



TAL TECH

NATURE-BASED SOLUTIONS – CATCHMENT FIT OR FIT TO CATCH

Prof. Ivar Annus
Tallinn University of Technology



URBAN WATER SYSTEMS

Interreg
Baltic Sea Region



Co-funded by
the European Union



SUSTAINABLE WATERS

City Blues

NBS – CURE FOR ALL?

- *"...Our results show strong evidence that NBS can effectively mitigate climate change impacts, promote ecosystem resilience and improve human well-being by providing multiple benefits, such as enhanced biodiversity, improved air and water quality, increased food security and reduced urban heat island effects*..."*
- *One size does not fit all...*
- *When all you have is a hammer, everything looks like a nail...*



HOW TO MAKE THE SOLUTION FIT?



Let's make it smart!

BACK TO 2018...

- <https://interreg-baltic.eu/project/noah/#output-0>



PROTECTING THE BALTIC SEA FROM UNTREATED WASTE WATER SPILLAGES

Handbook of the NOAH CONCEPT

**TAL
TECH**

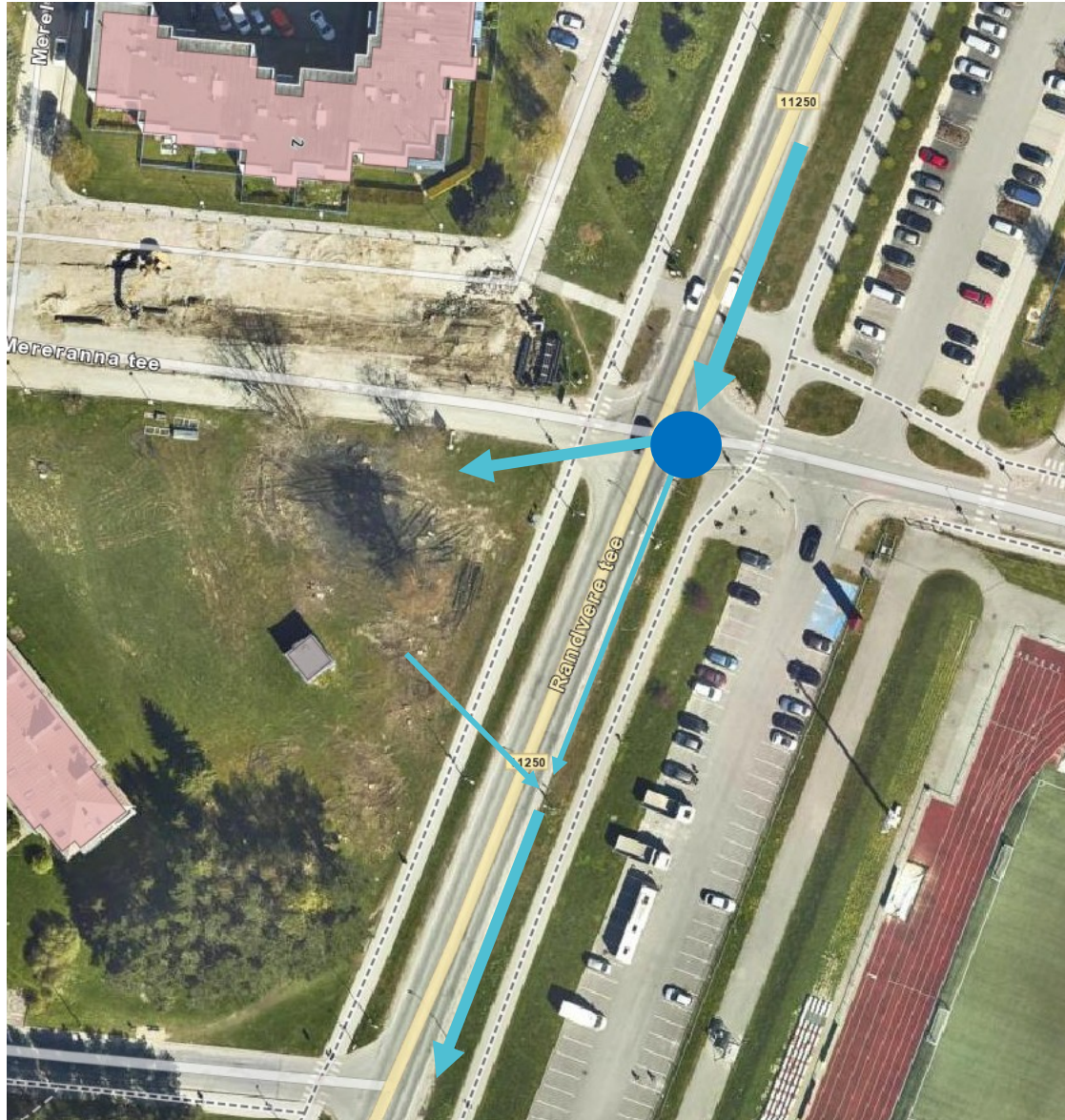
TALLINN UNIVERSITY OF TECHNOLOGY

Interreg
Baltic Sea Region

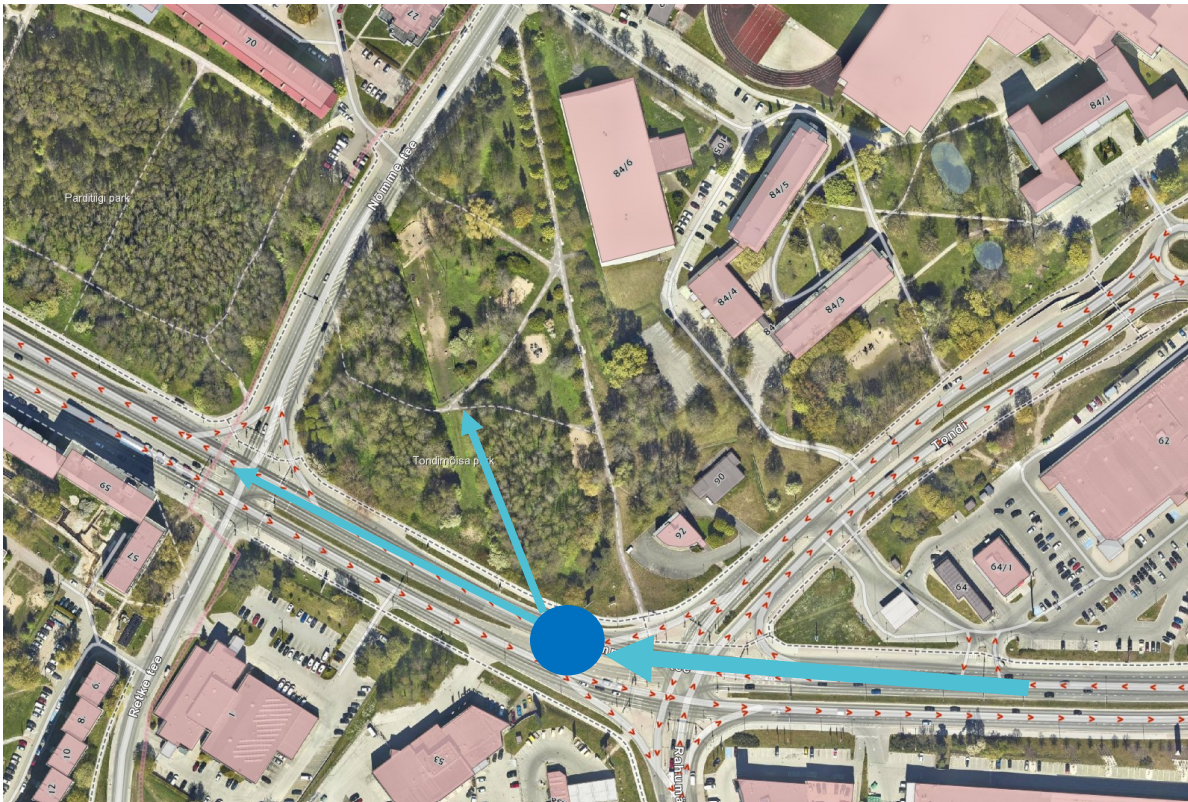


NOAH

FROM NO-TECH TO HIGH-TECH



FROM NO-TECH TO HIGH-TECH



ARE ALL NBS ALREADY FIT?

Google

nature based solution failure

×

Al-režiimKõikPildidVideodLühivideodVeebRahandusVeelTööriistad

Coastal protection

Drought

Urban resilience

Coastal erosion

Case studies

Climate crisis

Flood

Biodiversity

Coastal defences

Nbs

Disaster risk

Climate resilience

Nature-based Solutions: Protecting...
D Dalberg

Effectiveness of Nbs

Nbs & society relations

Implementation

Design of Nbs

Knowledge gaps for the various...
R⁶ ResearchGate

Cost-effective coastal defences with nature-based solutions
R⁶ ResearchGate

Nature-based solutions can reduce...
Haskoning

Nature-based Solutions – how should w...
sefari.scot

TECHNICAL BRIEF
Nature-based Solutions For Drought Resilience
IFRC

NATURE-BASED SOLUTIONS TO ADDRESS THE CLIMATE CRISIS
IFRC

How can we use nature to help communities build resilience to extreme weather events and climate change?

Mountains, forests and watersheds

Rivers and Wetlands

Coasts

Cities

Farmland

Liked this infographic on Nature Based...
LinkedIn

Working with Communities in Developin...
DA Development Asia

NATURE-BASED SOLUTIONS
Helping communities to reduce disaster risk, adapt to and mitigate climate change through nature.
IFRC

How can we use nature to help communities build resilience to extreme weather events and climate change?

Mountains, forests and watersheds

Rivers and Wetlands

Coasts

Cities

Farmland

Intro to nature-based solutions | IFRC
IFRC

Nature-based approaches to prevent...
Haskoning

Nature-based solutions can reduce...
Haskoning

Nature-based Solutions across different landscapes and hazards

A guide for Nature-based solutions in t...
A guide for Nature-based solutions in...

Nature Based Solutions Pathway for...
Infrastructure Pathways

Nature-based solutions: Overcoming...
Healthy Land & Water

Nature-based solutions to disaster risk...
Phys.org

How can we use nature to help communities build resilience to extreme weather events and climate change?

Mountains, forests and watersheds

Rivers and Wetlands

Coasts

Cities

Farmland

Nbs Resources - PrepareCenter
Global Disaster Preparedness Center

Seotud otsingud

nature based solutions

urban nature based solutions

nature based solutions nbs

Nature-based Solutions Initiative |...
Nature-based Solutions Initiative

Nature-based Solutions Essential to...
PH Politics Home

Nature-based Solutions: a Cost-effecti...
World Bank

Nature-based Solutions: WWF's Holistic...
WWF

Adaptation10: Nature-based Solutions
Climate Proof

Nature-based Solutions (NbS) is an...
R⁶ ResearchGate

Nature Based Solutions – CLARA

Types of Nature-based Solutions (NbS)

What are the types of Nature-based...
Terracon Ecotech

Nature-based Solutions: WWF's Holistic...
WWF

The Critical Insights of Nature-based...
ClimateSeed

Accelerating Adaptation: Nature-based...
The Nature Conservancy

NATURE-BASED SOLUTIONS

Water Management

Sustainable Agriculture

Green Infrastructure

Restoration of Ecosystems

Nature-based Solutions
S emwis

Nature-based Solutions: How LIFE works with nature for people

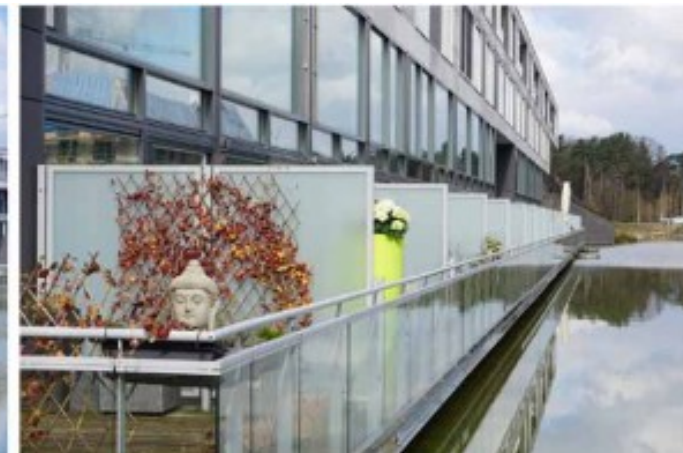
TAL
TECH

HOW TO INCREASE THE FITNESS OF NBS?

- Lack of vision for multifunctionality (preventable failure)
 - How to balance multiple functions
 - Limited stakeholder input
 - Baseline not defined
- Fragmented governance and legal ambiguity (complexity-related failure)
 - Limited institutional capacity
 - **Challenges in land ownership**
 - **Misaligned strategic objectives**
- Spatial constraints; disconnection (complexity-related failure)
 - **Failure to connect flow paths and ensure green corridors**
 - **Disruption of urban functions**
- Community exclusion (preventable failure)
 - Lack of public support
 - Green gentrification
 - Failure to address social gains
- Lack of guidance for further stages (preventable failure)
 - **Integration of NBS with the existing system**
 - **Failure in formulating expected design and performance**

HOW TO INCREASE THE FITNESS OF NBS?

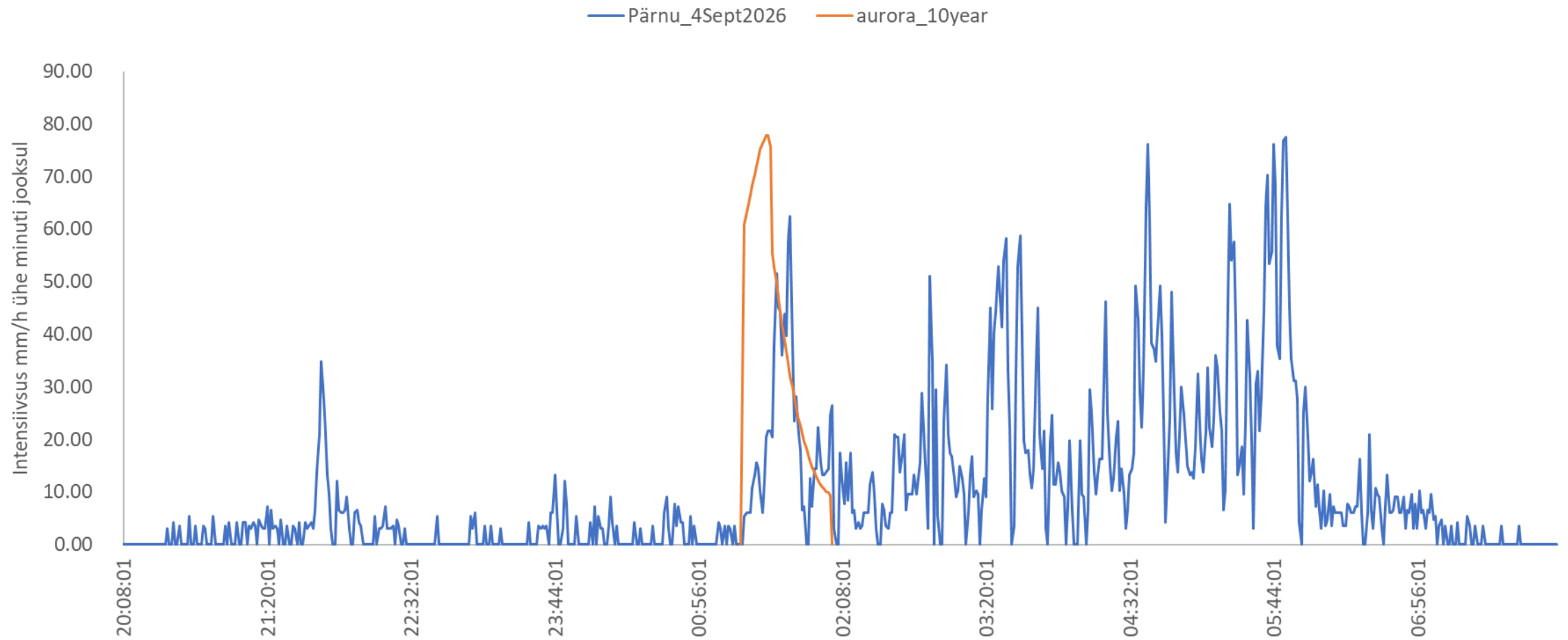
Root causes	Number of cases
1. Embedded practices of involved actors	13
2. Poor communication between different actors	12
3. Incomplete knowledge about the interactions of SUDS with other urban systems	11
4. Incomplete knowledge about the technical performance of SUDS	11
5. Lack of experience in constructing SUDS	10
6. Fitting SUDS to unforeseen circumstances	8
7. Actual use of SUDS by humans	6
8. Poor communication between phases	6
9. Lack of knowledge how to maintain SUDS	6
10. Poor maintainability of SUDS	5
11. Ambiguity about the maintenance responsibilities	3
Total	91



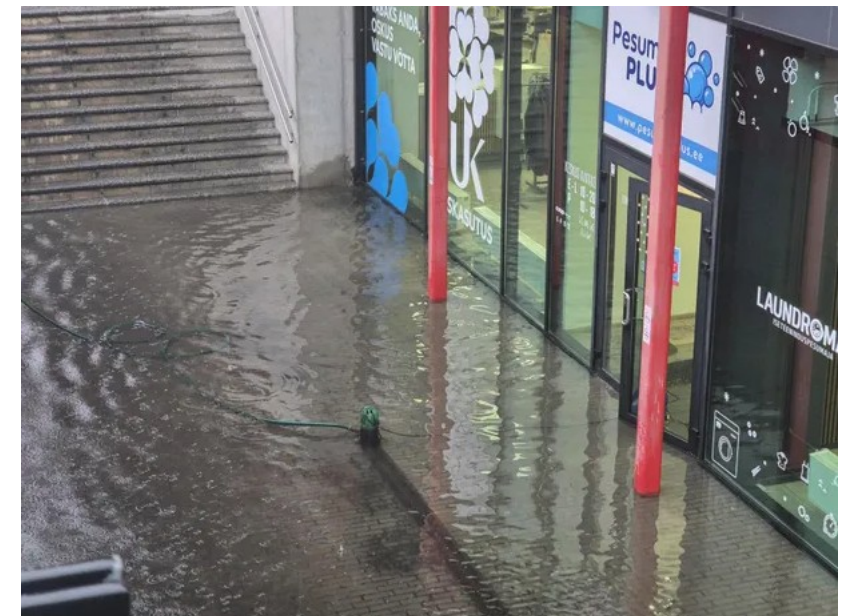
Vita Vollaers, Eva Nieuwenhuis, Frans van de Ven, Jeroen Langeveld; Root causes of failures in sustainable urban drainage systems (SUDS): an exploratory study in 11 municipalities in The Netherlands. *Blue-Green Systems* 1 January 2021; 3 (1): 31–48. doi:

<https://doi.org/10.2166/bgs.2021.002>

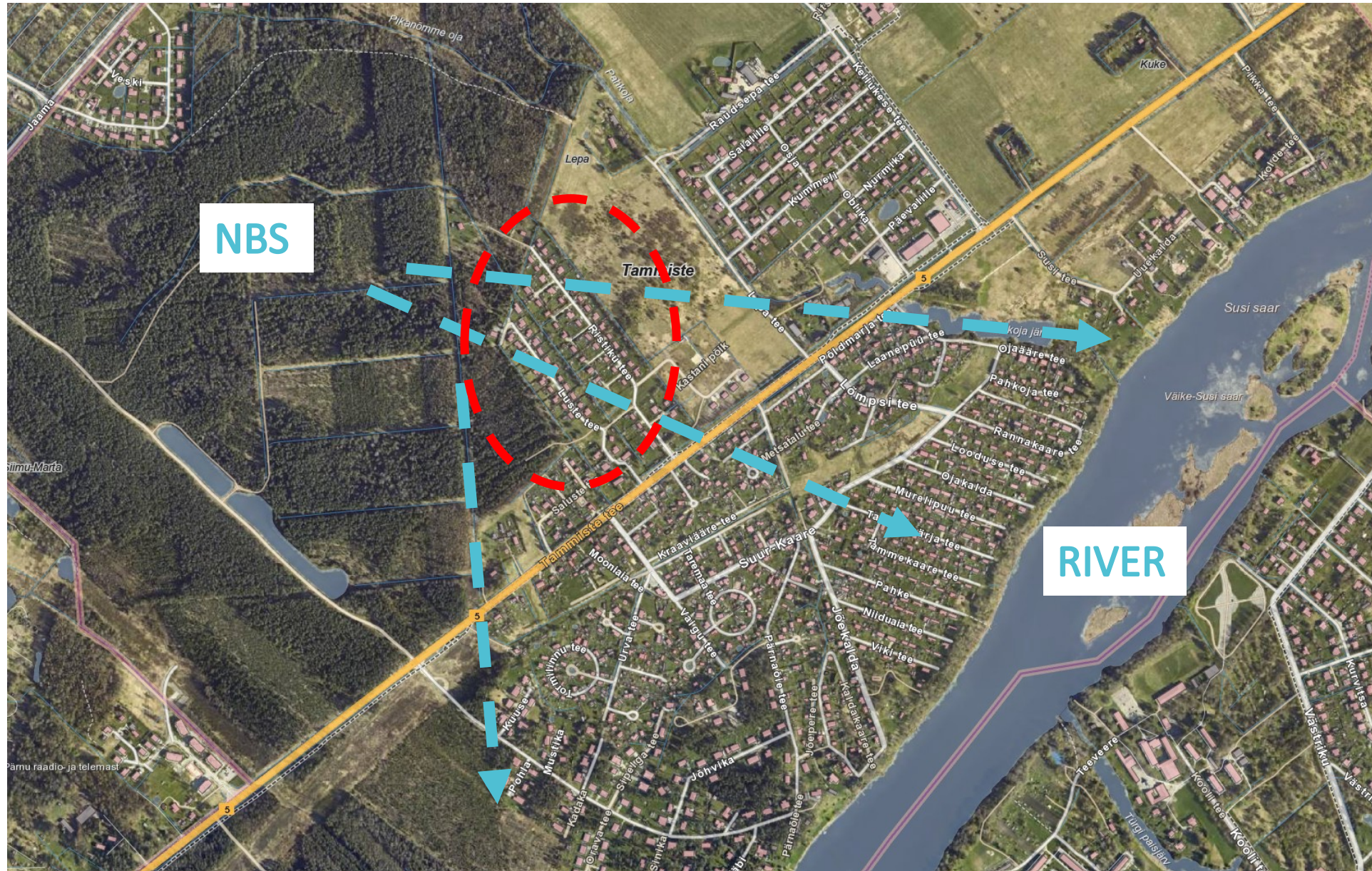
NATURE BASED SOLUTIONS IN MIXED ENVIRONMENT

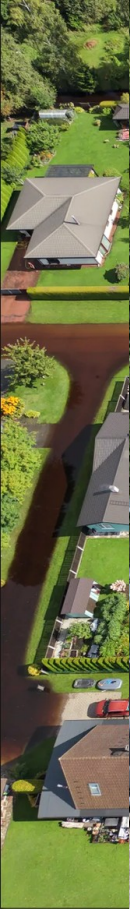


NATURE BASED SOLUTIONS IN MIXED ENVIRONMENT



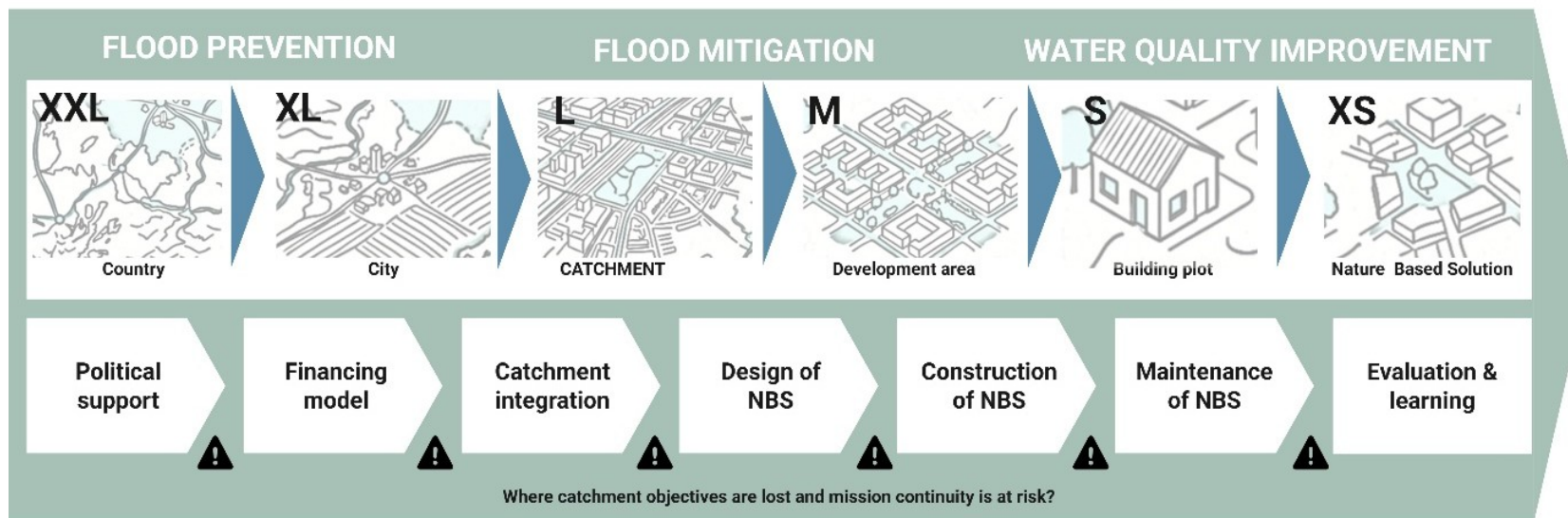
NATURE BASED SOLUTIONS IN MIXED ENVIRONMENT





CATCHMENT FIT NBS NEEDS A MISSION

Catchment-scale objectives must remain continuous across urban scales and governance functions!



Mission keeper:
individual or a group securing mission
continuity & inventing catchment integration



Catchment fit NBS: blue-green infrastructure
/ nature based stormwater solution
performing effectively for catchment
objectives

JOINT OPERATIONAL MODEL FOR IMPLEMENTING CATCHMENT-FIT NBS IN CITIES

FOLLOW THE 4 PRINCIPLES

- Institutionalize catchment integration;
- Maintain mission continuity through designated mission keepers
- Combine governance mechanisms and leverages
- Close the learning loop

TO AVOID THE RECURRING RESONANCE PATTERNS OF FAILING SYSTEMS

- Loss of catchment objectives during governance transitions
- Misalignment between strategic objectives and local implementation
- Dependency on temporary pilots or individual expertise

M. Truu, N. K. Christensen, M. J. S. Pristed, K. Kaur, K. Kõiv, I. Annus, K. Mardi, T. Ehrnstein, S. Leppänen, A. Vilhula, M. Pever. Functional Resonance Analysis of ownership continuity in catchment-scale governance of Nature Based Solutions, Blue Green Systems, 2026, under review

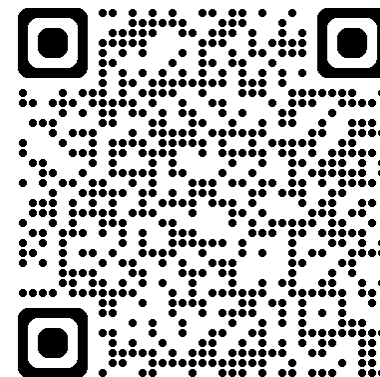
CATCHMENT FIT NBS NEEDS MISSION KEEPERS

- **NBS champions** – individuals who mobilize the support, build coalitions and enable the initiation of innovative pilot projects
- **Mission keepers** – actors who maintain and carry catchment-scale objectives across governance functions and ownership transitions
- People make the difference but institutions carry on the change!





Prof. Ivar Annus
Department of Civil Engineering and Architecture
Tallinn University of Technology
ivar.annus@taltech.ee



Interreg
Baltic Sea Region



Co-funded by
the European Union

 SUSTAINABLE WATERS
City Blues