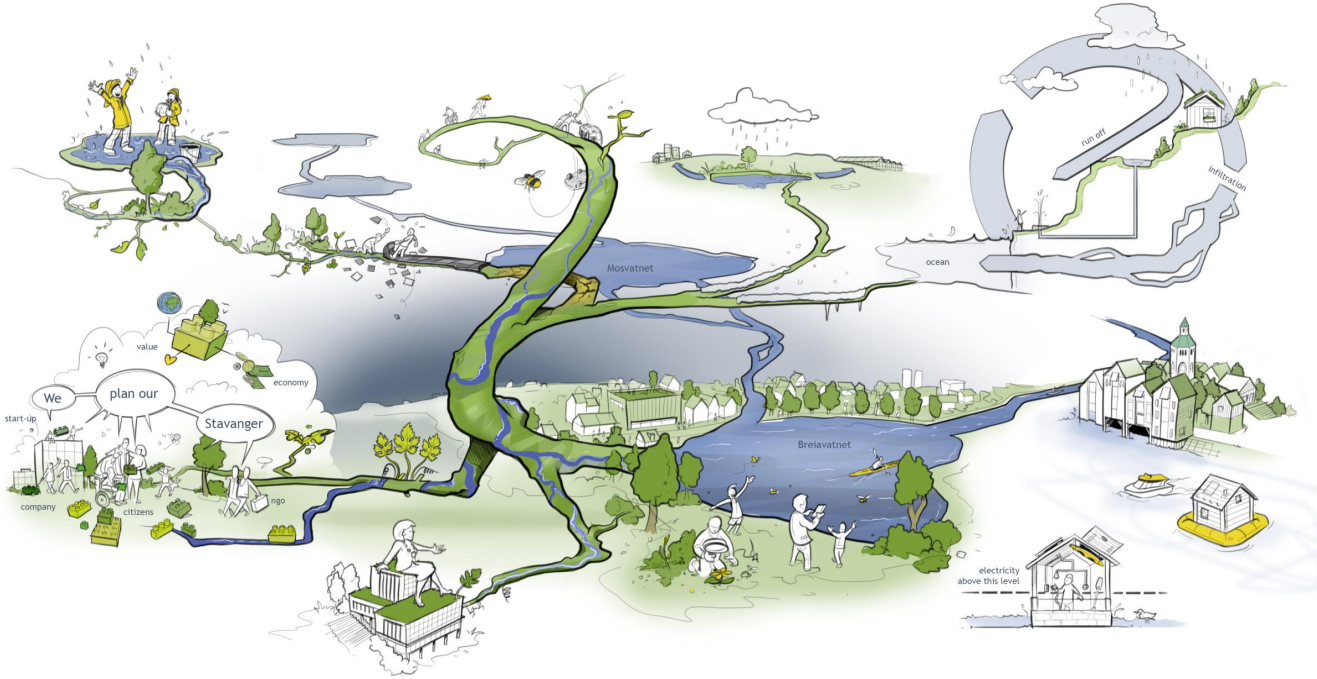
Roadmap to Stavanger 2050: Urban resilience through nature and knowledge



Presentation for the Joint roadmap workshop
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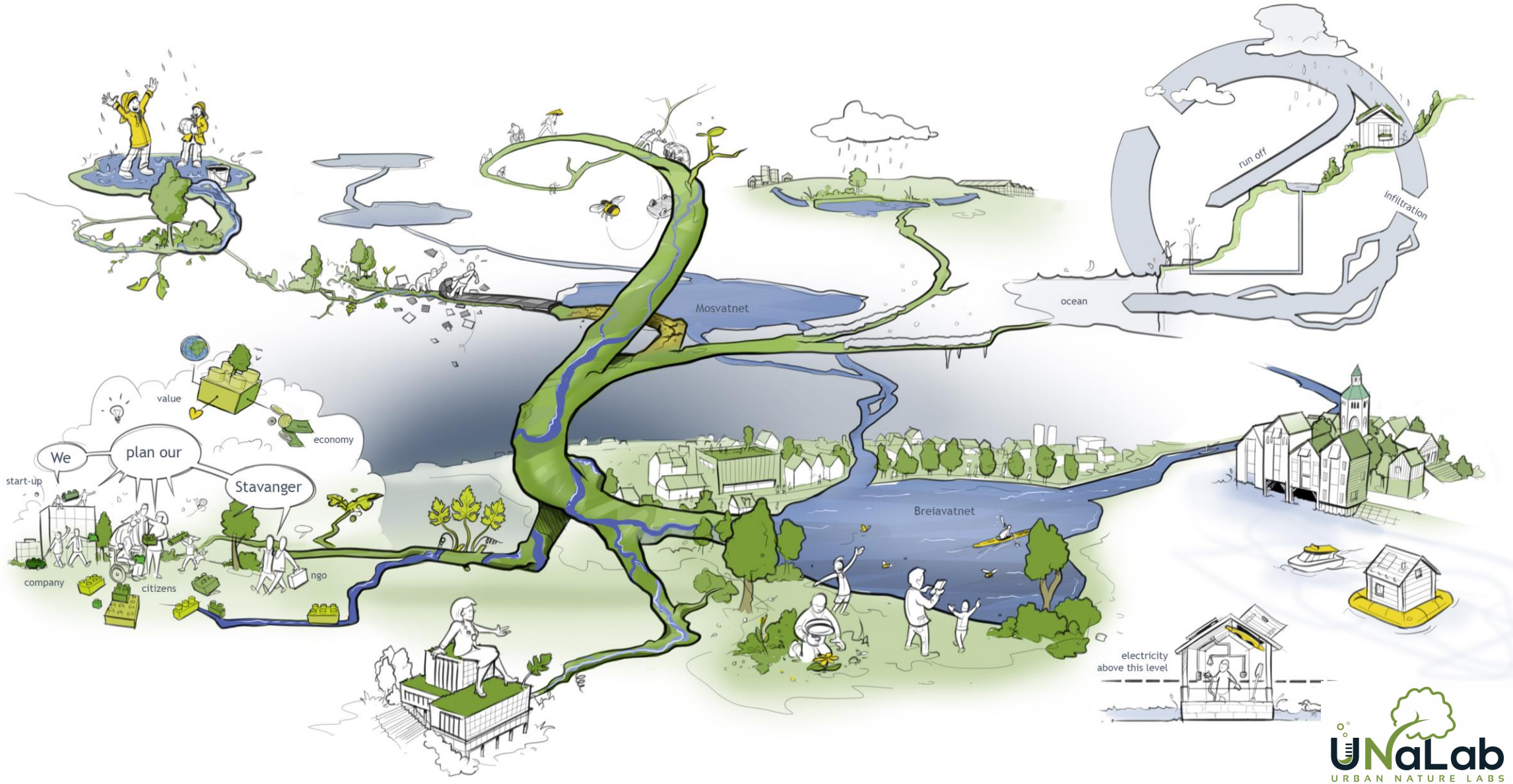
Our Vision: Stavanger 2050 – Urban resilience through nature and knowledge



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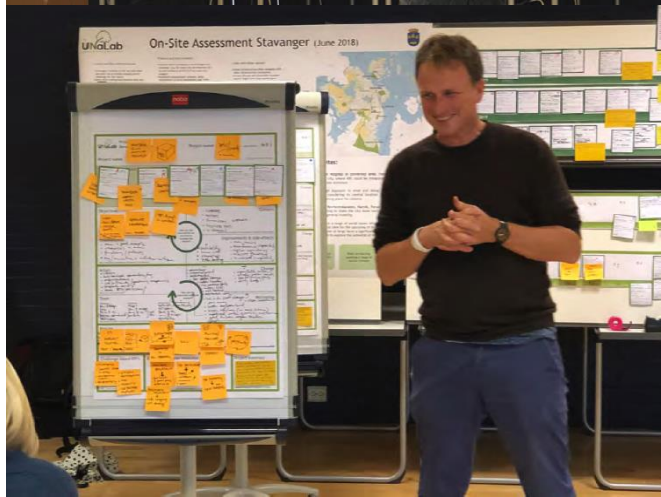
Stavangers NBS interventions

- **Which NBS <u>can introduce nature (water & green)</u> in the city center** to create healthy green spaces for people and enhance biodiversity, while at the same time reducing storm water inflow to the sewer system?

- **Which NBS can <u>prevent storm water flooding from recreational areas</u> and farm land upstream of residential areas,** such as Sørmarka, while at the same time increasing nature and biodiversity as a cobenefit?

- **Which NBS can <u>reduce storm water inflow into combined sewer systems</u> with low capacity and potential overflows to the sea**, in the Mariero area while at the same time providing other co-benefits to the area?



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Stavangers Governance interventions

- How to facilitate cross-departmental and external collaboration for NBS to make sure we achive the potential co-benefits and financing?

- How to increase awareness and engagement of citizens and other external stakeholders in NBS, biodiversity and climate change adaptation?

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Stavanger roadmap to 2050

ROADMAP — NATURE-BASED SOLUTIONS FOR CLIMATE & WATER RESILIENCE

MILESTONES

- Increased awareness of NBS
- Increased urban green
- Reduced storm water problems
- NBS integrated in master plan
- Blue/green factor revised and more targeted to NBS
- NBS implementation projects & governance interventions grow together

- NBS is standard in all new buildings
- 50% reduced flood damage
- 50% increased biodiversity
- Co-creation is standard in all NBS work
- NBS is a business
- Happiest city

NBS INTERVENTIONS

Which NBS can introduce nature (water & green) in the city center to create healthy green spaces for people and enhance biodiversity, while at the same time reducing storm water inflow to the sewer system?

N10 Mobile vertical greening · N8 Green facades · N12 Extensive green roof · N13 Smart roof · N11 Single tree lines · N14 Permeable paving system · Creating a liveable street in the city centre: More people, more green, attractive place by introducing urban nature solutions · Mix · N3 Group of trees · N4 Residential park · N15 Bioswale

Which NBS can prevent storm water flooding from recreational areas and farm land upstream of residential **areas, such as Sormark**a, while at the same time increasing nature and biodiversity as a cobenefit?

N18 Permeable paving system · N19 Rain garden · N16 Retention ponds · N3 Group of trees · N20 Constructed wetlands · The Sørmoka Back and Forrest project will combine tree planting and wetlands projects to manage stormwater and increase biodiversity in Sørmoka North West · Water theme for kids in botanical garden · Boardwalk instead of impermeable path · Constructed beck with fav dams · Twig dams · Constructed marshlands · N21 Daylighting

Which NBS can reduce storm water inflow into combined sewer systems with low capacity and potential overflows to the sea, in the Mariero area while at the same time providing other co-benefits to the area?

Masterplan blue/green structures · Depaving · N8 Green facades · N3 Group of trees · Reducing stormwater inflow to the combined sewer system: Disconnecting stormwater runovar from roofs private & public buildings · Disconnecting roof runoff · N12 Extensive green roof · N11 Intensive green roof · N15 Bioswale · N21 Daylighting · Disconnecting roof runoff

GOVERNANCE INTERVENTIONS

How to facilitate cross-departmental and external collaboration for NBS to make sure we achive the potential co-benefits and financing?

G2 Development of shared visions · G5 Awareness campaigns · G13 Introducing NBS-supportive zoning regulations · G15 Use of compensation schemes for Ecosystem Services · Multibenefit analysis of storm-water management · Stricter pre-feasibility studies & impact assessments · Create more opportunities for direct communication · G4 Strengthen informal networks through opportunities for exchange between key actors · G7 Establish formal structures for cross-sectorial cooperation · G9 Training of administrative staff in cross-cutting issues · Development of a municipal management system for sustainability and environment and the development of a learning co-operating organisation · G3 Implement municipal environmental and sustainability management services · Development of indicators for sustainability and biodiversity · G23 Establish mechanisms to support financing across multiple departments · G20 Reconfigure fees and other charges to reflect the costs and benefits associated with NBS · Framework for co-creation with external partners

How to increase awareness and engagement of citizensand other external stakeholders in NBS, biodiversity and climate change adaptation?

Insight - Establish baseline. What is the public perception? · Culture / public perception: nature is outside the city · Detect car inactivity: free up space · G16 Encouraging the use of certification schemes and sustainability programs · Policies: stormwater guides and reduced water fees · G6 Awareness campaigns · G3 Implement municipal environmental and sustainability management services · Rainbed course for consultants · Incentive program for business · Maintenance cost agreement · A user-friendly, easy accessible incentive package to cater for NBS in neighbourhoods, through co-creation and bottom-up initiatives. Citizens will be happier, save money and we will have more diversity and less water damage for less public spending · G6 Awareness campaigns · Living labs · G5 Awareness campaigns · G2 Introducing NBS-supportive building regulations · Restrictions · G20 Reconfigure fees and other charges to reflect the costs and benefits associated with NBS · Regulation to save the trees in the city · More responsibility to property owners · G12 Introducing NBS-supportive building regulations

2019 · 2025 · 2035 · 2050

Roadmap: final version 25 November 2019

Vision: final version 30 April 2020

Stavanger 2050: Urban resilience through nature and knowledge

Desired future scenario

In 2050 Stavanger is resilient to flooding from the rising sea level and storm water. Nature is integrated in the city and water is valued as a positive element. In the vision this is visualised by water and green as the veins of Stavanger.

The 'green and blue' structures are connected and function well to deliver a wide range of benefits for citizens, such as healthy living, well being and biodiversity.

In 2050 the social fabric of Stavanger enables a holistic approach to climate resilience, with the inclusion of all the knowledge in the region used for the same purpose: creating a resilient and livable city through nature-based solutions. Knowledge flows freely through the veins of the city, and is shared and further developed through citizen involvement and co-creation. This allows for new solutions to the future challenges of Stavanger.

Key elements in the desired future scenario:

Storm water and nature as a resource

The lakes in the city are connected through a green and blue infrastructure. This ensures resilience to flooding and at the same time creates all sorts of co-benefits for citizens. Nature is a key element in the city, and this nature is highly valued.

All actors accept the natural water pathways. Streams are opened where it is natural and valuable to do so. New developments, roads and installations can deal with extreme rainfall. Densified areas are carefully positioned and feature buildings with green structures. Different shapes of roads (v-shaped) or swales and lawns create invisible water pathways. Water is used – directly where it falls – for different purposes, e.g. recreation in buffer zones (small lakes and occasionally canoeing), generating electricity in water dynamos, use for agriculture or watering plants, or for aesthetic purposes such as fountains.

Resilience to flooding

The city is resilient to sea level rise through nature based solutions. Different areas have different solutions.

The people of Stavanger have learnt to live with water and not to fight it. Waterproof buildings are 'happy with wet feet' and smartly designed, e.g. with electrical systems positioned above the rising sea level and using sustainable materials. Floating houses or houses built on stilts can resist temporary flooding.

In this way the water surface is used and green areas are protected.

Knowledge and living

The general mindset is flexible and people are able to live with change and make sustainable decisions for the future and for society at large.

People have knowledge of the actual value of natural elements and value nature. The knowledge from the cultural heritage of farming and fisheries is captured. Facts and data to support that knowledge stem from living labs, in which we have experimented and learnt the (unforeseen) effects, benefits and impact of nature-based solutions. This has eventually led to knowledge of the monetary and economic value of green and water.

Co-creation

Society has found new ways of organising itself, nurturing co creation, involvement of all citizens and bottom-up initiatives. The general mindset is: "what can we do?".

Climate resilience is a joint effort, shared by companies, NGOs, start-ups and citizens. Awareness and knowledge are gained by using everybody's expertise and experience.

People are actively participating in mapping the potential, e.g. engaged citizens map their living environment and the potential for green facades and roofs in their neighbourhood. Small 'pocket parks' are created as a string of pleasant places for

all kinds of groups. Insights into biodiversity are gathered through collective actions such as counting bees, bumblebees and birds. Schools and children contribute as part of their educational programme.

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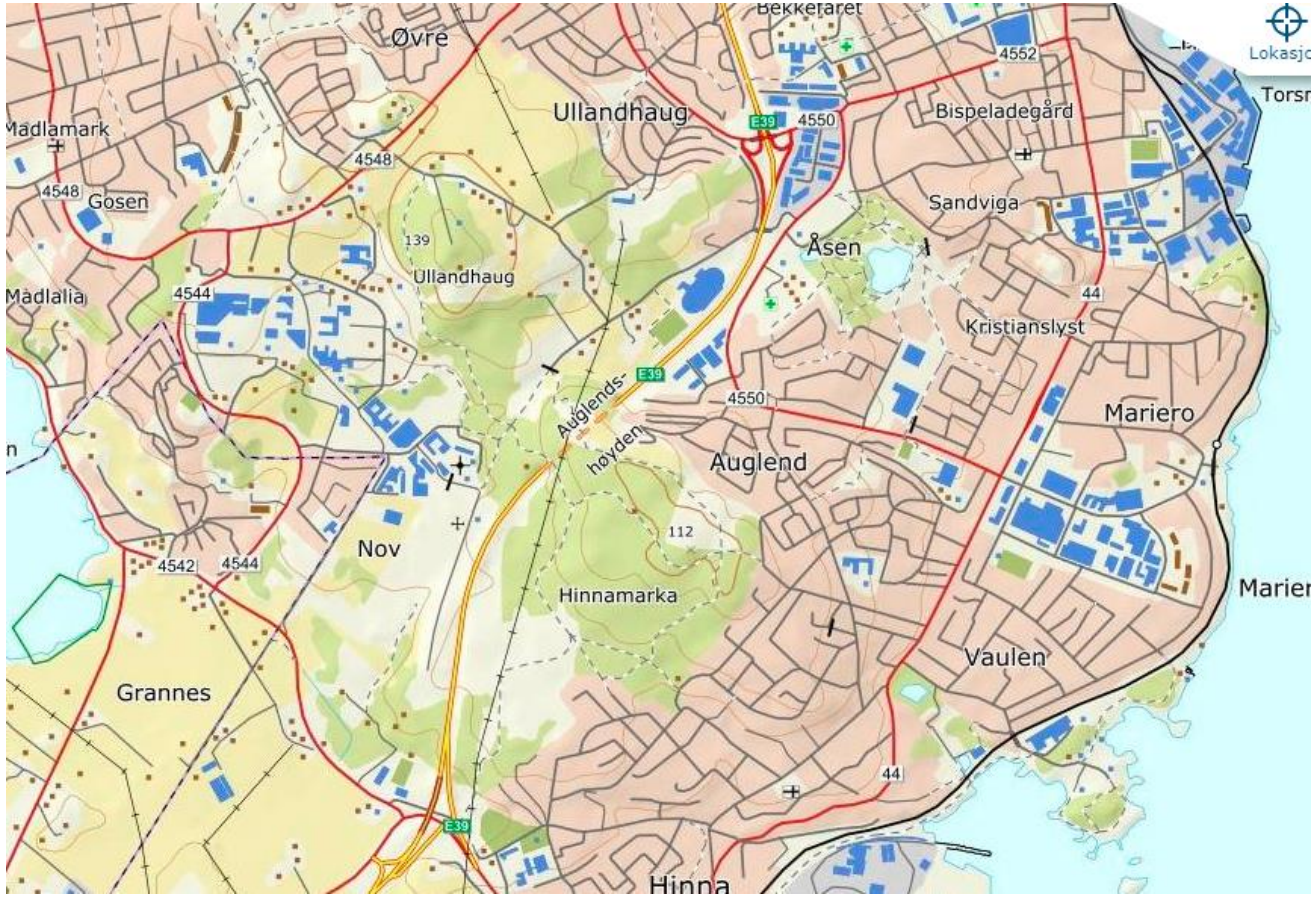
NBS Project: The Sørmarka Beck and forrest project

The Sørmaka Back and Forrest project will combine tree planting and wetlands projects to manage stormwater and increase biodiversity in Sørmaka North West



NBS Project: The Sørmarka Beck and forrest project

The challenge: Prevent storm water flooding from recreational areas and farmland upstream of residential areas, such as Sørmarka, while at the same time increasing nature and biodiversity as a cobenefit

The aim of the project sketch:

- Reduction in reported water damages
- Constructed lakes and wetlands as basis for increased biodiversity
- Improved recreational value
- Increase the foilage/forrest area and move to more suitable species that contribute to biodiversity

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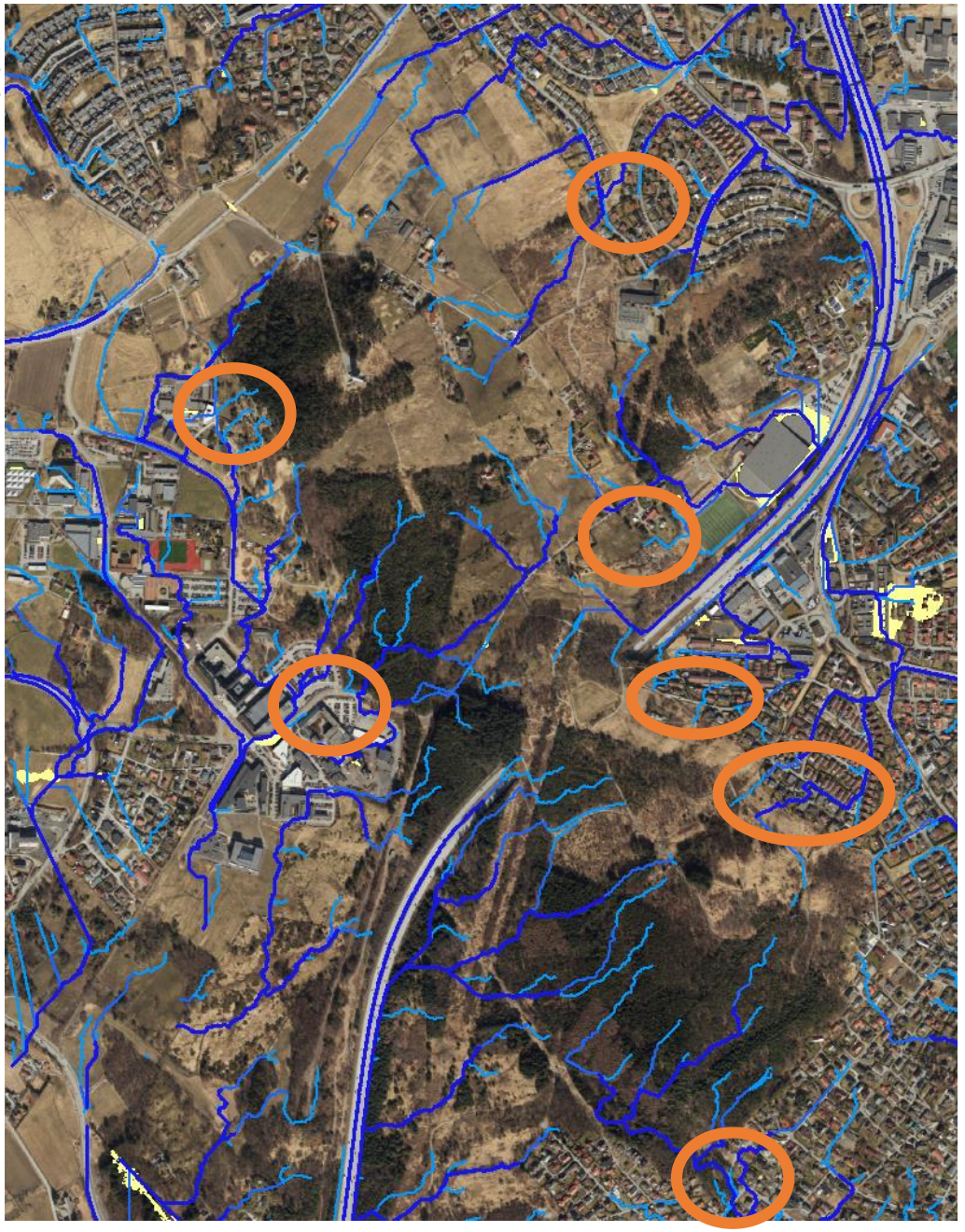

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NBS Project: The Sørmarka Beck and forrest project

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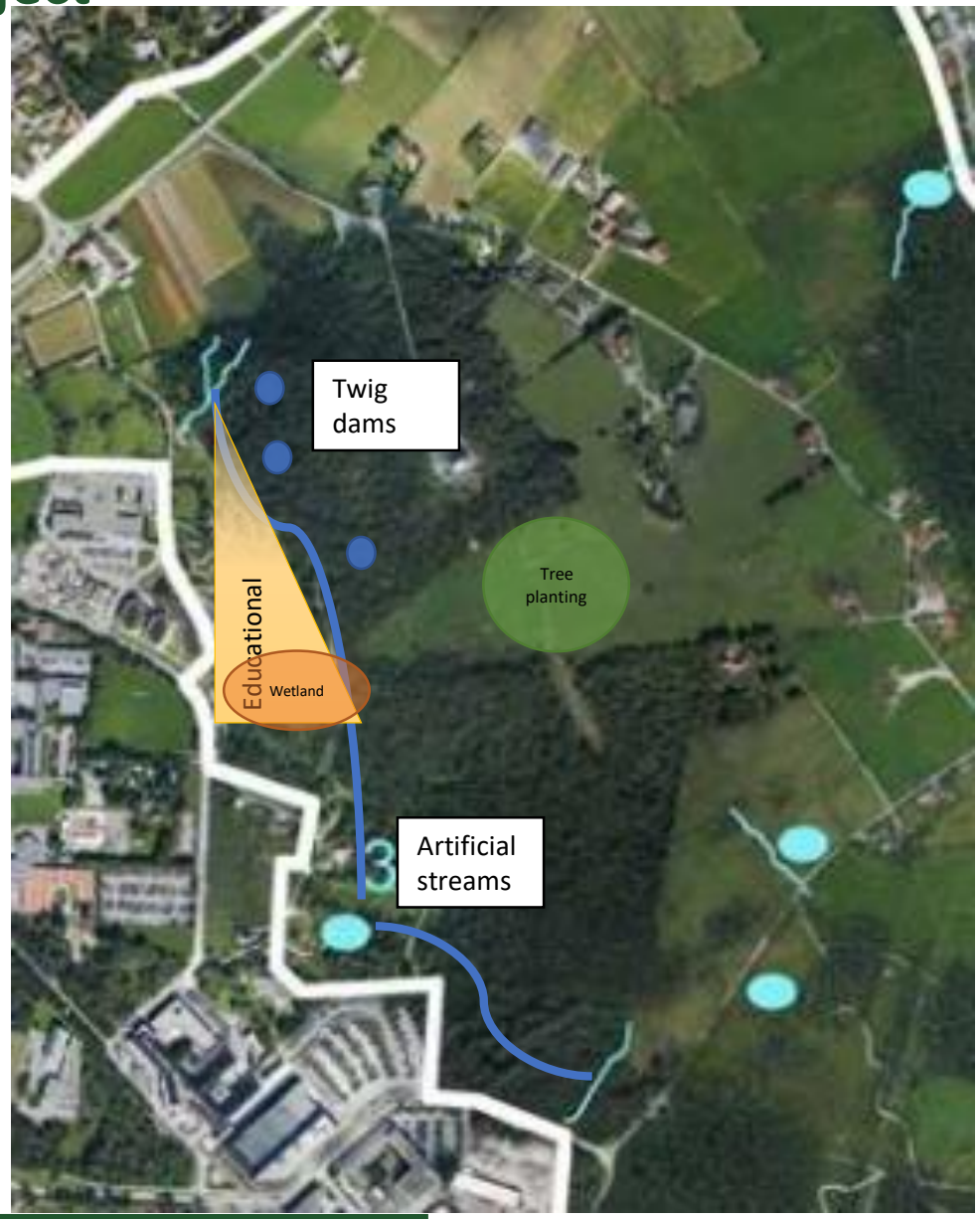
NBS Project: The Sørmarka Beck and forrest project

We would need a string of connected NBS elements:

- Trees – change of species, larger areas
- Constructed wetlands – would contribute to biodiversity as well as water management
- Educational activities connected to the botanical garden
- Artificial streams
- Low twig dams



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Governance project: Joint Forces for NBS

Development of a municipal management system for sustainability and environment and the development of a learning co-operating organisation

Aim of the project:

- Lay the foundation for implementing NBS in Stavanger on a larger scale
- Fulfill the city master plan ambition of becoming a «spearhead» for NBS and climate adaptation
- Establish necessay structures for cross sectorial cooperation

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Stavangers Governance Project 1

Development of a municipal management system for sustainability and environment and the development of a learning co-operating organisation

Key governance actions:

- Development of shared visions
- Awareness campaigns
- NBS-supportive zoning regulations
- Training of the administration (NBS topics, skills and methods, co-creation)
- Implement municipal environmental and sustainability management systems (with indicators)
- Develop indicators – resilience and biodiversity
- Strengthen informal networks
- Strengthen and support cross sectorial networks

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Questions for discussion

NBS project:

- How do you manage upstream/downstream issues with regards to stormwater?
- Do you have suggestions for NBS in steep slopes?
- How would you finance this kind of measure?

Governance project:

-How have you succeeded in mainstreaming NBS in your organisations?

-In what areas, other than water management, have you successfully used NBS?

-What do you see as the key measure to ensure cross sectional cooperation within climate change adaptation and NBS?

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