

**Proposed thesis topic for the Doctoral degree studies (2021-2025) in
Ecology and Environmental Science at Marine Research Institute (Klaipėda University)**

Title	Assessment of effectiveness and optimization of water and nutrient retention measures in agricultural basins
Brief description of the topic	<p>The increased number of extreme events in many European regions has further aggravated the conflicts between different water users and made apparent the past mistakes in watershed management. Agriculture as a major water user plays a key role in watershed management. Climate change projections suggest that many regions in Europe will experience more frequent extreme events such as droughts, heavy rainfall events and increasing winter precipitation, which creates additional challenges in agricultural basins with respect to water scarcity, excess water, and increasing amounts of nutrient and sediment runoff. To ensure sufficient drinking and industrial water supply, recreation, and the needs for maintaining the natural environment in good condition (e.g., environmental flow, chemical and ecological status) innovative integrated water resources management approaches are required, which include measures aimed at safeguarding and enhancing the water storage potential, fostering ecosystem services for mitigating the impact of extreme effects, and others that contribute simultaneously to the achievement of different Sustainable Development Goals (SDGs 2, 6, 12, 13 and 15) and environmental targets formulated in several European Union (EU) policies, including the Water Framework Directive, Floods Directive, Nitrates Directive, EU Biodiversity Strategy, EU Thematic Strategy for Soil Protection, EU Action on Water Scarcity and Drought, EU Climate Change Adaptation Strategy, and the Common Agricultural Policy.</p> <p>Although comprehensive sets of techniques to increase the water and nutrient retention on both catchment and farm levels exist, knowledge on the effectiveness of different scale- and region-specific measures across various agricultural systems under changing climate conditions is still incomplete. Integrated modelling approaches are required to combine and allocate the possible water and nutrient retention measures in a way that they respond best to the characteristics and management of certain agricultural catchments under consideration of local constraints, other human uses and environmental needs. This necessitates a comprehensive analysis and assessment of the sustainability of these measures, which will focus on the environmental and socio-economic aspects in terms of placement, maintenance and long-term benefits for the environment, farmers and society. The proposed study can be completed by applying hydrological and water quality basin-scale models and model optimization techniques.</p>
Requirements for a candidate	<p>The candidate should: 1) have a solid training on hydrology and/or soil science, 2) have hands-on experiences of applying watershed hydrologic models such as the Soil and Water Assessment Tool (SWAT) to conduct long-term simulations of runoff and its associated constituents (e.g., sediment and nutrients) at a watershed scale, and 3) be familiar with commonly used GIS tools. The demonstrated computer programming and relational database skills would be an asset. An economic background and/or training is preferable.</p> <p>Good English language skills are necessary. Understanding laws of physics, basic ecology and willingness to conduct individual research are essential. The candidate will also need to have a high willingness for mobility.</p>
Existing research experience	<p>PhD student will enter the modelling team with experience in applying multiple models to analyze the environmental conditions and making predictions. In particular, the modelling group of the Marine Research Institute has the following objectives: Create excellence in the field of numerical modelling of the coastal zone and transitional waters for Lithuania and other countries; Bring together modelers and non-modelers and show the advantage of using models that can help the interpretation of observations and supplement them with other useful data; Create a framework of models that will be able to compute, forecast and predict important parameters, also as a tool for identification of pollution and environmental impact.</p>
Existing research infrastructure and support	<p>Analytical facilities will be provided by Marine Research Institute. The software necessary to conduct the research is in open access or will be provided by the institute. The candidate will have an opportunity to join several national and international projects as a junior researcher with the appropriate remuneration.</p>

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