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Scenario analysis (impacts by 2050) for the Baltic Sea Basin

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Please note that the results shown in this presentation are preliminary and subject to revisions

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The Bonus Programme

Science for a better future of the Baltic Sea Region

The BONUS Programme is supported by the national research funding institutions in the eight EU member states around the Baltic Sea and the EU Research Framework Programme (Article 185). Scientists from the Russian Federation participate in BONUS research projects through special agreements.

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http://cordis.europa.eu/fp7/art185/about-185_en.html

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Project Concept: Regulation should exploit local variation in nutrient reduction and retention

If we can identify areas where subsurface reduction and instream retention takes place ➔ we can plan a more cost-effective regulation of nutrients to the Baltic Sea

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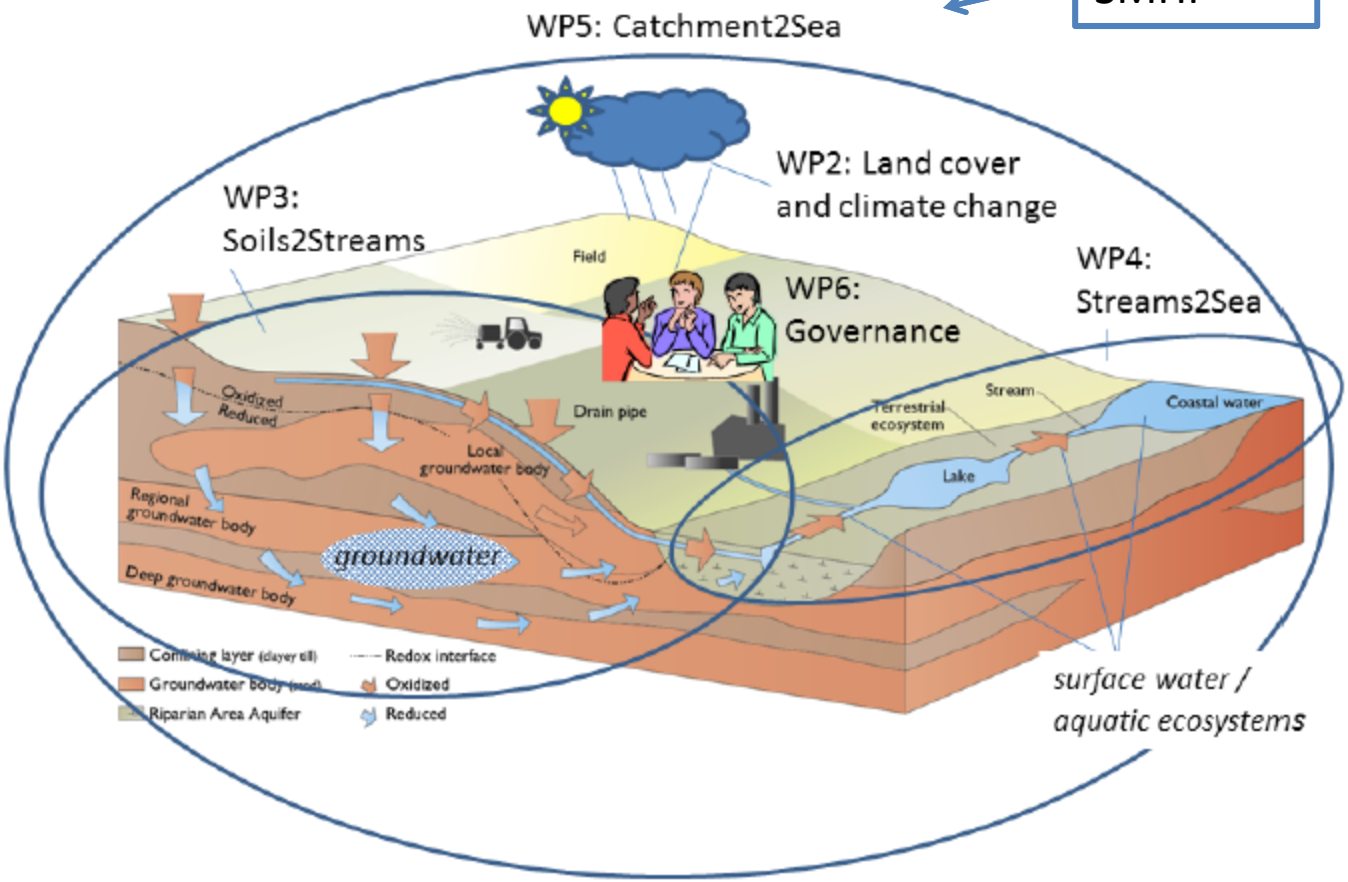
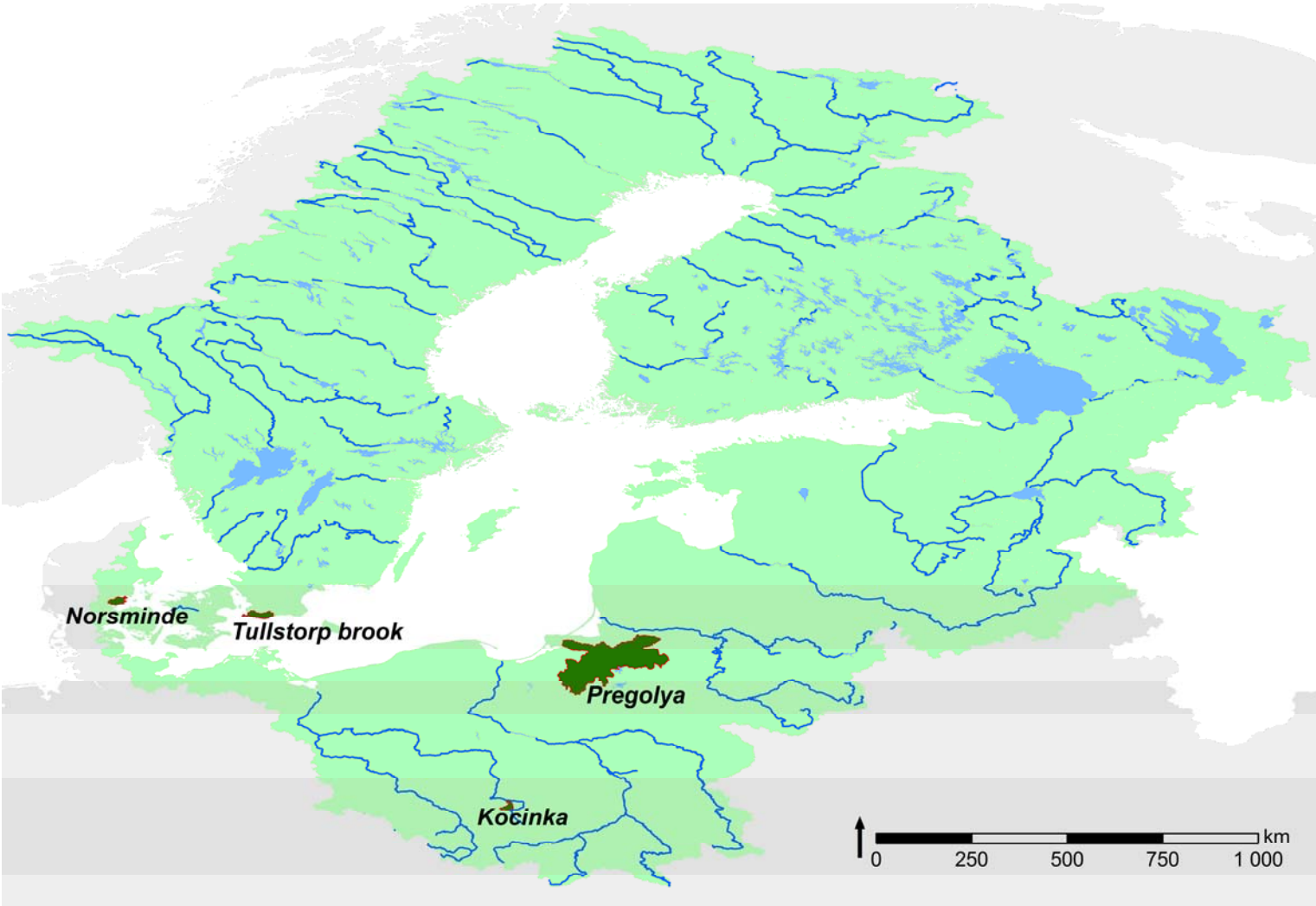


LS2SEA

Case study areas vs. Baltic Sea Basin



Scenarios for Baltic Sea Basin (BSB)

- RCP 8.5
  - Climate ”mini-ensemble”
  - Four scenarios to simulate the ”spread”
- Shared Socioeconomic Pathways (SSPs)
  - Land use projections
  - Assumptions on fertilization, wastewater treatment, population, etc.
- Measures
  - Applied to individual future projections
  - Spatially differentiated measures
  - Surface water retention

SSPs in Soils2Sea

SSP1: Sustainability

10% reduction in agricultural area

50% reduction in livestock production

10% increase in manure N use efficiency

Effective N fertilization reduced by 5%

SSP2: Middle of the road

-10% reduction in agricultural area

Current livestock production maintained

5% increase in manure N use efficiency

Effective N fertilization maintained at current level

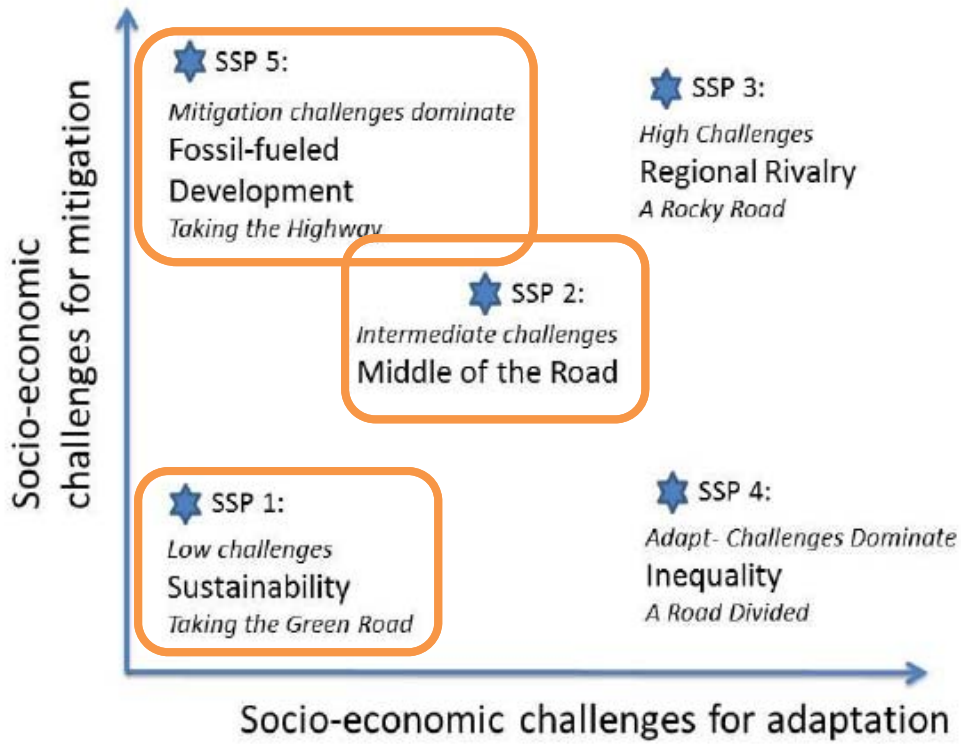
SSP5: Fossil fueled development

10% increase in agricultural area

50% increase in livestock production

5% reduction in manure N use efficiency

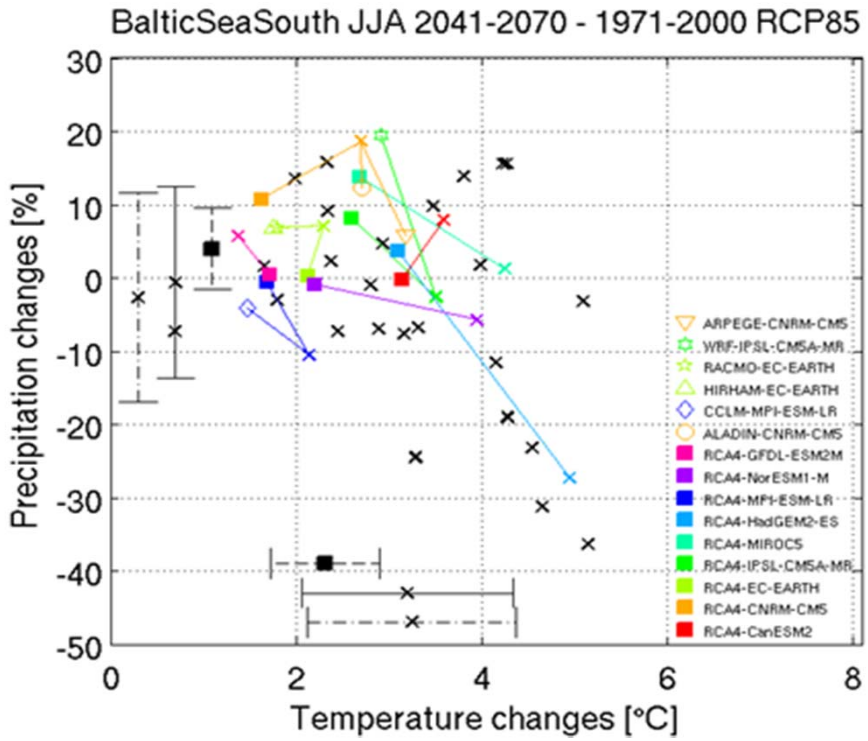
Effective N fertilization increasef by 5%



Selecting a CM ensemble for Soils2Sea

- RCP 8.5, summer months
- Mid-century time slice (2041 to 2070), reference period 1971 to 2000

- Spread in temperature and precipitation change in CORDEX ensemble
  - GCMs as crosses
  - RCA4 as filled squares
  - Other RCMs as open shapes



	P change lowest	P change highest	T change lowest	T change highest
RCP8.5	RCA4-CNRM-CM5 (CCLM-MPI-ESM-LR)	WRF-JPSL-CM5A-MR	CCLM-MPI-ESM-LR	RCA4-CanESM2 (ARPEGE-CNRM-CM5)

Land cover / land use model

Land cover

Urban area taken from expansion of existing urban areas (defined in SSPs)

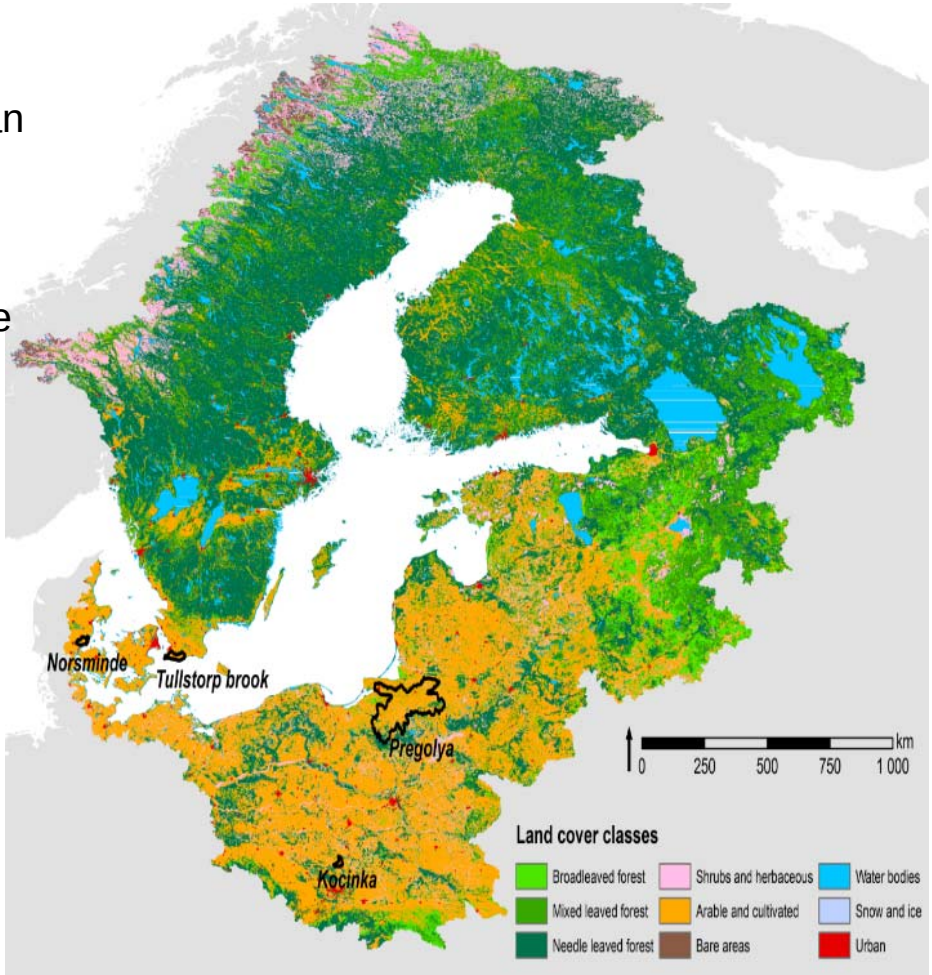
Land cover (agriculture, forestry, etc.) modelled from climate and soils using empirical models based on Random Forest procedure + the change from SSP

Land cover will thus depend on the specific combination of climate model and SSP

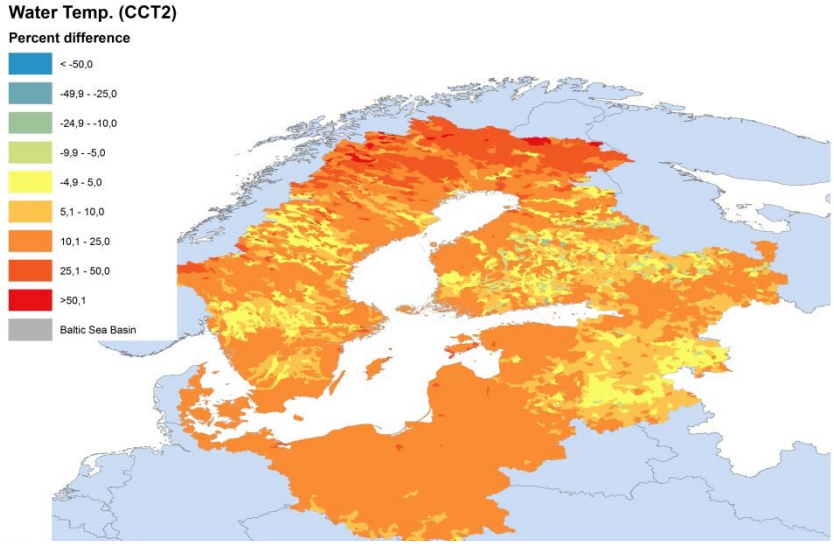
Land use

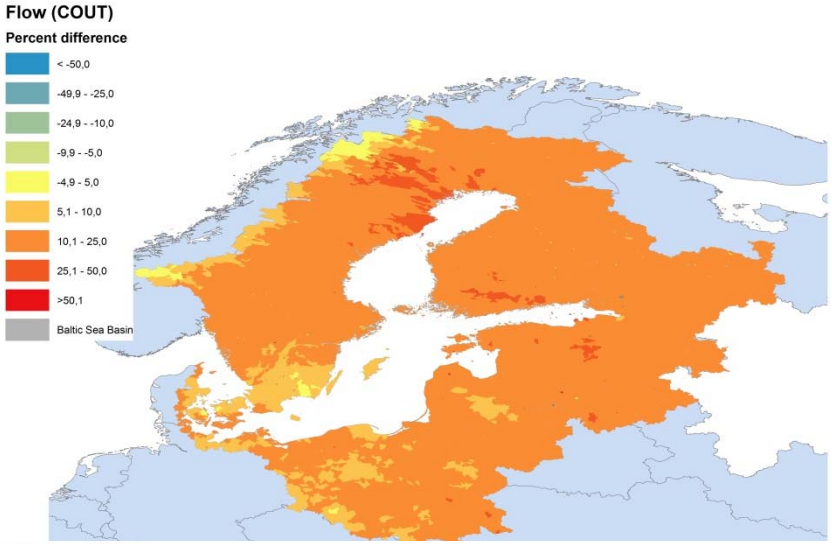
Current distribution between irrigation/non-irrigated

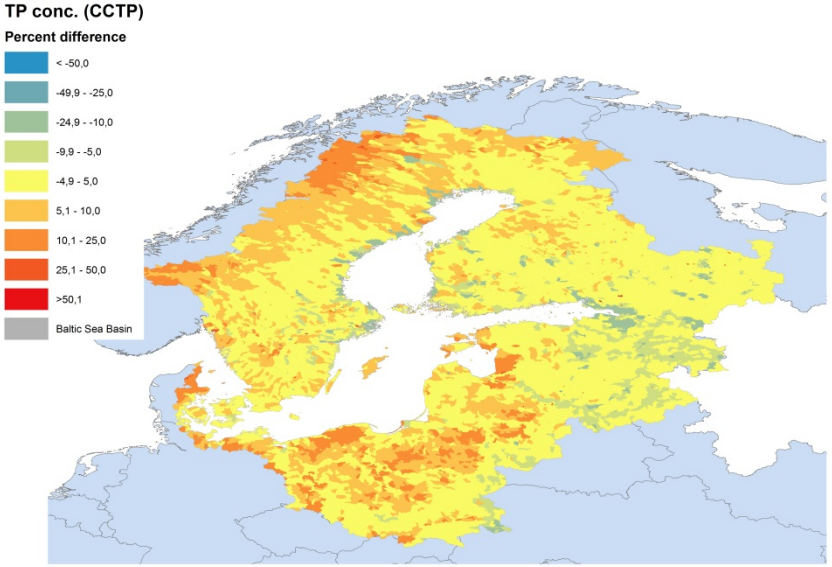
Winter/spring sown crops modeled to depend on temperature

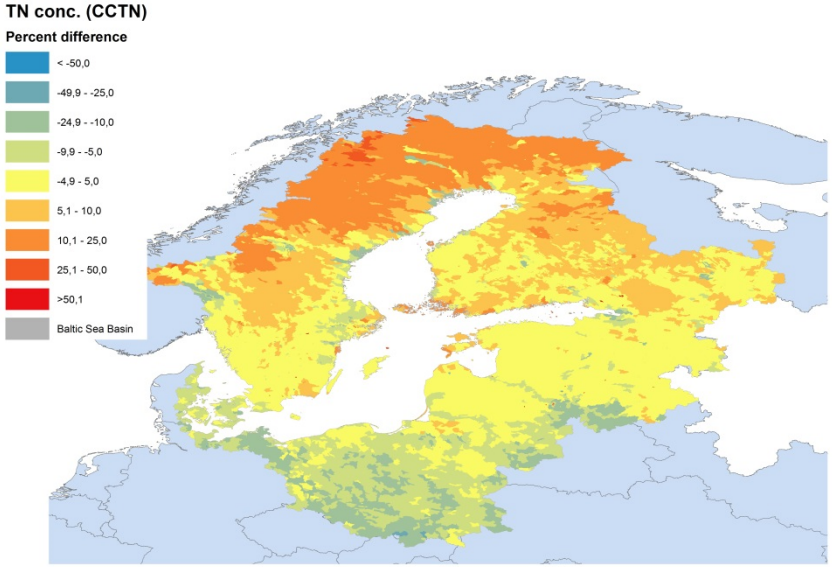


Percent difference for ensemble mean



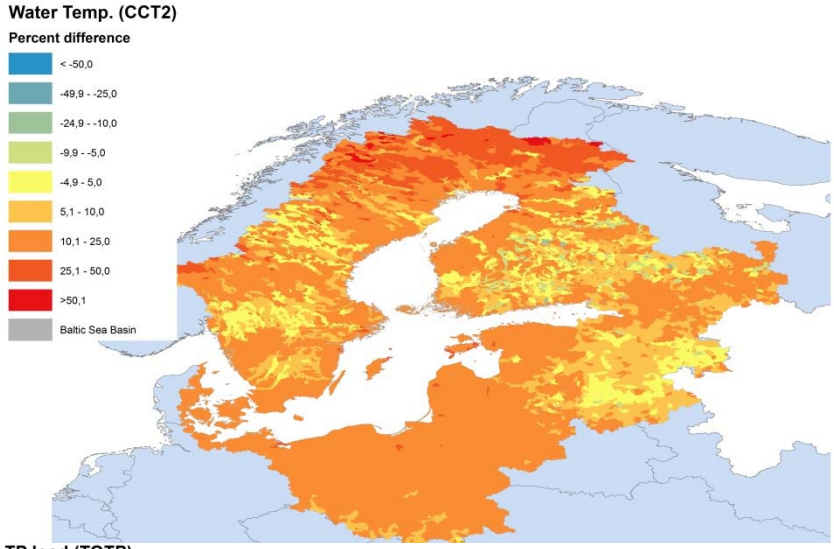


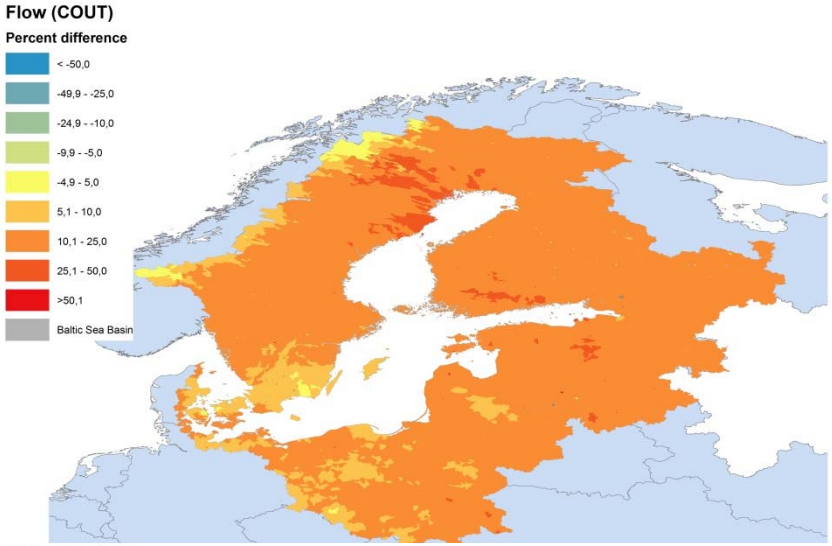


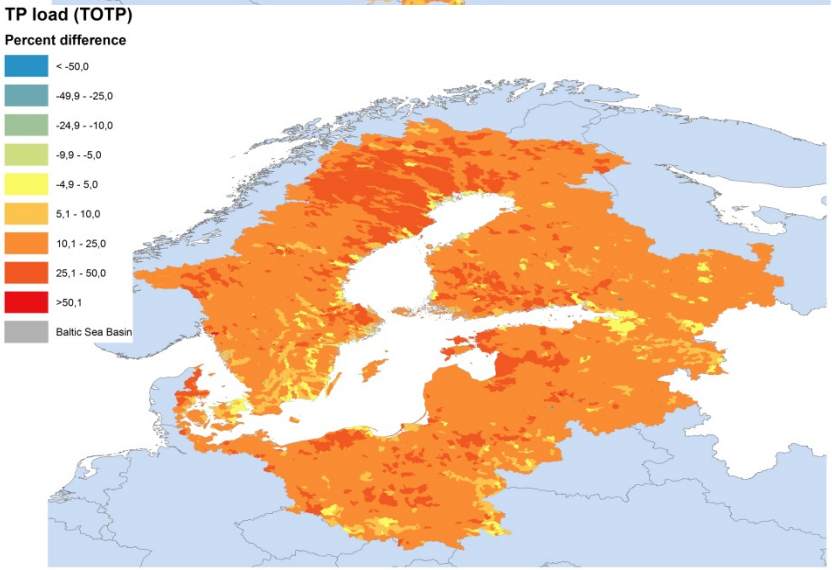


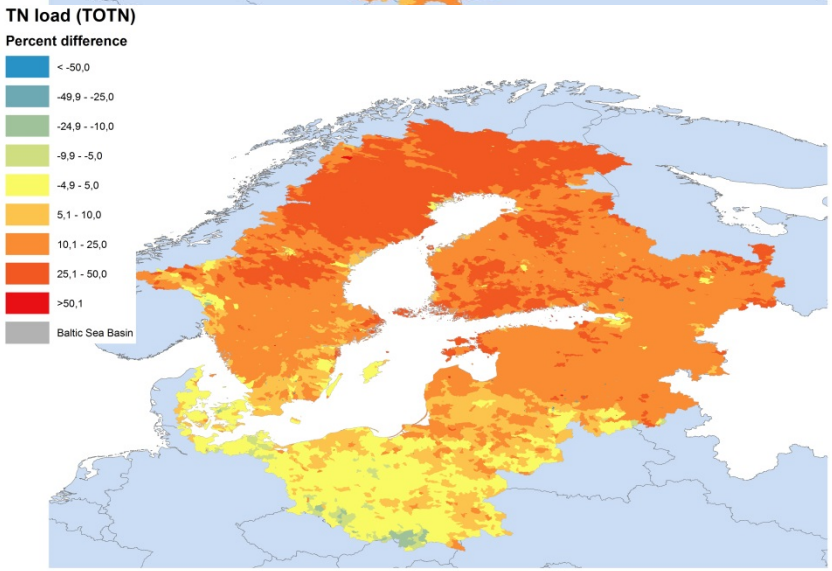
Preliminary results subject to revision

Percent difference for ensemble mean



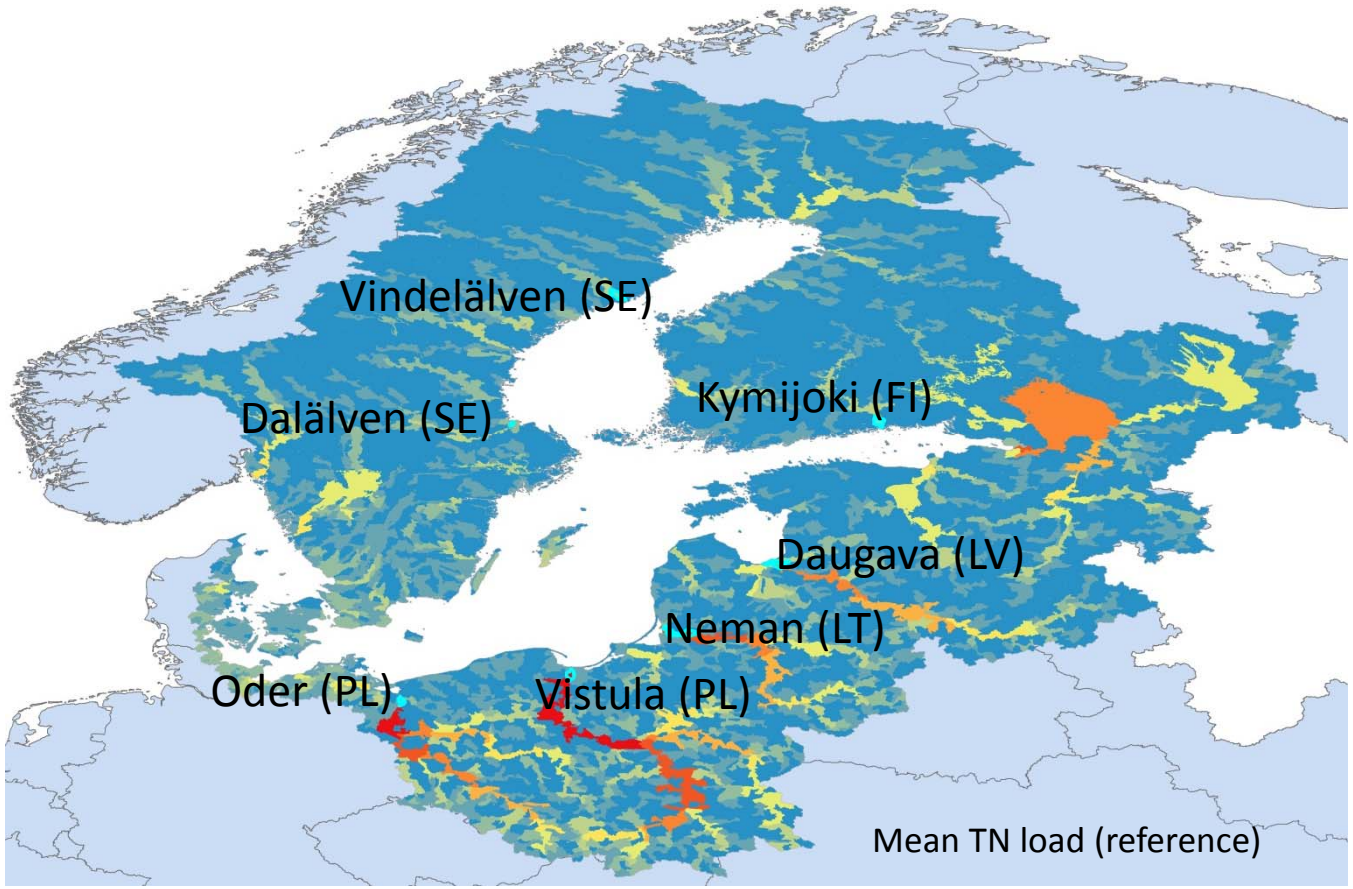






Preliminary results subject to revision

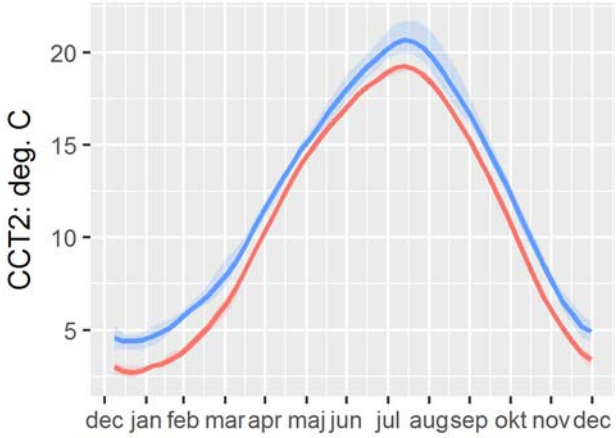
Outlets from several major tributaries

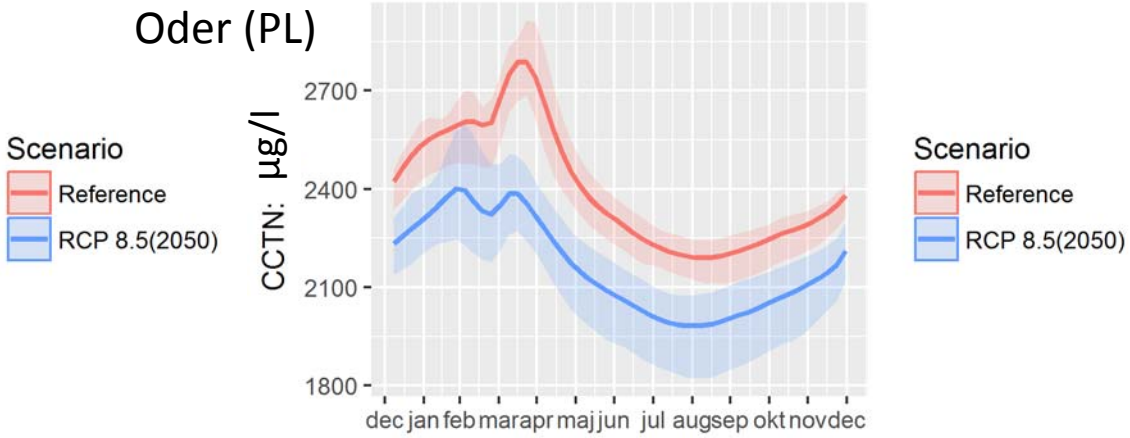


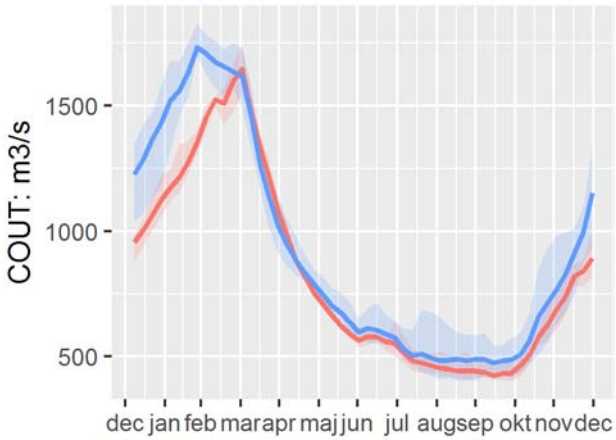
Preliminary results subject to revision

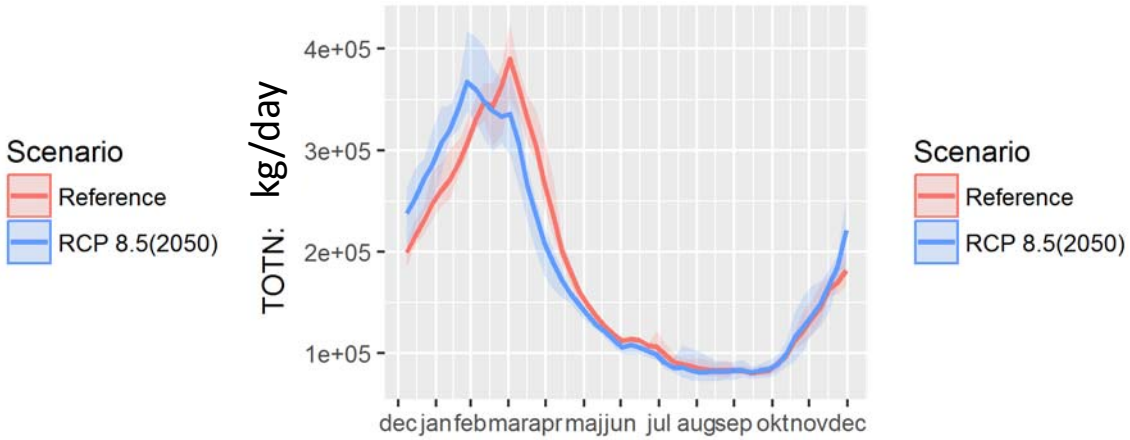
Changes in annual regime

Oder (PL)



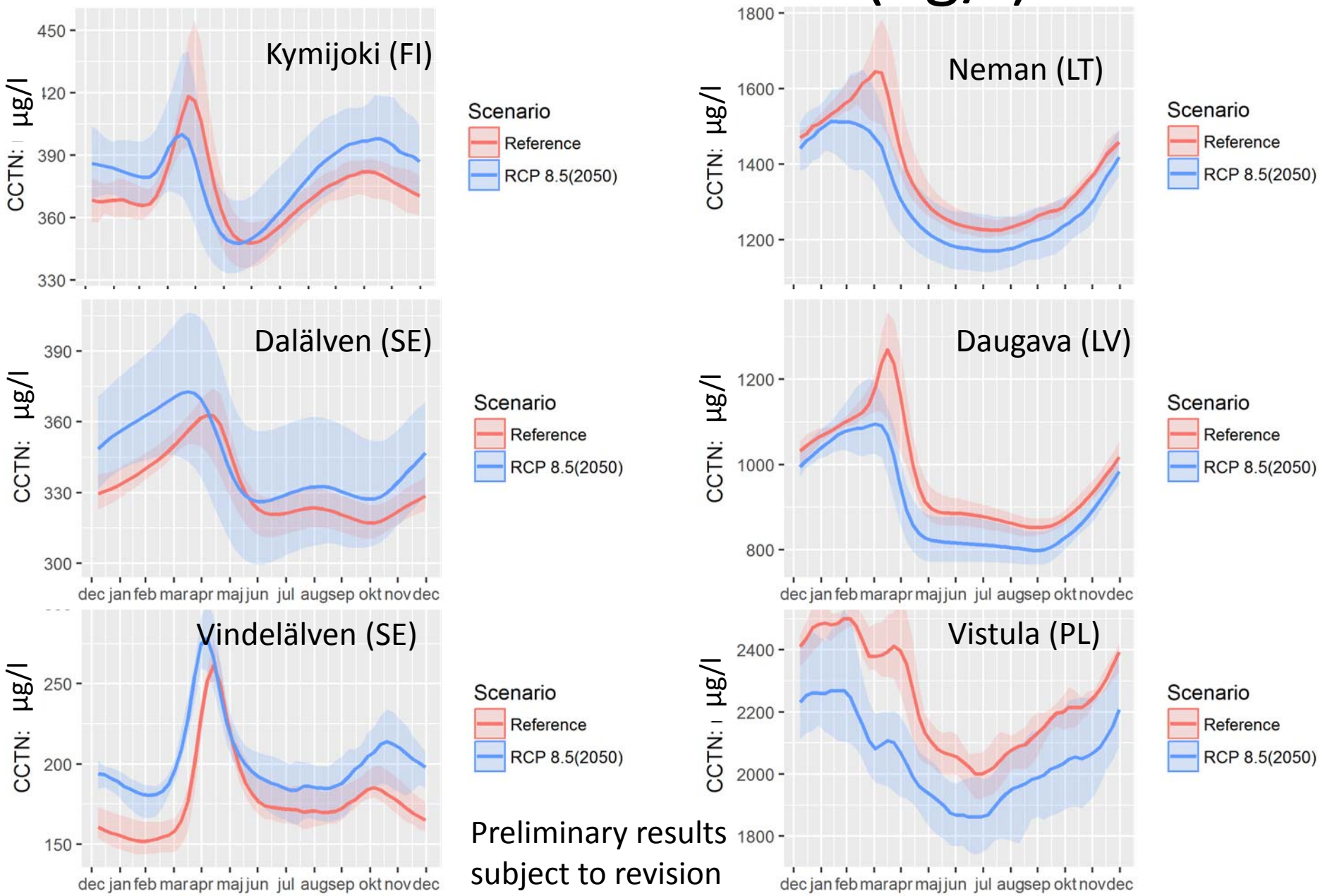






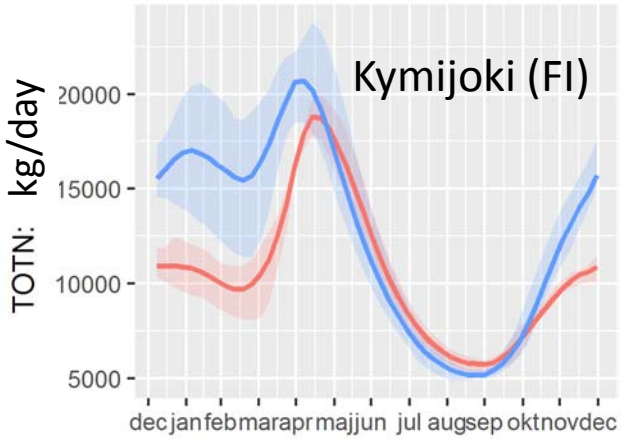
Preliminary results subject to revision

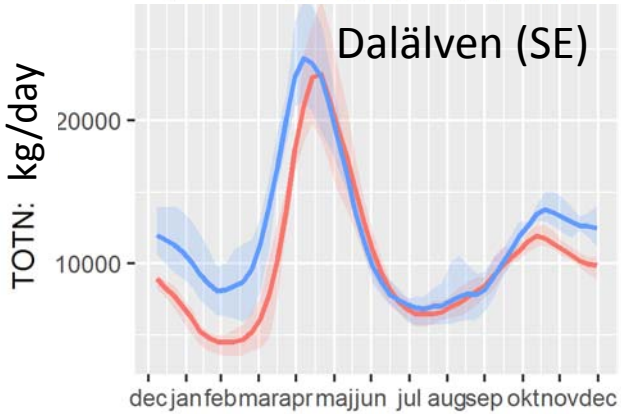
TN concentration (ug/l)

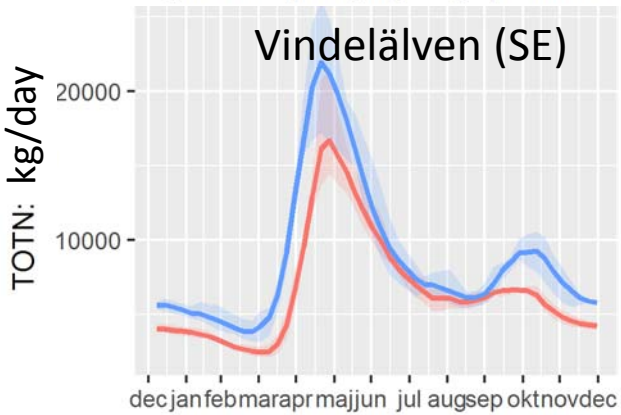


Preliminary results subject to revision

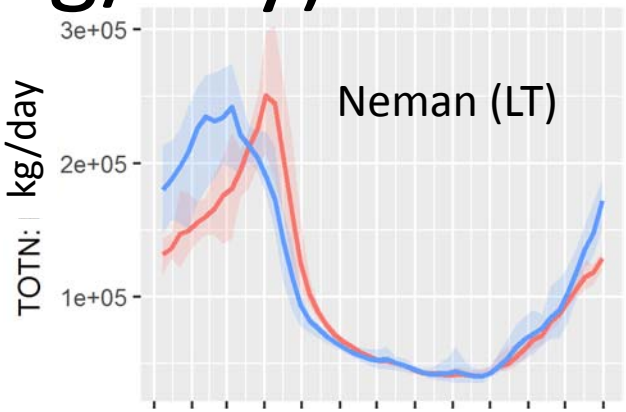
TN loads (kg/day)

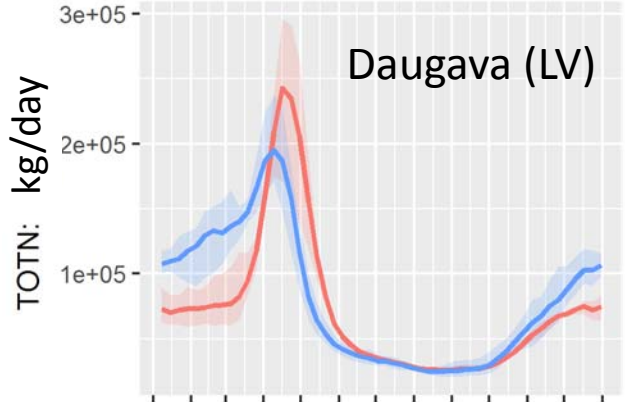


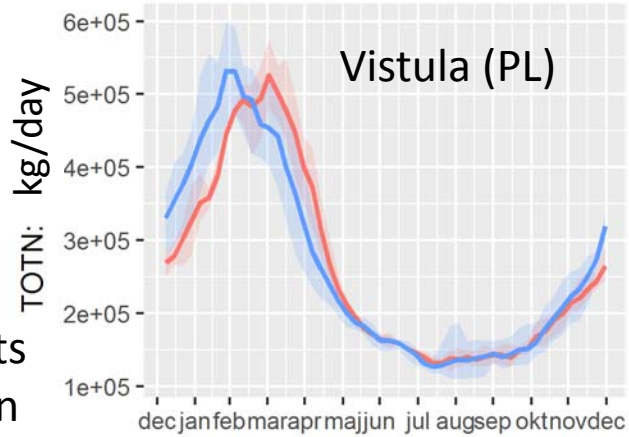




Scenario
Reference
RCP 8.5(2050)







Scenario
Reference
RCP 8.5(2050)

Preliminary results subject to revision

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Conclusions - key outputs

- New methodologies for the planning of differentiated regulations based on **new knowledge of nutrient transport and retention processes between soils/sewage outlets** and the coast.
- Evaluation of how **differentiated regulation** can offer more cost efficient solutions towards reducing the nutrient loads to the Baltic Sea.
- Analysis of how **changes in land use and climate** may affect the nutrient load to the Baltic Sea as well as the optimal location of measures aiming at reducing the load.
- A high-resolution **model for the entire Baltic Sea Basin** with improved process descriptions of nutrient retention in groundwater and surface water tailored to make detailed simulations of management regulations differentiated in space.
- New knowledge based **governance and monitoring concepts** that acknowledge the relevant aspects of EU directives and at the same time are tailored towards **decentralised decision making**. The proposed spatially differentiated regulations will aim for incorporation of local scale knowledge to optimally design solutions.

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More information

- Objectives
- Methodologies
- Case study areas
- Detailed work plan
- Publications
- Deliverables

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