Development of framework for the application of coastal, riverine, environmental and socio-economic modeling tools to predict the values of indicators for Ecosystem Services

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Introduction

The main research idea of this study is to combine multidisciplinary expertise to predict the future ecosystem services in the coastal Lithuania (area of the Curonian Lagoon and Nemunas river delta). This involves mapping and modelling current ecosystem services in the area and prediction of the future ecosystem services in a view of global change (using both environmental (biophysical) modelling tools and socio-economic scenario development).

Modeling the current situation

The watershed model (SWAT) is applied to build the basis for the application of the state-of-the-art models, such as transitional waterbody models (SHYFEM), Life Cycle Assessment models and the economic evaluation models, which would evaluate environmental quality improvements that respond to end-user needs.
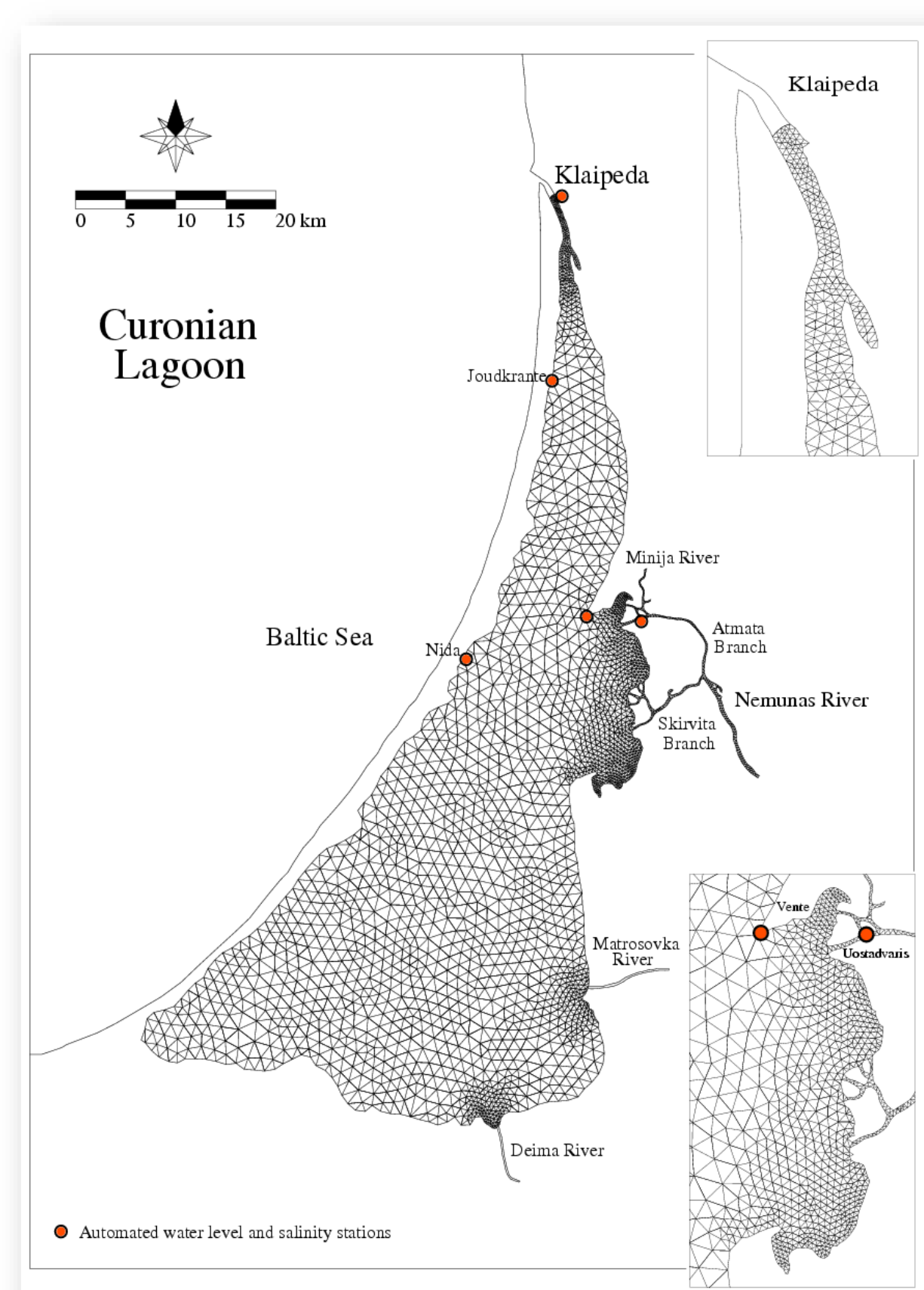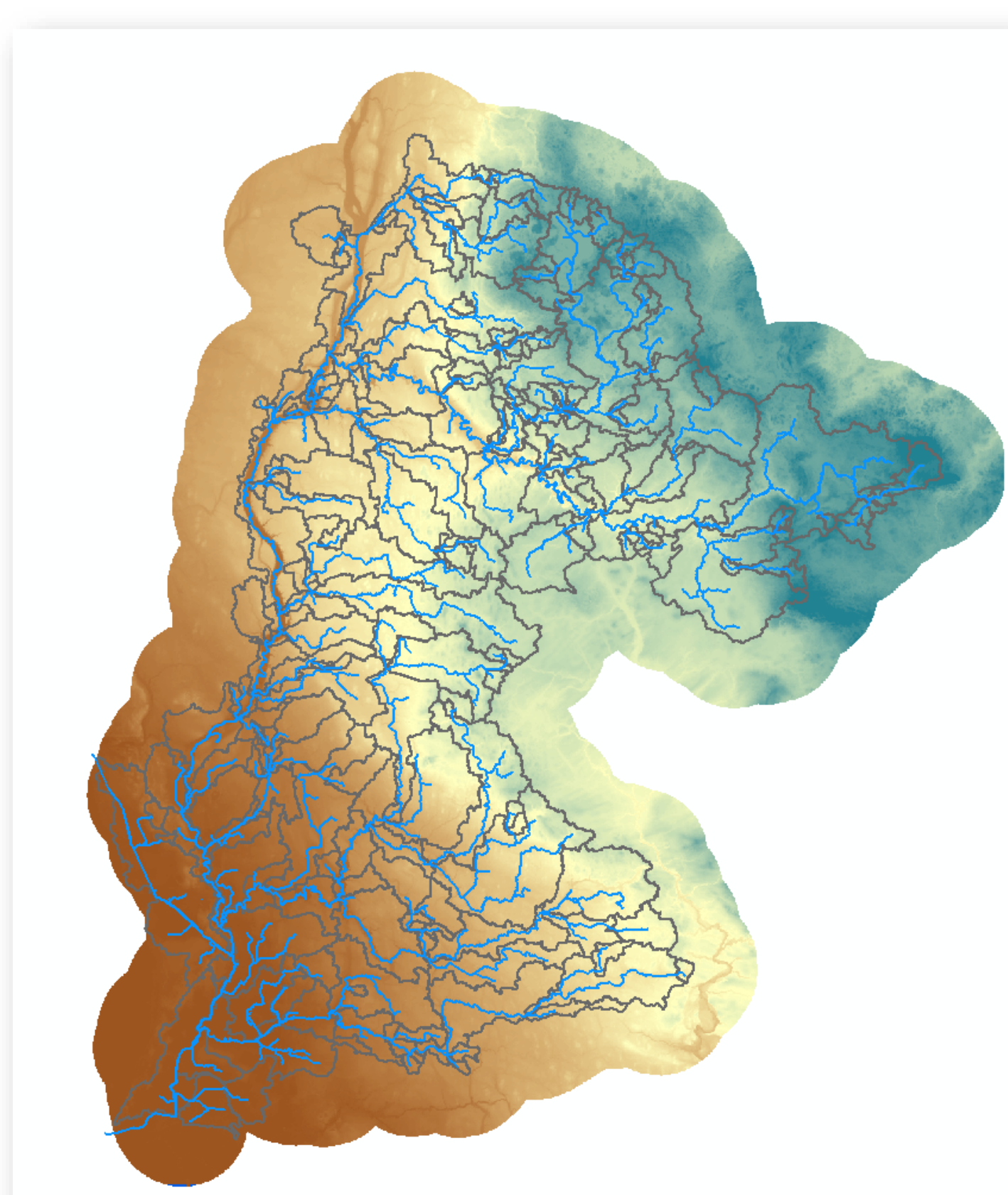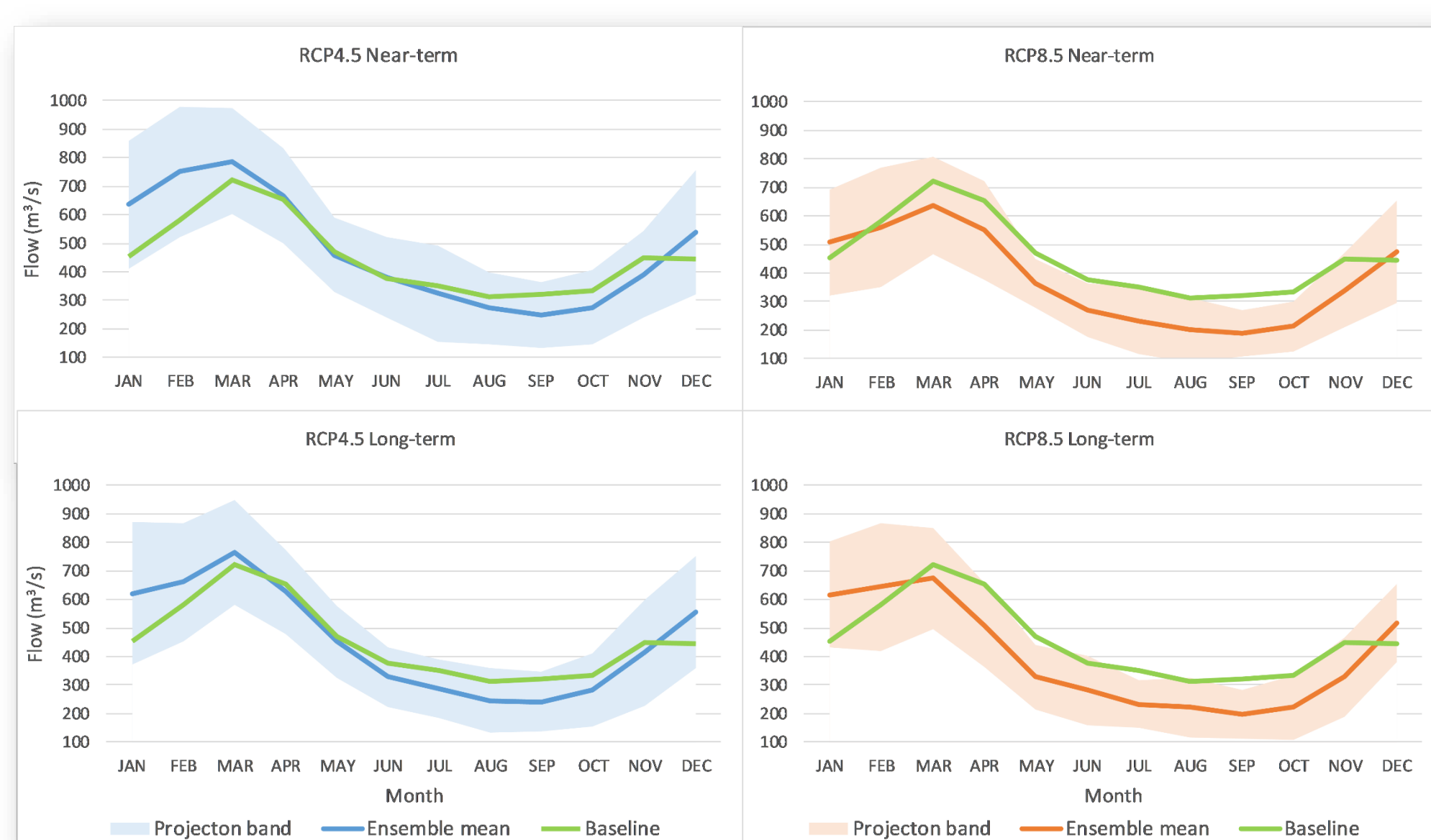
Study area
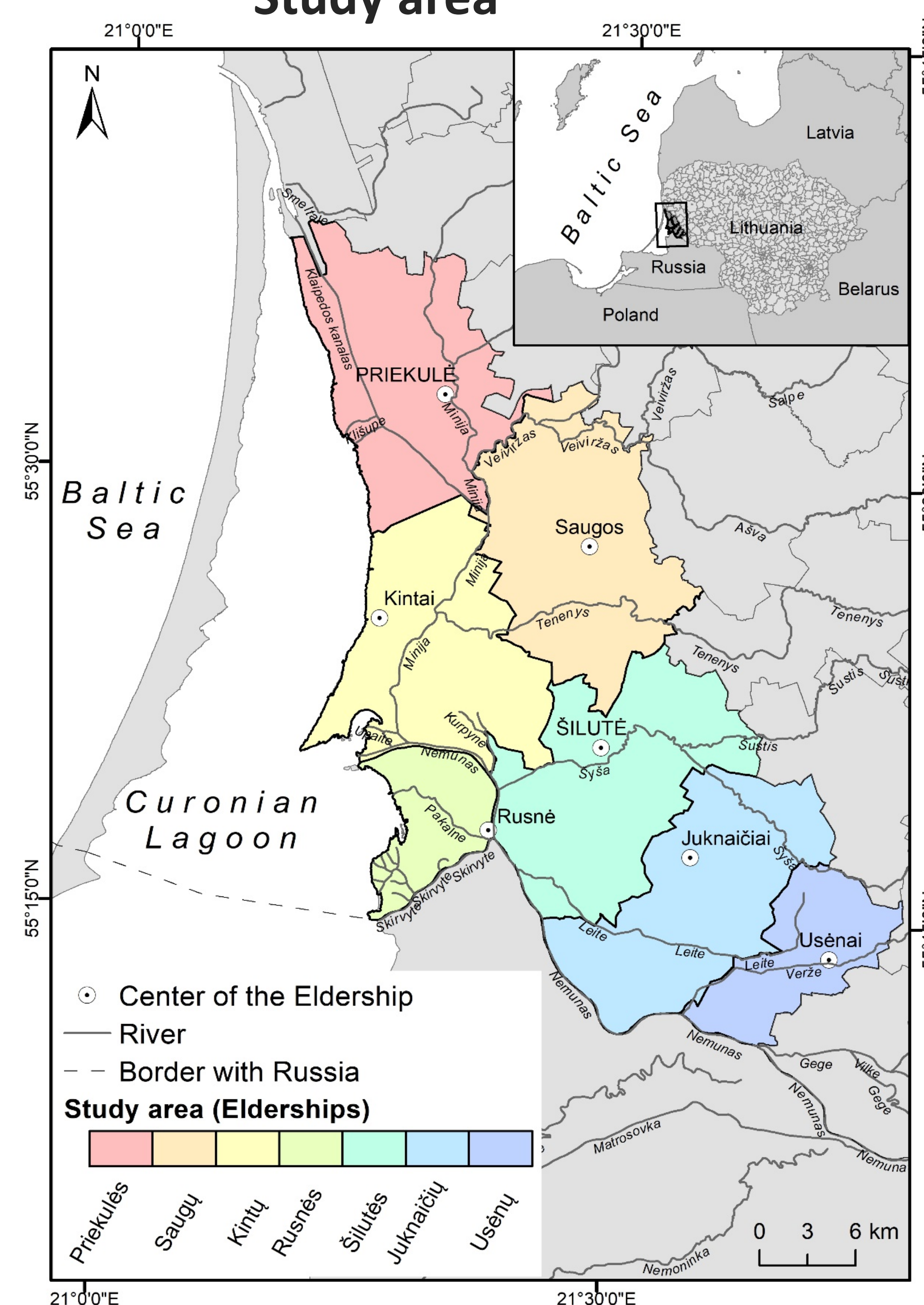
Hydrology and water quality model setup (SWAT) of the Minija river

Hydrodynamic model grid (SHYFEM) of the Curonian lagoon

Socio-economic analysis based on survey

Agriculture and Aquaculture in the study area

The SWAT model of the entire study area is developed, calibrated and validated for flow, sediment and nutrient loads. The model was run to assess the projections of future climate change that would affect the ecosystem services in the study area.


Flood management

Some early results....

Downscaled climate timeseries from five Global Circulation Models under the conditions of RCP4.5 and RCP8.5 were used to drive the SWAT model to analyze the changes of water and biogeochemical cycles for near-term (up-to 2050) and long-term (up-to 2100) period.

The projection indicates that a net annual **increase in flow** is projected under the conditions of the RCP4.5 (up to +10%), while **a decrease** is simulated under RCP8.5 (by up to -12%). **A shift in the hydrological regime** through the seasons is projected under both scenarios: with a more significant flow projected in mid-winter and early spring and a decrease in the warm season (late spring to early fall).

The projected nutrient loads are also subject to change in a similar manner, with a higher load in winter and early spring.

ES related to tourism in the study area
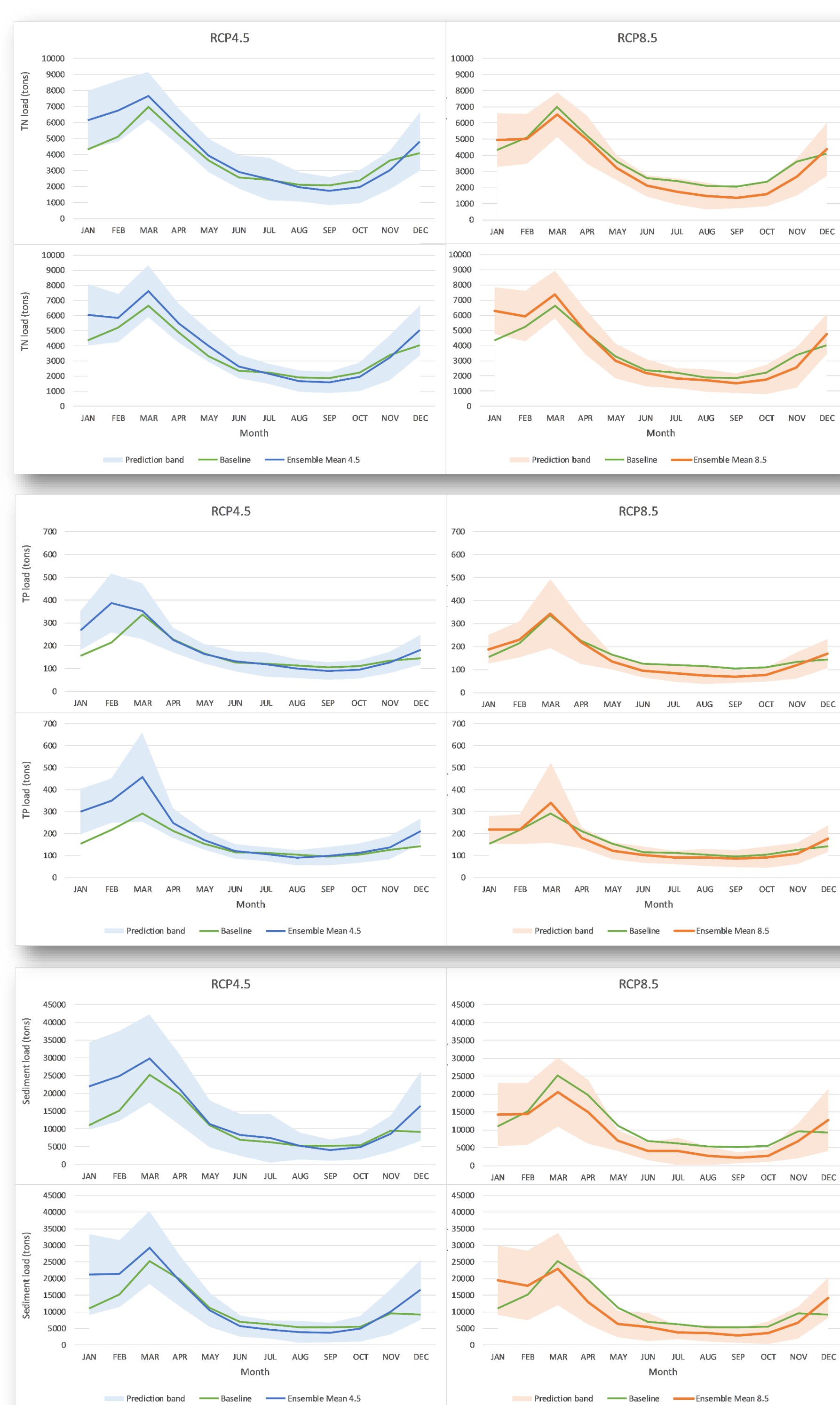
Ongoing work…

EcoServe project is in its second year of implementation, so more work is still to be done, including defining combined climate and socio-economic scenarios, and producing projections based on model outputs.