Assessment of groundwater status in Lithuania

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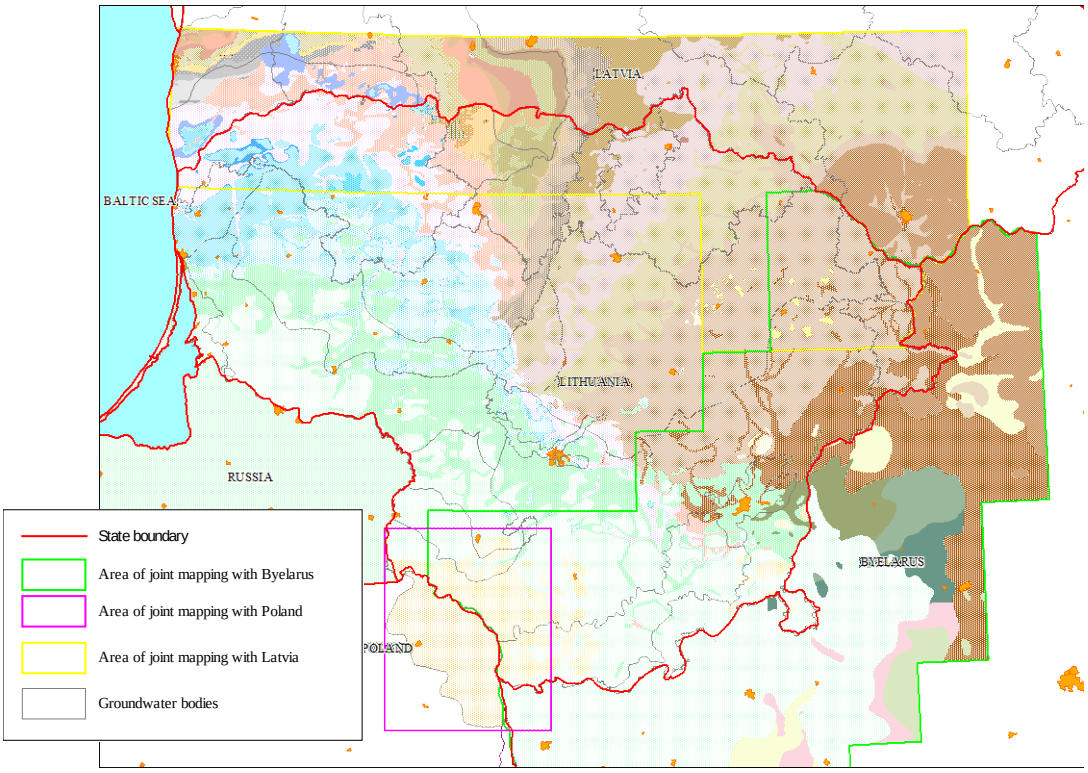
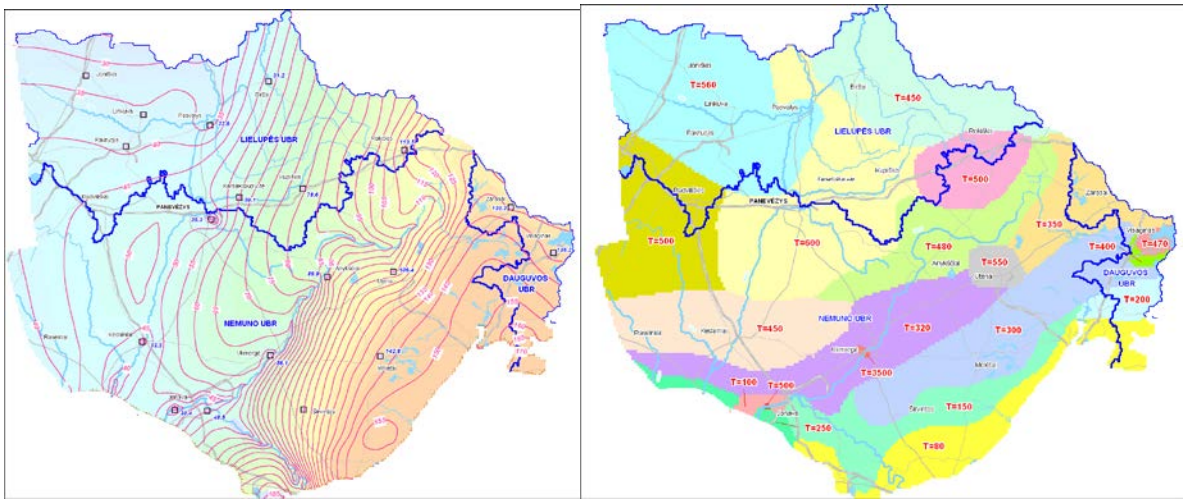
The Republic of Lithuania is a country situated along the south eastern shore of the Baltic Sea, and across the Baltic Sea to the west lie Sweden and Denmark. It shares borders with Latvia to the north, Belarus to the east and south, Poland to the south, and a Russian exclave (Kaliningrad Oblast) to the southwest. Lithuania has a population estimated at 3.2 million in 2011, and its capital and the largest city is Vilnius. Lithuania has four official river basin districts that are part of the Baltic Sea region. The largest part of the country is within the Nemunas rivers basin, which is shared with Belarus and Kaliningrad oblast, the Venta and Lielupe river basins in the north shared with Latvia and the Daugava basin.

In Lithuania, the drinking water supply relies only on groundwater. Therefore, sustainable management of groundwater resources and their protection are very important tasks included in River Basin Management Plans. Implementing the requirements of the Water Framework Directive, (2000/60/EB) 20 groundwater bodies were delineated in the territory of Lithuania. The groundwater bodies have been identified taking into account the lithological, hydrodynamic and hydrochemical differences of aquifers and groundwater use within the bodies. Actually, 15 of the groundwater bodies are trans-boundary. Though the boundaries of groundwater bodies do not match with those delineated in Latvia and Poland, adjacent groundwater bodies have the same hydrogeological background, so are comparable.



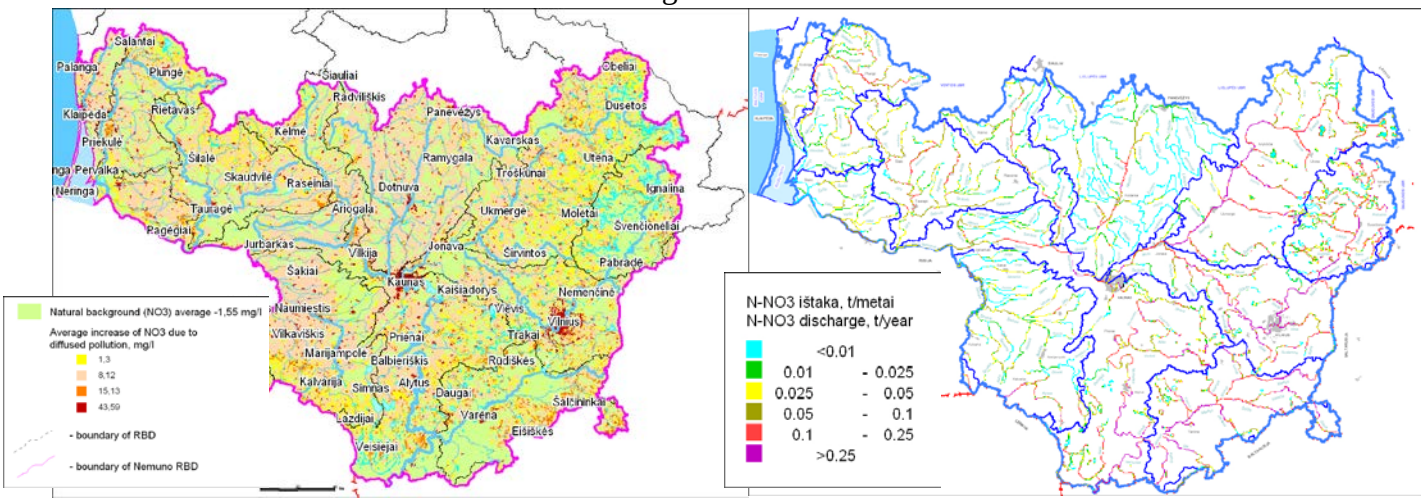
Areas of cross-border cooperation (in the background Hydrogeological map of pre-Quaternary deposits)

Mathematical modelling was used for the impact assessment of point and non-point pollution on the quality of groundwater bodies and surface-groundwater interaction. The models covered shallow groundwater in individual groundwater bodies, surface water bodies and deeper confined aquifers.



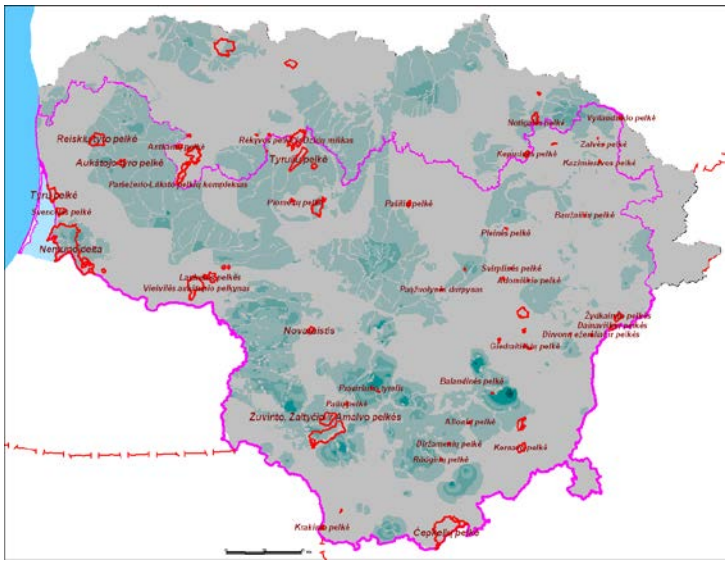
Groundwater level and transmissivity in Upper _ Middle Devonian aquifer

The results of mathematical modelling and groundwater quality maps indicate that groundwater chemical status in Lithuania is good - anthropogenic activities do not affect groundwater status on a regional scale. E.g. nitrate concentrations in shallow aquifers do not exceed requirements of drinking water standard and the largest impact of non-point pollution is observed in urban areas and territories of intensive agriculture.



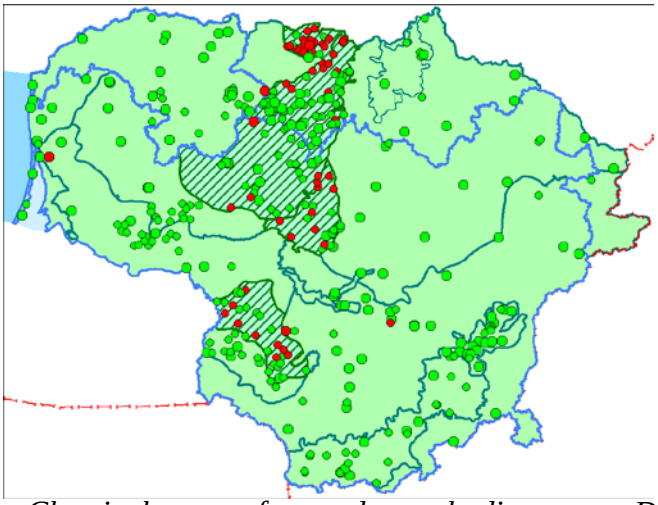
Concentration of nitrates in shallow groundwater and predicted discharge to the rivers

It has been established that groundwater abstraction has no negative effect on surface water bodies or terrestrial ecosystems dependent on groundwater, or on the status of groundwater aquifer in the neighbourhood of preserved natural objects.

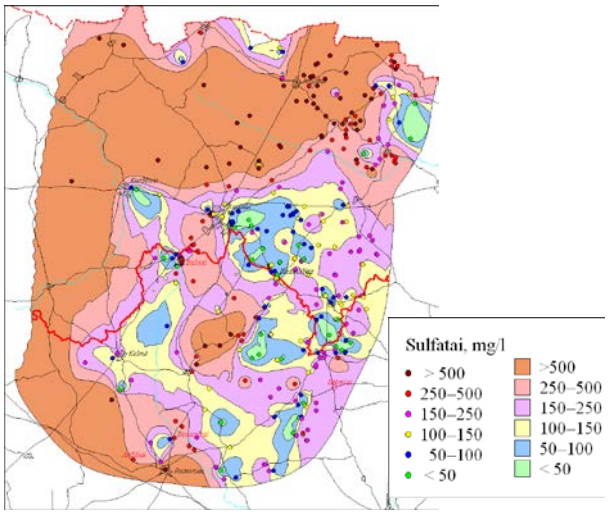


Modelled forecast of groundwater impact on surface ecosystems in 2015

Salt water intrusions under Lithuanian geological conditions are a potential source of risk, especially in the confined aquifers. Five groundwater bodies potentially at risk have been identified. The chemical composition of groundwater in these bodies fails to conform to the requirements of the established drinking water standards due to natural reasons. Since increasing trends of water deterioration as a result of human activities are not clear yet, it is suggested that additional monitoring is carried out during the next planning period (2010–2015) and that the impact of groundwater abstraction activities on the changes of water quality is analysed.



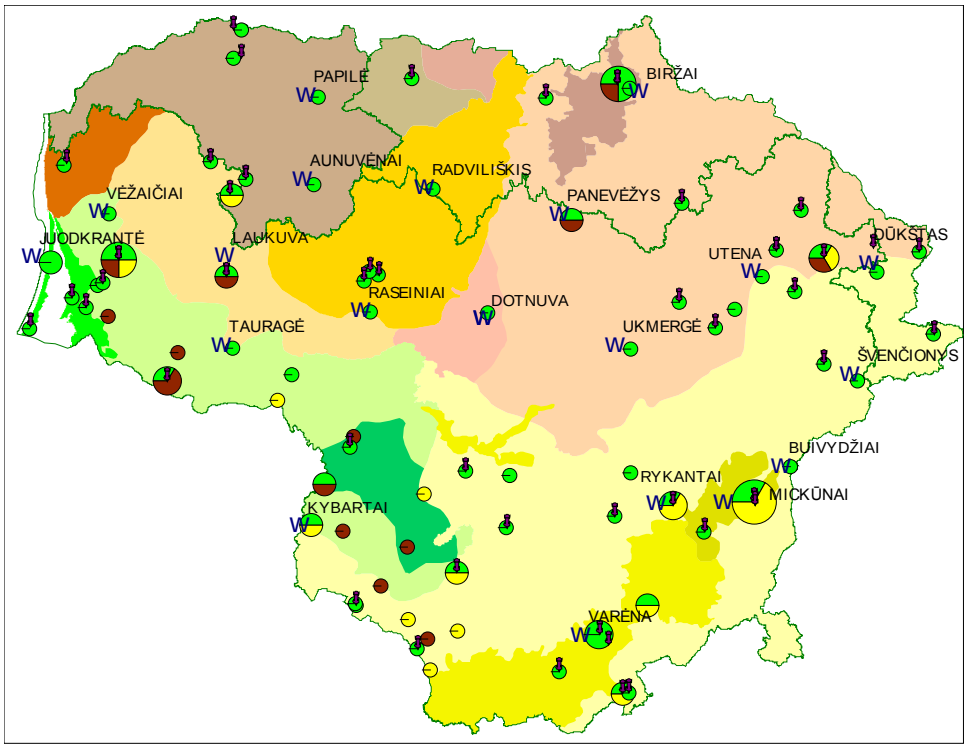
Chemical status of groundwater bodies



Distribution of sulphates in Upper Devonian aquifer

Assessment of trans-boundary impact on groundwater resources – quality and quantity revealed, that groundwater abstraction in neighbour countries does not significantly affect groundwater resources, neither diffused nor point source pollution affect groundwater quality on the Lithuanian side (Nemunas, 2010). International impact on surface waters is much more significant.

Results of national groundwater monitoring were used to evaluate status of groundwater bodies, applying mathematical modeling techniques and prepare RBD management plans in Lithuania. The national monitoring network is not dense (0.1-0.3 stations/ 100 km^2), but is quite well supported by the data from obligatory monitoring executed by enterprises – both potential polluters (based on the issued IPPC) and groundwater users (well-fields > 100 m3/d) - (1.5-4.0 stations/ 100 km^2).



National (surveillance) groundwater monitoring network

Quantitative and chemical status in the most of GWB is good and surveillance monitoring is sufficient enough. But some GWB were identified as being at risk due to possibility of salt water intrusion and there additional operational monitoring is required, to find out if real risk exists. Beside this, main future tasks are to monitor groundwater levels as indicator of groundwater resources in changing climate conditions and to follow up trends of pollutants in groundwater bodies, especially those that are least investigated (pesticides, organic pollutants, some metals).