

Nature Based Solutions for multidimensional and cross- infrastructural storm water management in urban areas

Summary

The overall goal of the project is to develop an integrated design, management and maintenance framework for multifunctional nature based solutions (NBS) to increase the resilience of urban areas. This includes analyzing the risks, mitigation and adaption measures of NBS design, construction, management and maintenance to reach its full potential in urban environment. The project addresses the following research questions: What are the main barriers in integrating NBS for cross-infrastructural urban water management? What are the solutions (including technical) to cope with the cross-infrastructural challenges and increase resilience? How can the developed solutions be integrated with the existing systems to provide multi-benefits? How to pilot the developed solutions in real urban environment?

Research field:	Environmental, marine and coastal technology
Supervisors:	Prof. Dr. Ivar Annus Dr. Nils Kändler
Availability:	This position is available.
Offered by:	School of Engineering Department of Civil Engineering and Architecture
Application deadline:	Applications are accepted between June 01, 2023 00:00 and June 30, 2023 23:59 (Europe/Zurich)

Description

Today NBS are designed mainly as monofunctional and not considering the interconnections of the installations with other critical infrastructures. Therefore, there is a need to shift the paradigm in NBS design, construction, management and maintenance to reach its full potential in the urban environment. On one hand NBS needs to be planned as in the nature considering its “floodplain” addressing the interactions and impacts within this “floodplain” for all critical infrastructures to protect these from potential malfunctioning. A grid of NBS is needed to ensure the security and functionality across the urban infrastructures in case of multiple hazards.

On the other hand, NBS has to maintain its functionality to decrease the flood risk and improve the water quality. The planning, management and maintenance of the grid of NBS needs to consider the cascading effects of failure, i.e. failure of one infrastructure triggers a series of failures in interconnected systems. The implementation of the project results has to ensure that the integration of the cross-infrastructural grid of NBS in the urban environment improves the functionality of critical infrastructures compared to the status quo.

The goal of this PhD project is to develop a concept for multifunctional grid of NBS that is integrated with the existing infrastructures and improves the functionality of urban environment in case of different natural or man-made hazards. The solutions need to be tested in lab and real-life conditions to ensure the proposed benefits. Multi-hazard multi-benefit solutions are expected that take into consideration the impact of pluvial flood risk management in urban planning and infrastructure performance in general.

The framework has to be piloted in Estonian municipalities.

Responsibilities and (foreseen) tasks

- Assessment of existing NBS based and integrated pluvial flood risk management frameworks and solutions;
- Development of NBS design, construction and maintenance framework for smart climate proof cities;
- Modelling of urban water systems including grid of NBS;
- Validation of the developed approach in real life case studies;
- Integrating the developed solutions in pilot municipalities and water utilities.

Applicants should fulfil the following requirements:

- a master's degree in water engineering or environmental engineering
- a clear interest in the topic of the position
- excellent command of English
- strong and demonstrable writing and analytical skills
- capacity to work both as an independent researcher and as part of a team
- capacity and willingness to provide assistance in organizational tasks relevant to the project
- knowledge in basic hydraulics, hydrology and hydromechanics, city planning and development
- knowledge of Estonian and EU legislation on urban stormwater management.

The following experience is beneficial:

- GIS analysis
- Data analysis, big data
- Modelling in SWMM

The candidate should submit a research plan for the topic, including the overall research and data collection strategy. The candidate can expand the listed research questions and tasks, and propose theoretical lenses to be used.

We offer:

- 4-year PhD position in Urban Water Systems research group with a profound portfolio of ongoing pan-European and national projects on pluvial flood risks, mitigation and adaption measures and smart cities
- Work environment in the innovative campus of TalTech
- Participation in international projects
- Participation in international conferences and events
- Full-time employment
- Starting date September 2023.

About the department

The Urban Water Systems research group in the Department of Civil Engineering and Architecture has special expertise in the field of urban water systems. Open to cooperation, the unit has been coordinating and participating in numerous national and international projects during the last 15 years dealing with urban water systems funded by national R&D, European Union programs and by the European Commission. Workgroup members are active in the field of fluid dynamics in hydraulic networks with more specific interest in developing methods, concepts and technical solutions for pluvial flood risk assessments, mitigation and adaption in urban areas. Workgroup has close co-operation with potential stakeholders (municipalities and water companies in the Baltic Sea region, Ministry of Environment etc.) which supports the academic knowledge transfer to the stormwater quantity and quality management and control process.

Additional information

For further information, please contact Prof Ivar Annus ivar.annus@taltech.ee



To get more information or to apply online, visit <https://taltech.glowbase.com/positions/653> or scan the the code on the left with your smartphone.