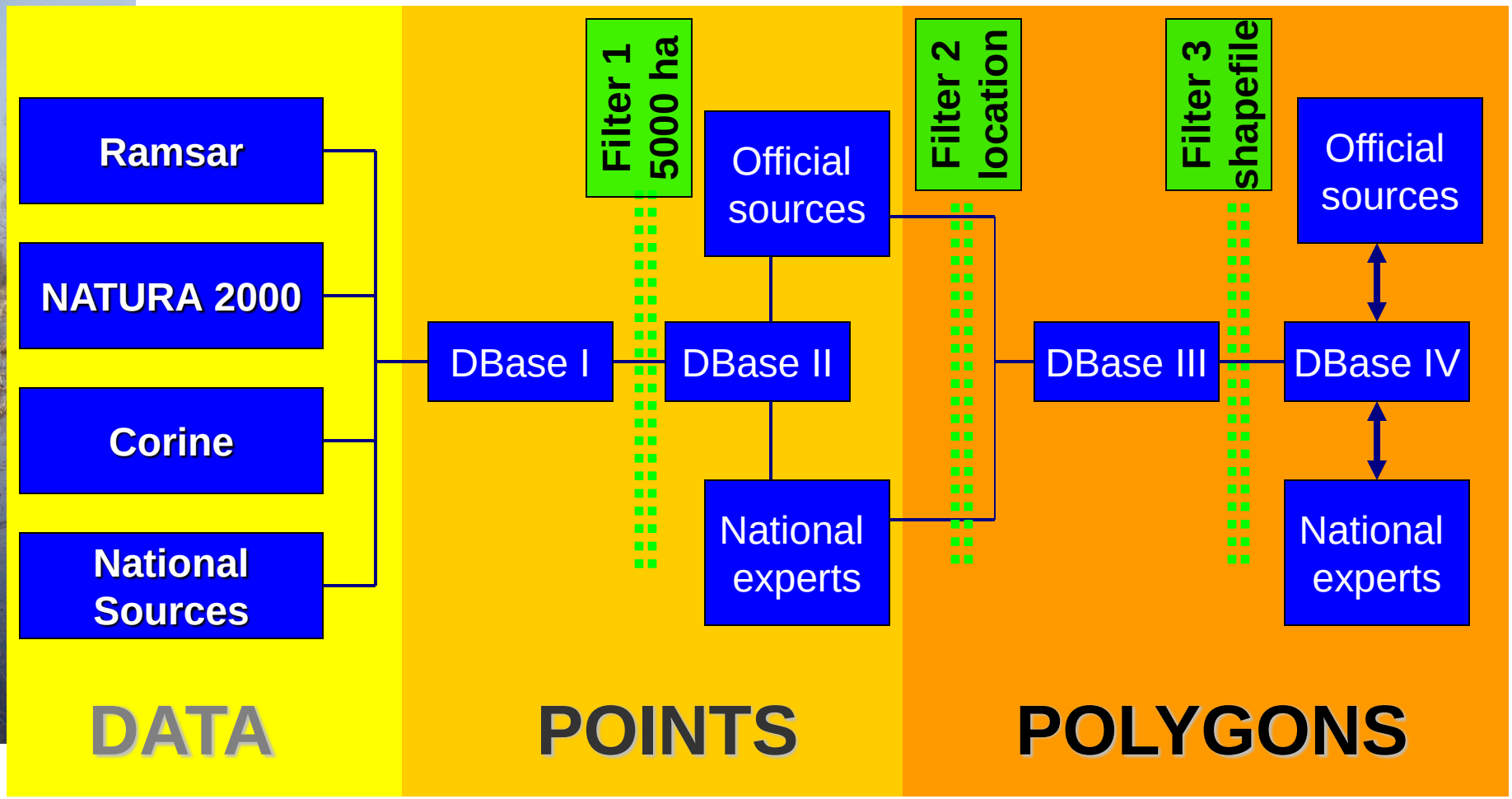
The scenarios:

- provide reference point for strategic planning
- alert policymakers and stakeholders
- allow river basin managers to test water plans

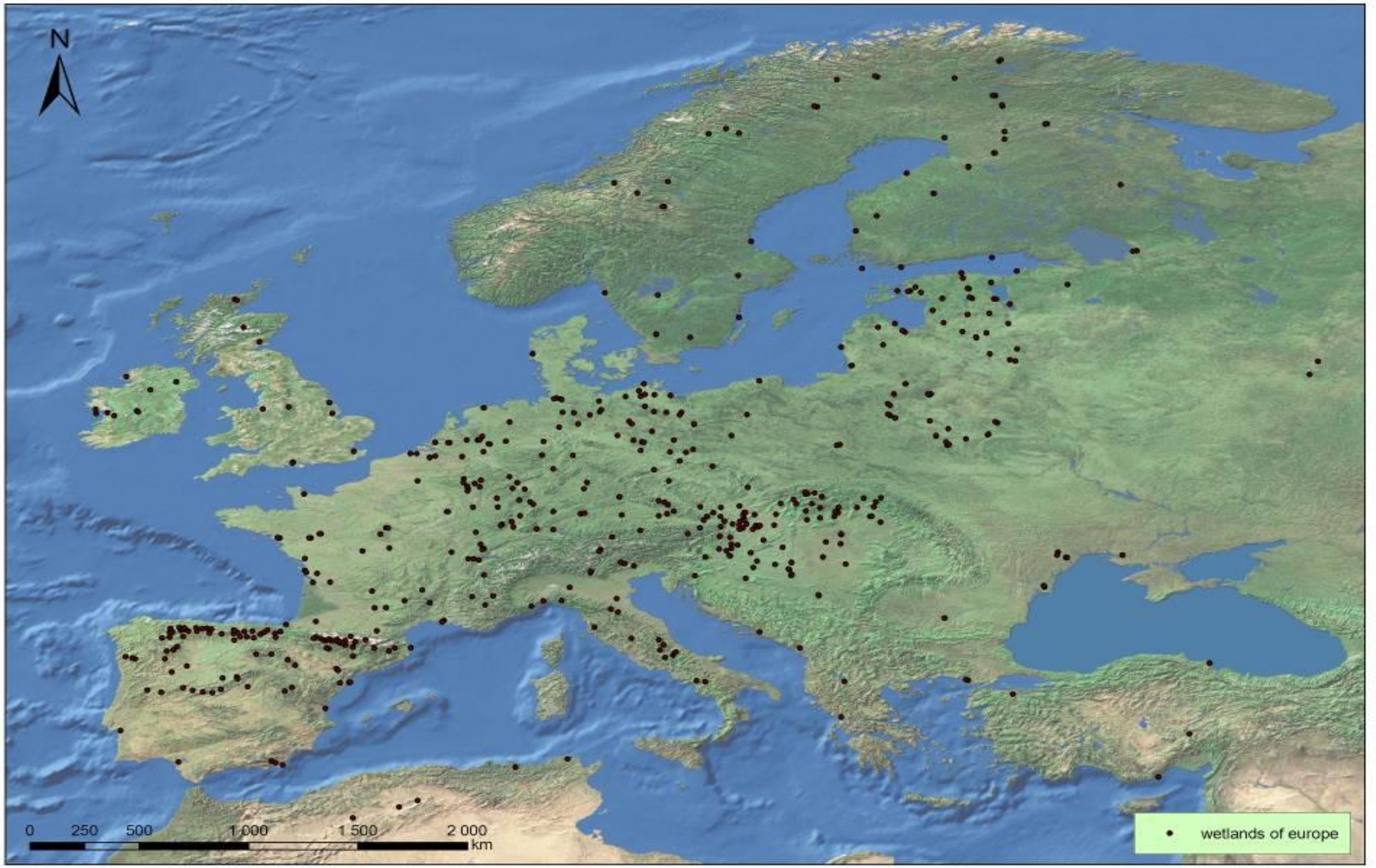
Intro – Scenes quantify analysis

- Analysing the socio-economic and environmental and ecological impact of changes in water resources for different water system services and water sectors
  - agriculture (irrigation), biodiversity, drinking water supply and sanitation, recreation and tourism, industry, hydropower, cooling water
  - clustered in 4 groups
    - ✓water for food
    - ✓water for nature
    - ✓water for people
    - ✓water for industry
- Quantification by using indicators

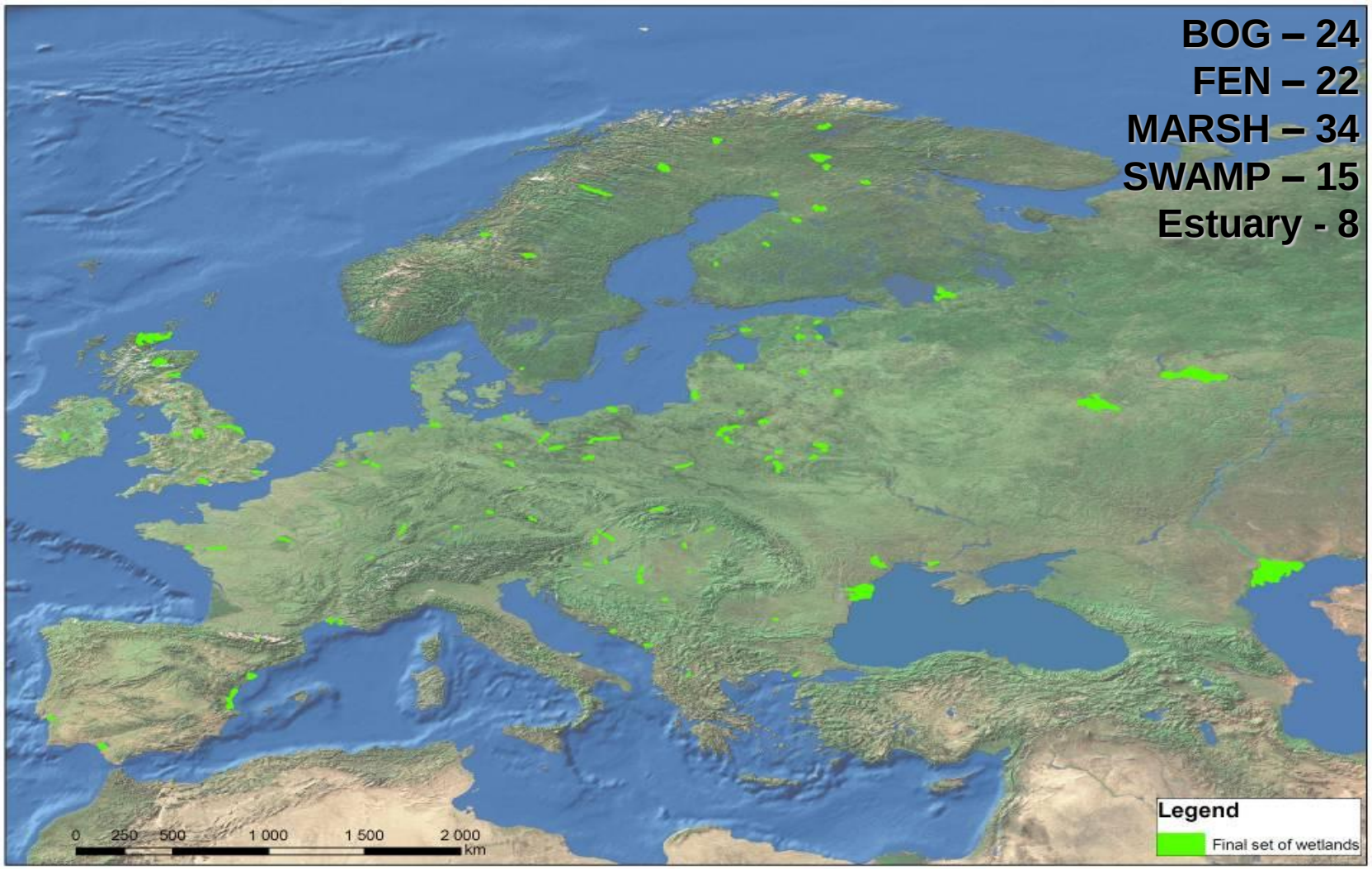
Methods – data set



Example: dbase II, wetlands >5000 ha, 470 centroids

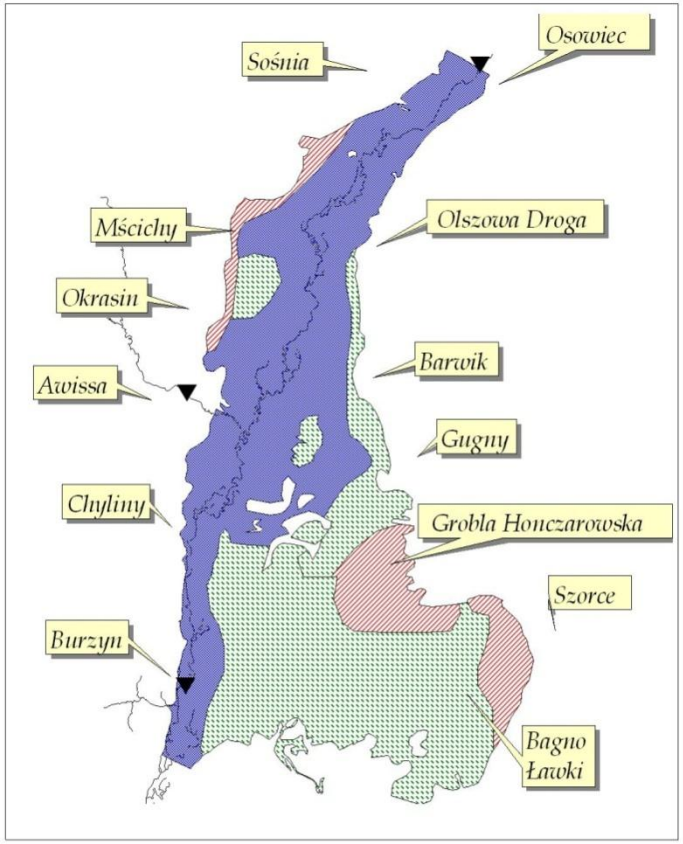


Example: dbase IV, wetlands >5000 ha, 103 polygon shapefiles



Hydrological types of wetlands

Example: Biebrza, different hydrological types in one wetland



Ecosystem services considered

Carbon storage

Habitat for birds

Habitat for vegetation

Production

Fish spawning

Nutrient removal

Methods – when service is lost?

Change of the hydrological characteristics comparing to the baseline:

- **Habitat for birds**
  no inundation or change of timing of inundation(S,M) or water balance negative (B,F)
- **Fish spawning**
  no inundation (M,S) or loss of 25 % of freshwater inflow (E)
- **Habitat for vegetation**
  no inundation (S,M) or water balance negative (B, F)
- **Carbon storage**
  water balance negative (B,F)
- **Nutrient removal**
  no inundation (S,M)
- **Production of goods**
  no inundation (S,M) or water balance changed by +100% (F)

Methods – WaterGAP 2 model overview

- Land Cover
- Climate

→ ***Water Availability***

→ **Water Availability**
- Runoff
- Groundwater recharge

↓

River Basin Water Stress

↓ **Water Withdrawals**

↑ **Wastewater Loadings**

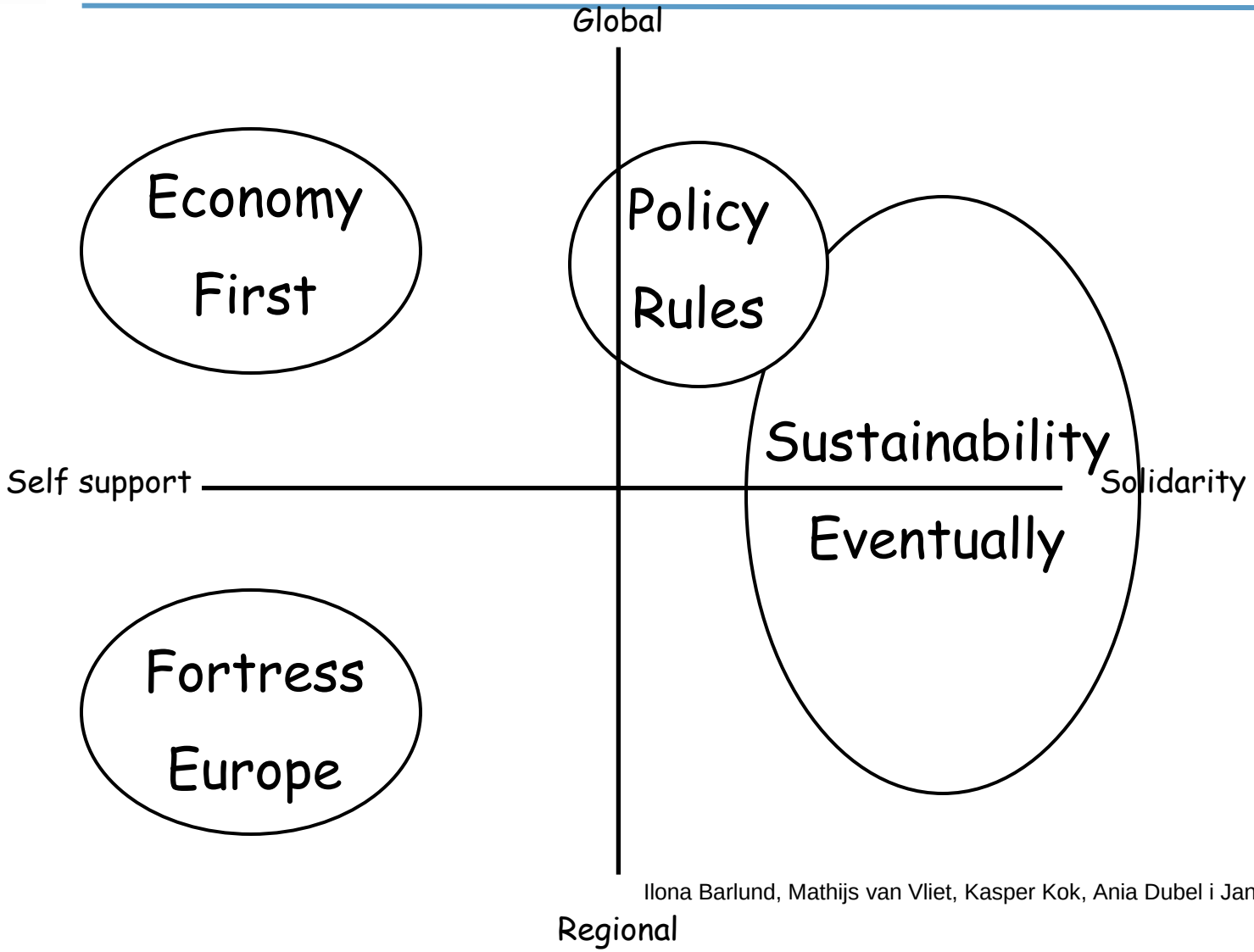
- Population
- Income
- Technology
- Climate

→ ***Water Use***

↓

J. Alcamo

Methods – socio-economic scenarios

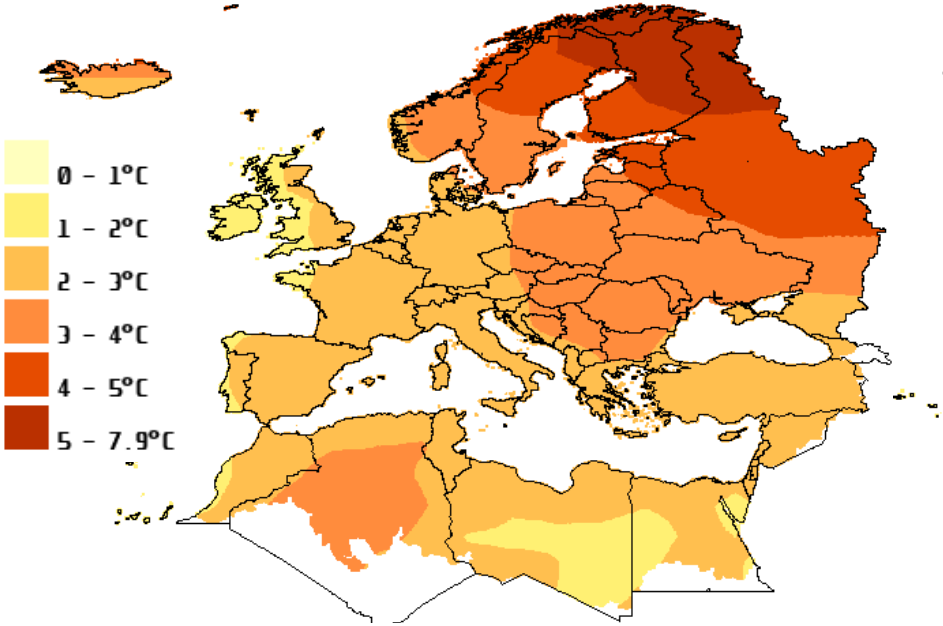


Ilona Barlund, Mathijs van Vliet, Kasper Kok, Ania Dubel i Jan Sendzimir.

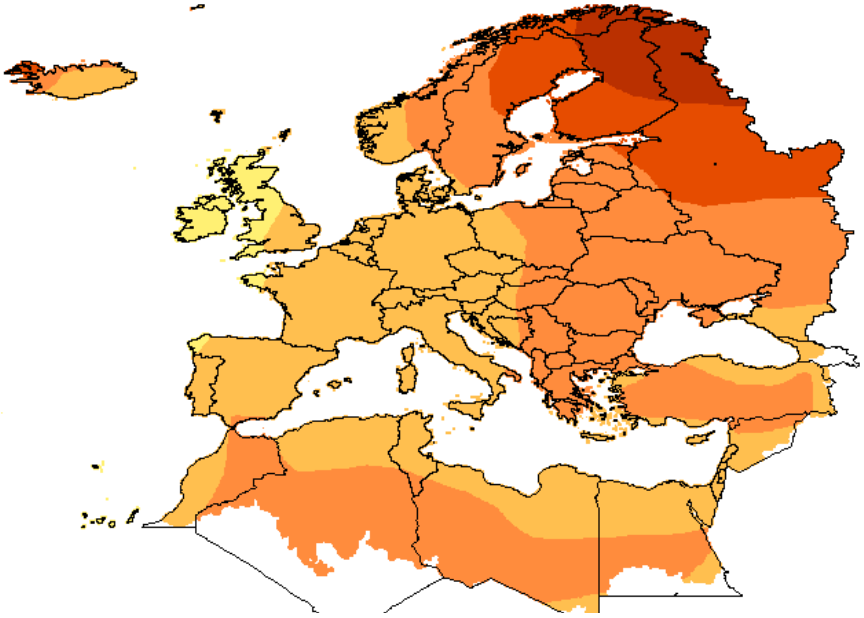
Methods – GCM & CC emission scenario

- In SCENES project two combination for Climate Change has been chosen and described by Global Circulation Models using A2 emission scenario:
- 1) The IPSL-CM4 model from the Institute Pierre Simon Laplace, France representing an A2 scenario (IPCM4-A2).
  2) The MICRO3.2 model from the Center for Climate System Research, University of Tokyo, Japan representing an A2 scenario (MIMR-A2).
- A2 emission scenario has been chosen by Pan-European Panel of experts;
- CC approach: difference between the GCM results for 2015-2045 (2025) and for (2040-69) and the reference climate 1961-90
- Variables: air temperature & precipitation

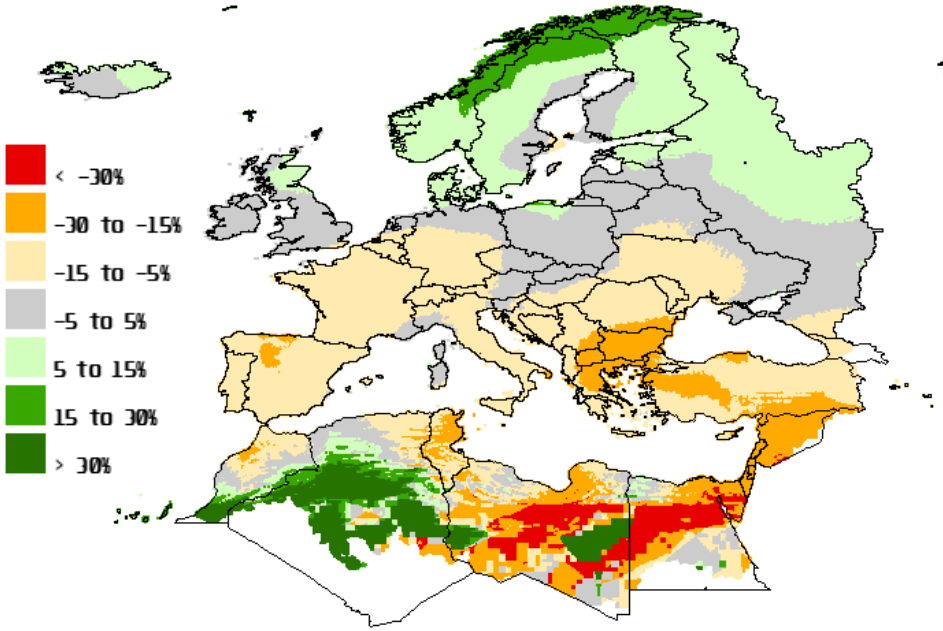
Temp. IPCM4-A2



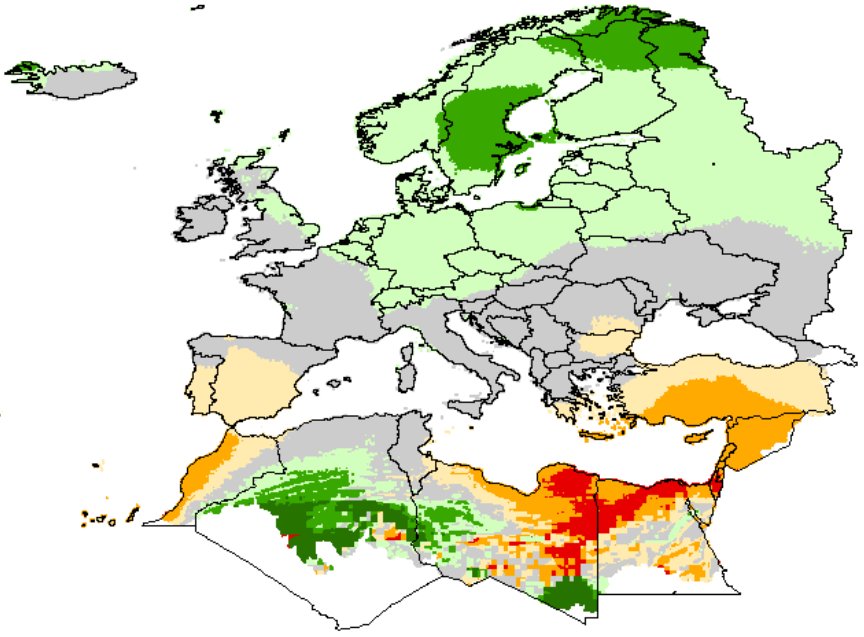
Temp. MIMR-A2



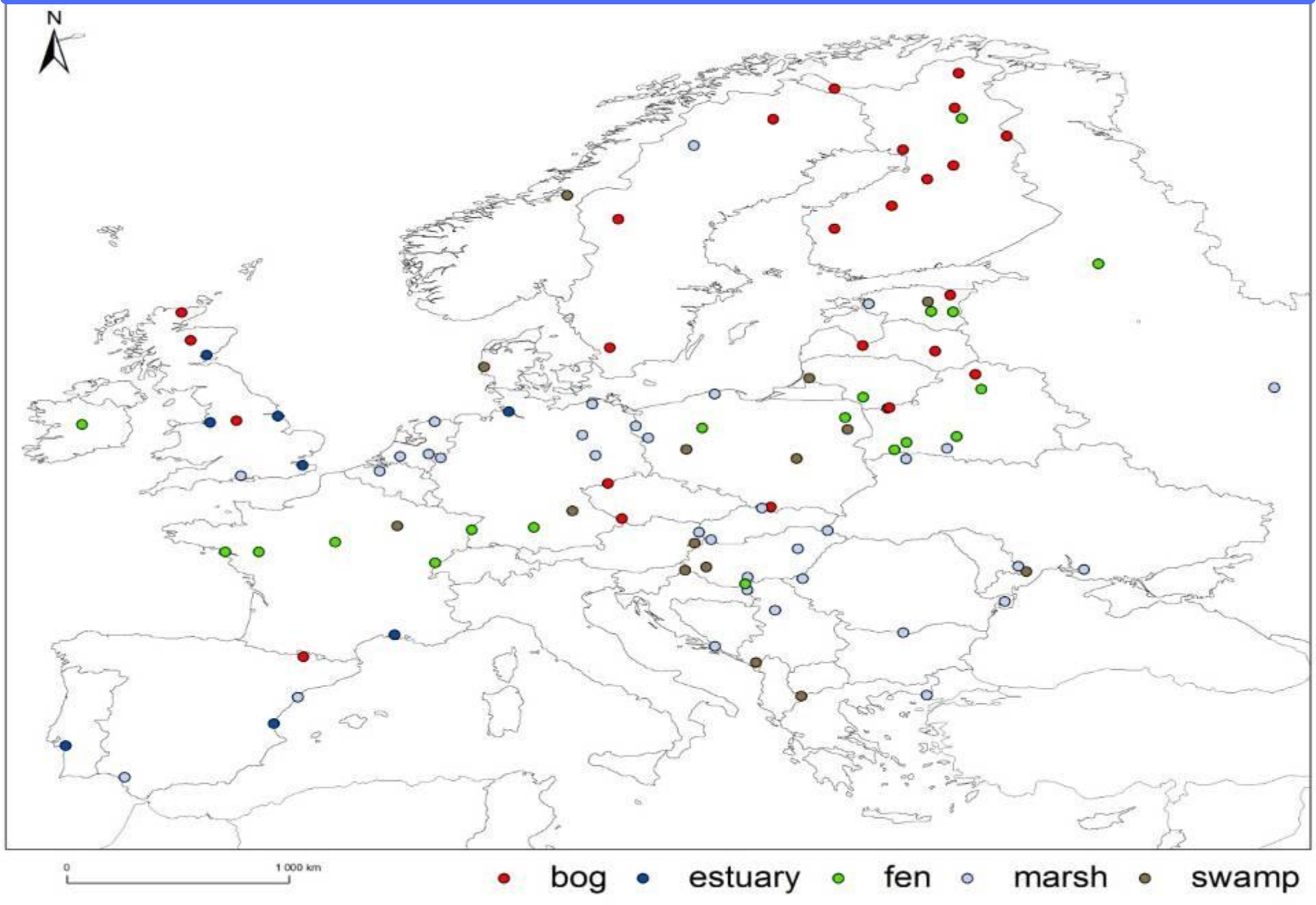
Prec. IPCM4-A2



Prec. MIMR-A2

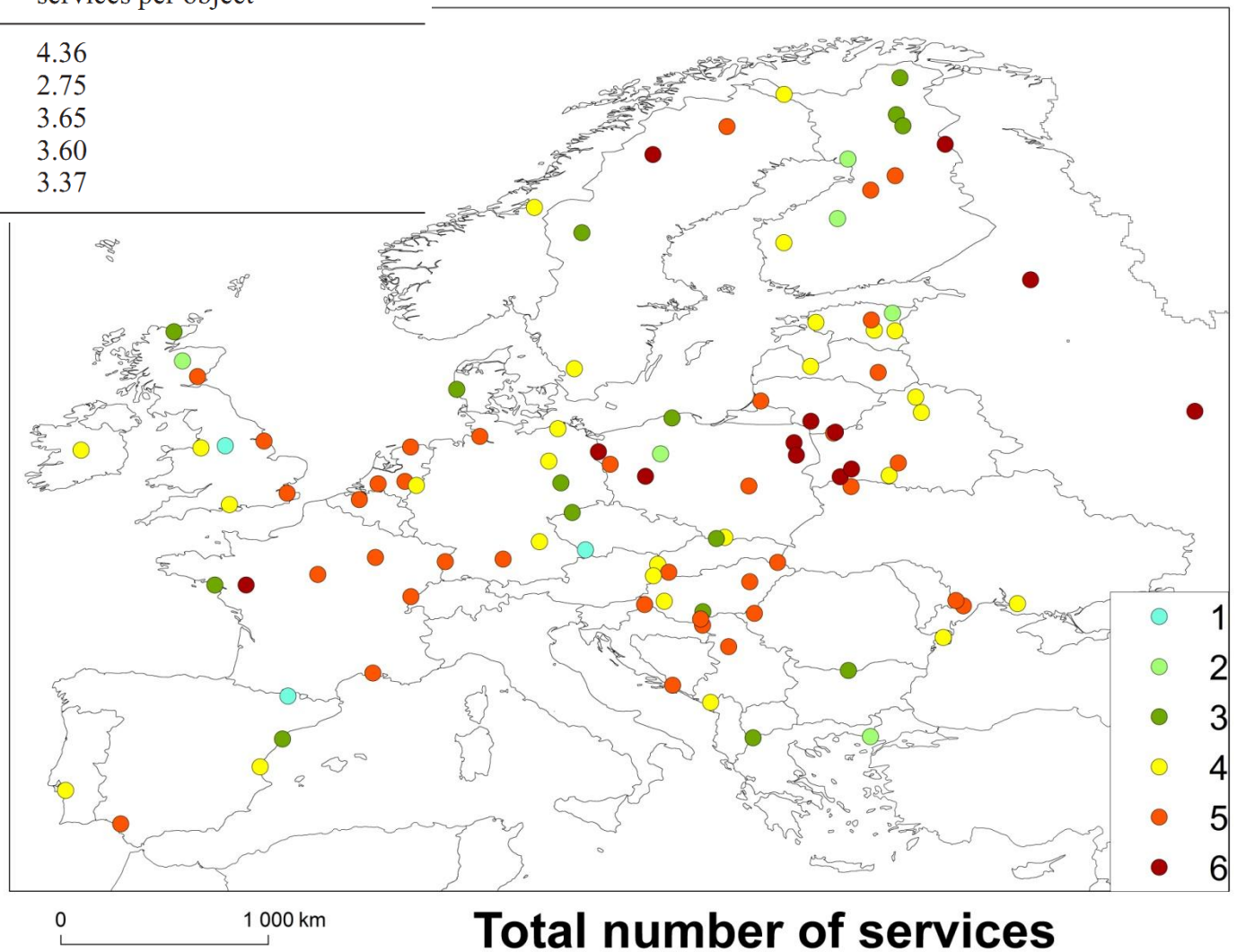


Results – 103 set of wetlands of dominant hydrological type



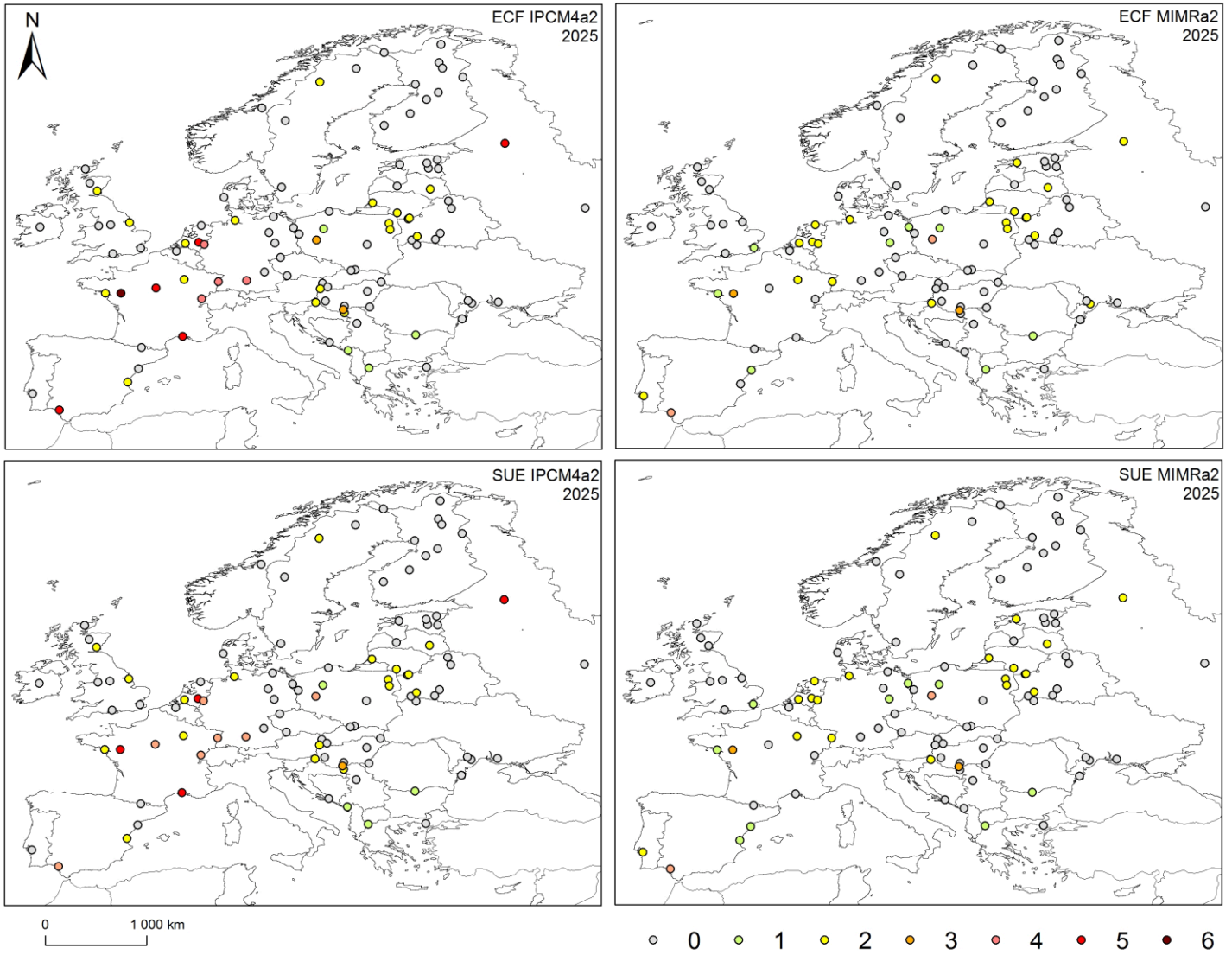
Results – current services

Type of wetland	Average number of ecosystem services per object
Fens	4.36
Bogs	2.75
Marshes	3.65
Swamps	3.60
Estuaries	3.37

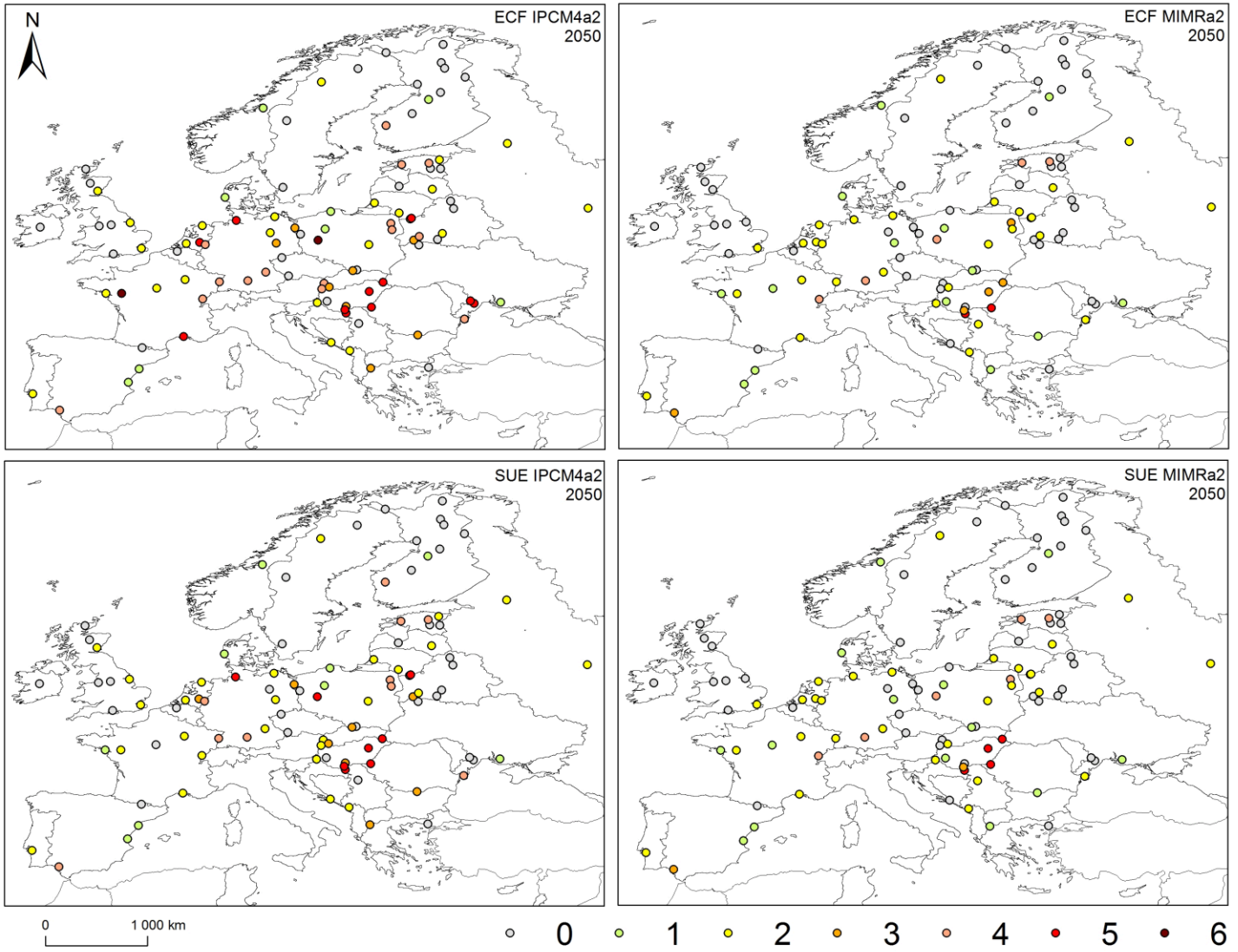


Total number of services

Results – year 2025 compared to present



Results – year 2050 compared to present

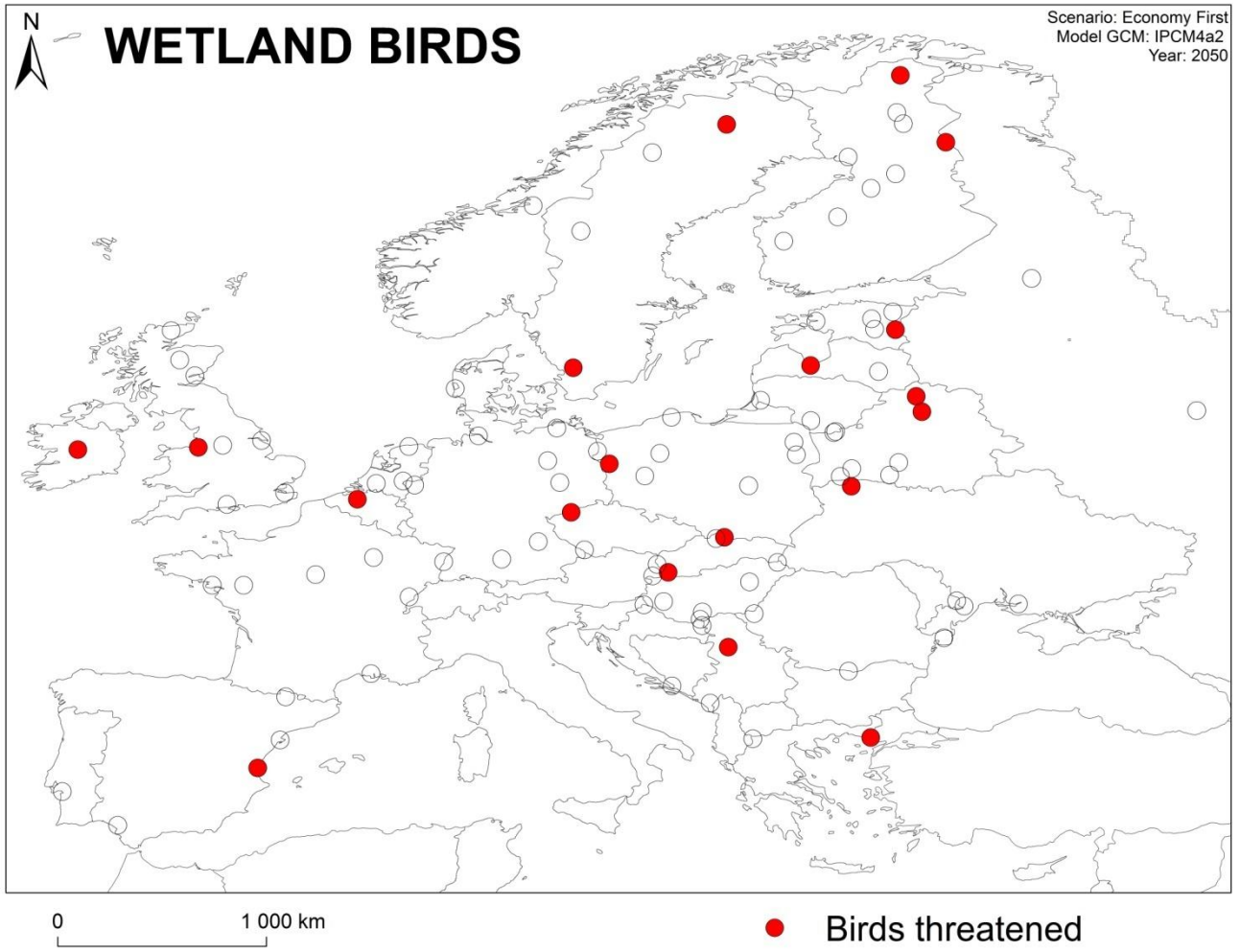


Results – summary

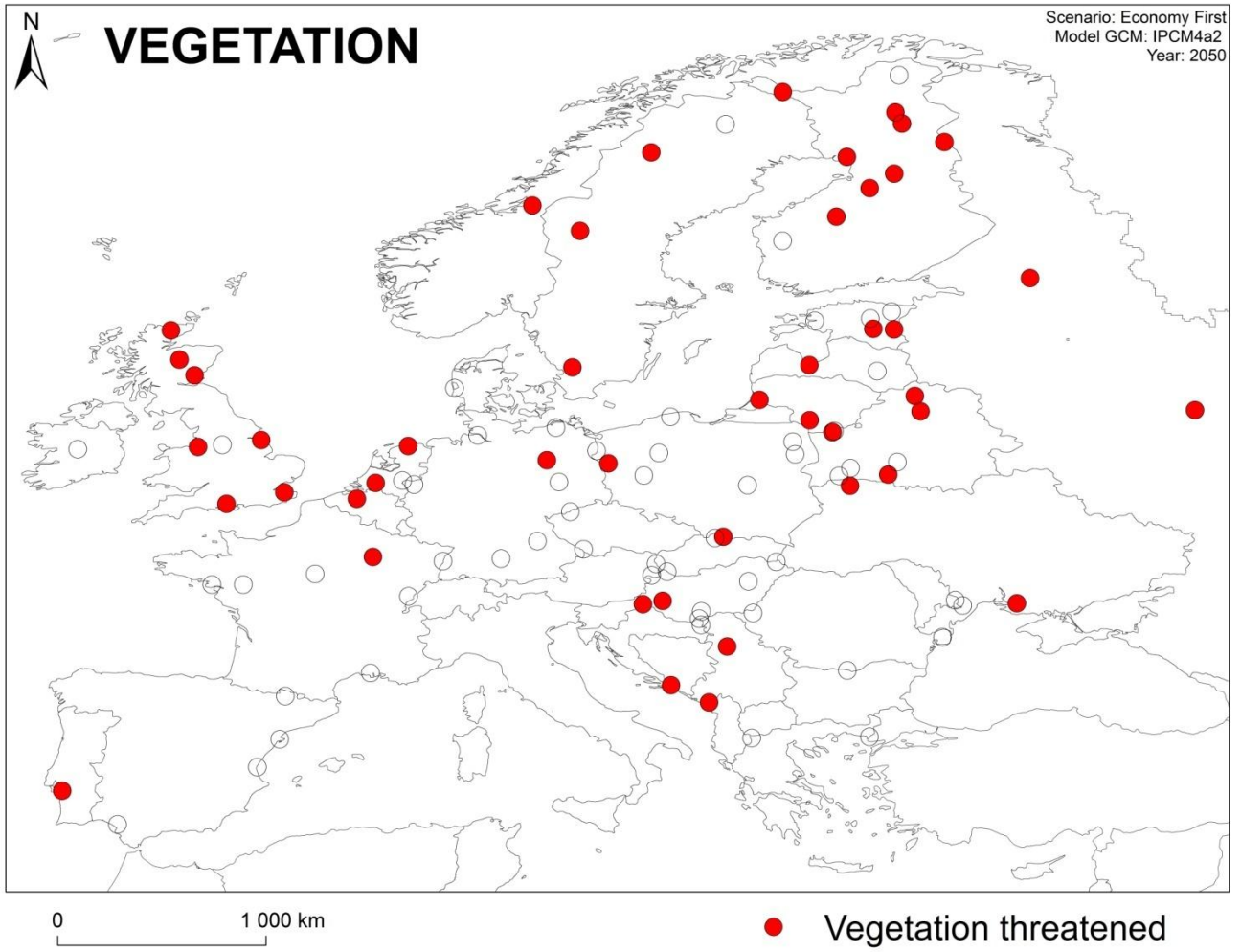
In total 441 services now

SCENARIO	Ecosystem services						Lost
	Wetland Bird	Wetland vegetation	Carbon storage	Production of goods	Nutrient removal	Fish spawning	
2025_ECF_IPCM4a2	43	67	46	72	72	46	**95**
2025_SUE_IPCM4a2	43	67	48	72	73	45	**93**
2025_ECF_MIMRa2	46	74	48	77	83	49	**64**
2025_SUE_MIMRa2	47	74	48	77	83	49	**63**
2050_ECF_IPCM4a2	21	47	36	55	54	21	**207**
2050_SUE_IPCM4a2	28	55	40	59	60	30	**169**
2050_ECF_MIMRa2	32	67	46	73	75	31	**117**
2050_SUE_MIMRa2	32	67	46	73	75	30	**118**

Ecosystem services of European Wetlands - 2050



Ecosystem services of European Wetlands - 2050



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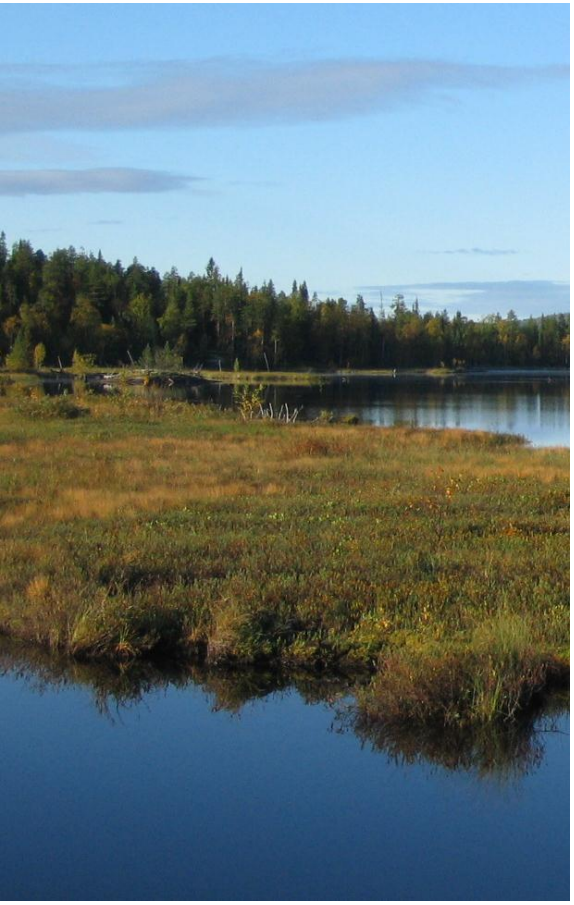
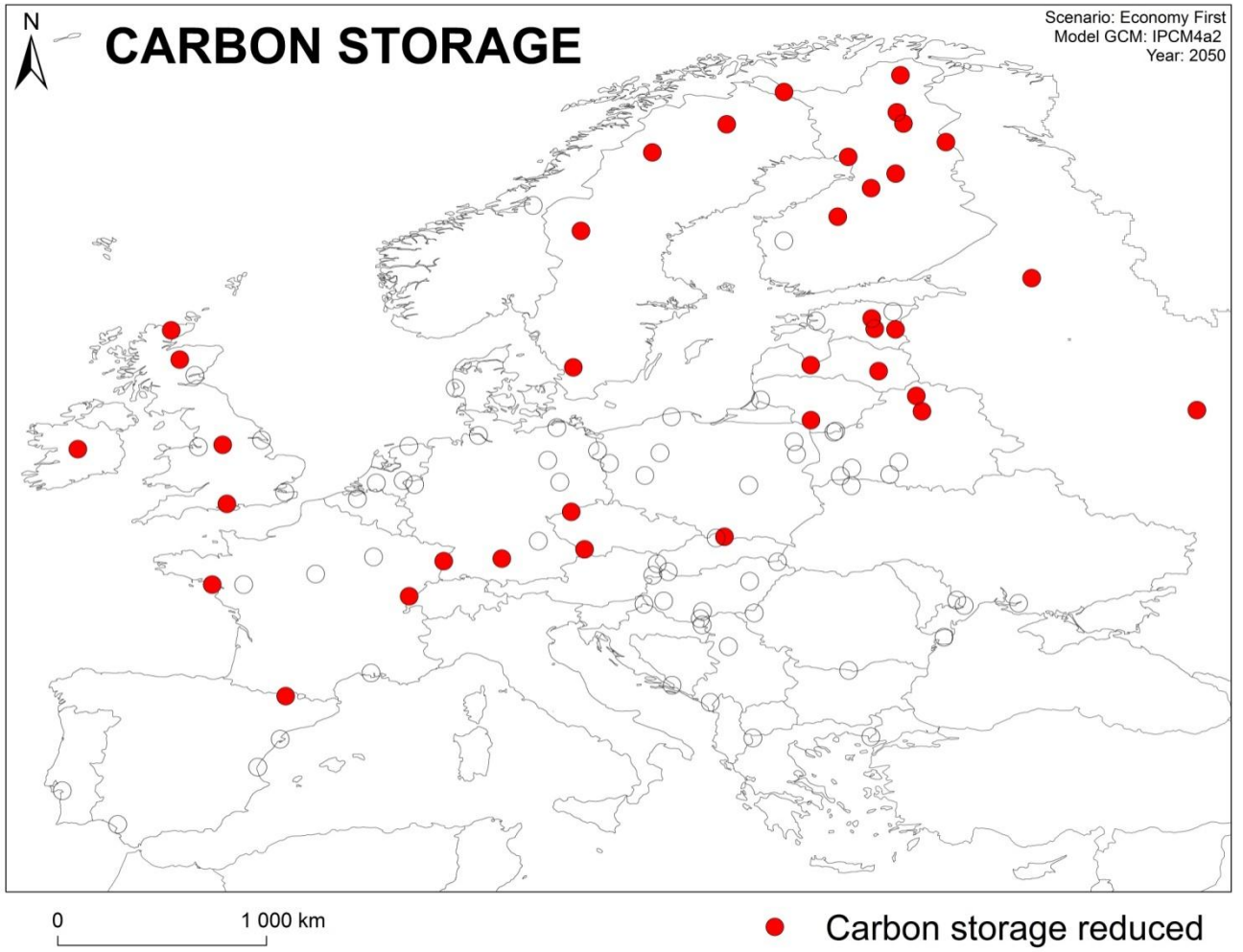
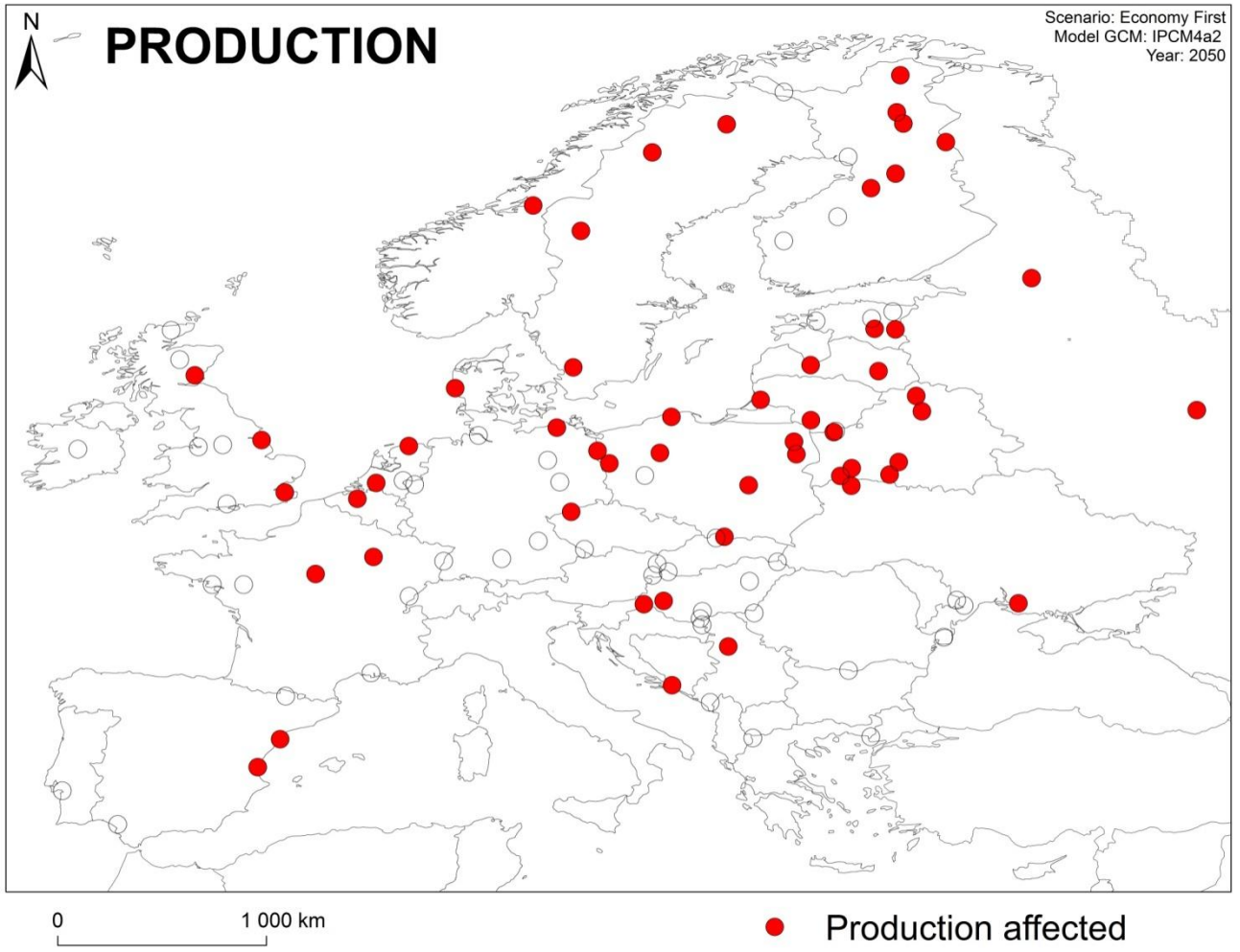
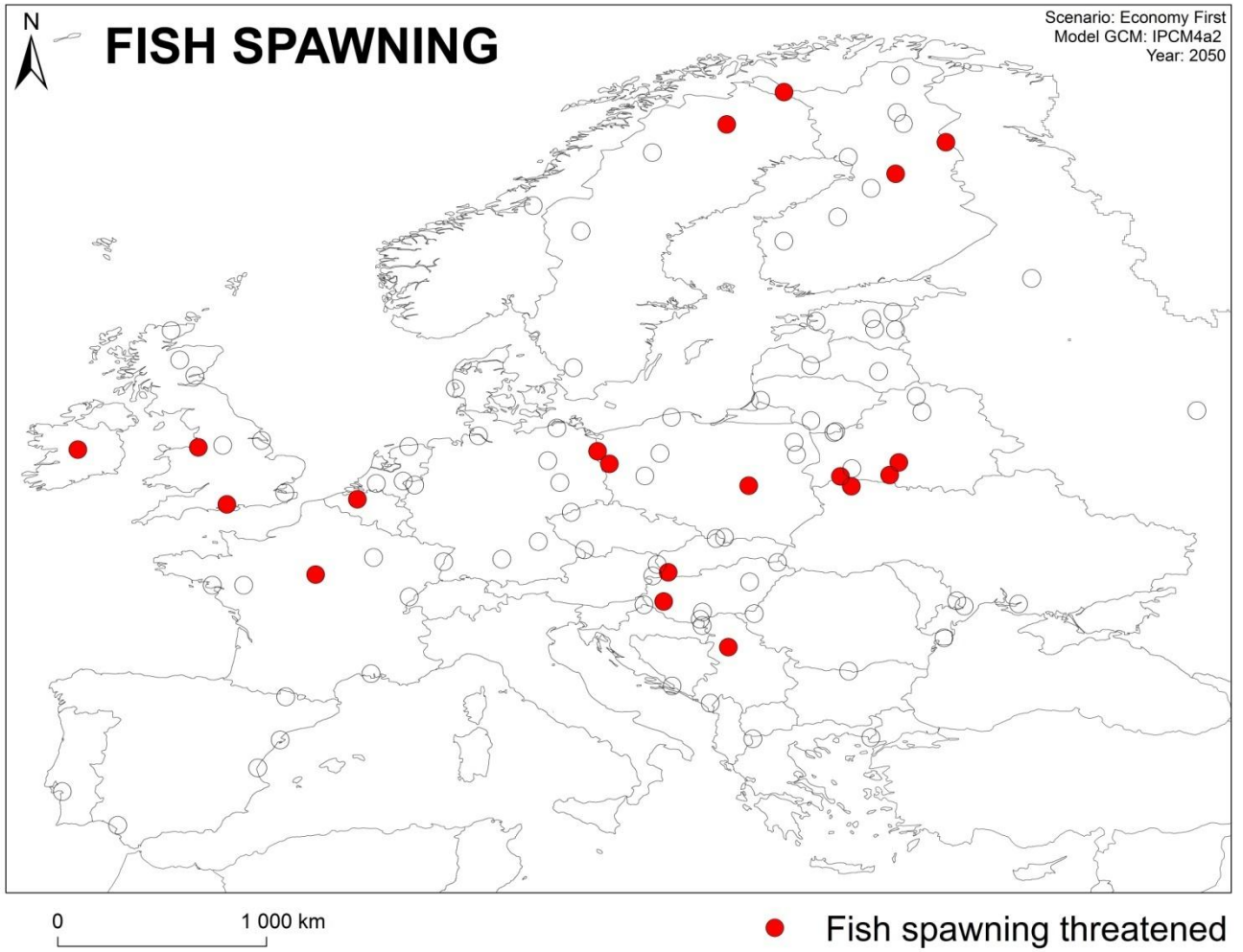




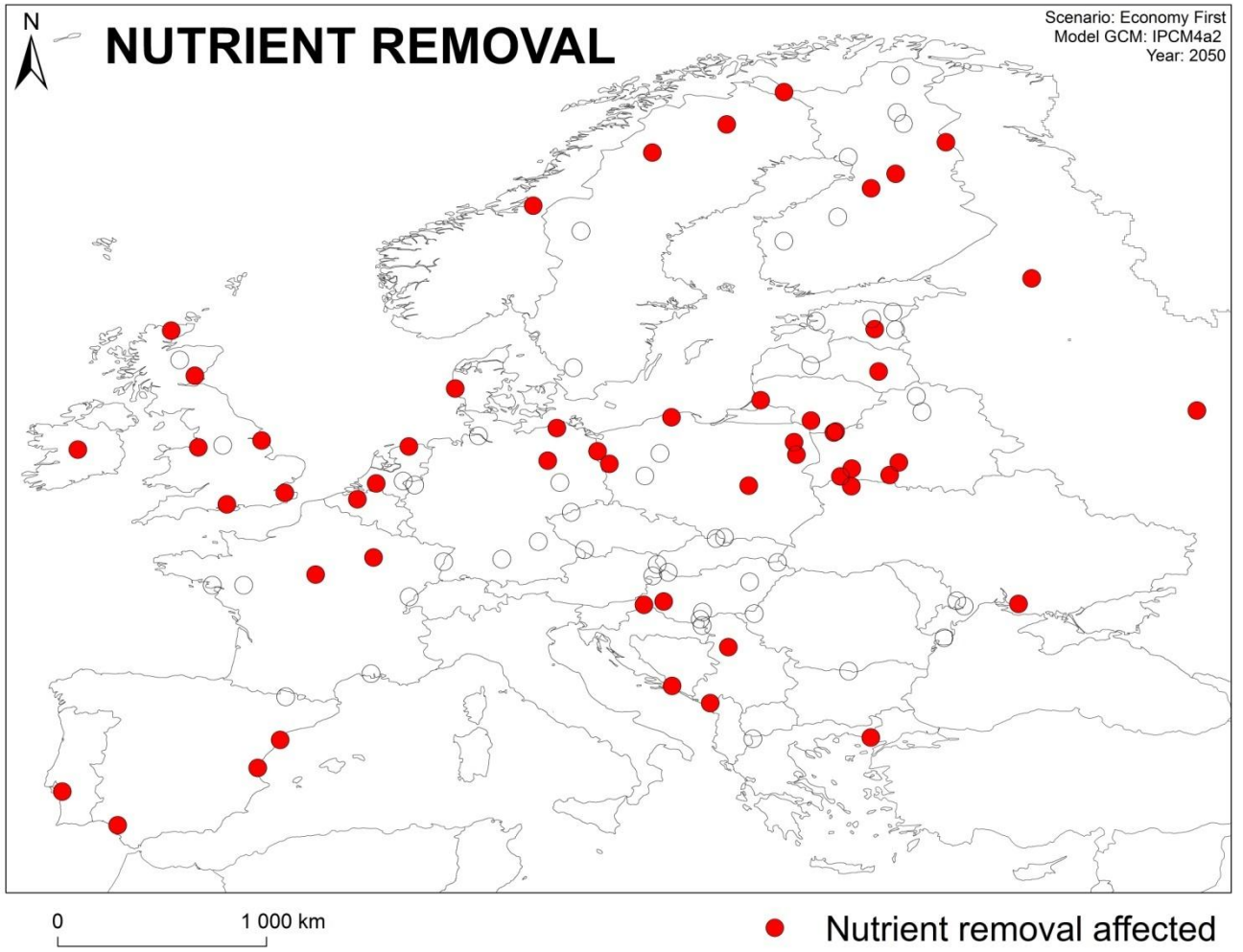
Ecosystem services of European Wetlands - 2050



Ecosystem services of European Wetlands - 2050



Ecosystem services of European Wetlands - 2050



Conclusions

- We may face a very strong deterioration of wetlands ecosystem services in Europe;
- Very strong Climate signal - pattern of changes follows then pattern of GCM results;
- Riparian wetlands more vulnerable due to shift in flooding and water use (in some regions) then fens and bogs (located in less affected regions of Europe);
- Lack of European wetlands inventory and assessment(s) of current status;

Conclusions- things to do …

- Definitions, classifications, data bases, etc.;
- Parameterisation of ecosystem services
- Scale issue and local models;
- Assessment of the small wetlands on continental scale;
- Climate Change - downscaling;

- Desk job important but …

Enjoy the fieldwork as well

Ławki marsh, Biebrza Lower Basin, 18 June 2006, 4 a.m.

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- Photographs used in this presentation: G. and T. Klosowscy, C. Werpachowski,