



Operational model in nature-based stormwater management

Tampere, Finland

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Stormwaters Unit

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Tampere

250 000

inhabitants

160

lakes

650 mm

*annual
precipitation*

800 km

stormwater sewers

~80

*nature-based
stormwater solutions*

98%

*of
sewers separated*

Challenges

- Precipitation increases 20-30% by 2070
- City is getting denser
 - ➔ Flooding, erosion, habitat loss & pollution
 - ➔ NBS to tackle the challenges

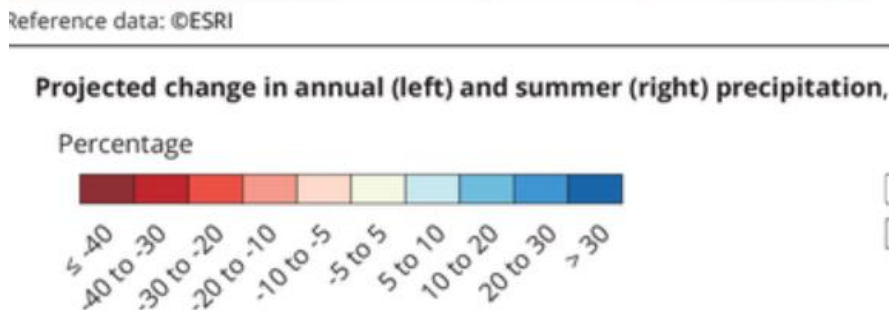
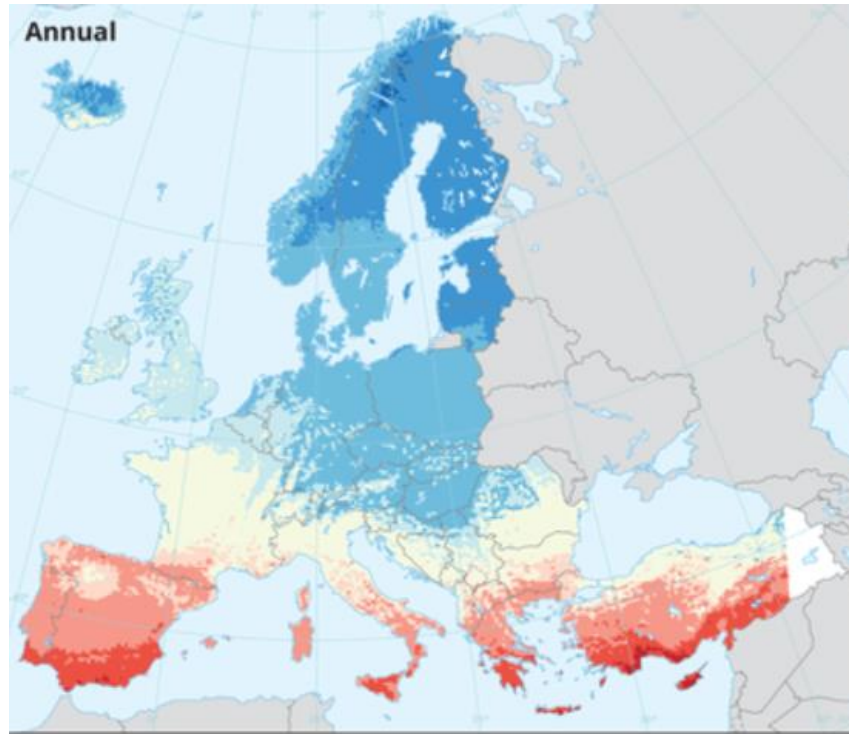


Image: European Environmental Agency



Strategies & policies support NBS implementation

- City strategy
 - Biodiversity program
 - Stormwater program
 - Carbon neutral Tampere roadmap
 - International commitments
- ➔ Strong commitment to manage stormwater primarily with NBS

Stormwater program:

[Tampereen hulevesiohjelman ja valuma-alueselvitys 2023-2030](#)



Stormwater basin in Vuores provides habitat for birds

Financing



- Property-specific stormwater fee
~5,6 million € /year
- EU-funding:
 - UnaLab project ~1,4 million €
 - City Blues project ~0,5 million €

Opening of piped Vuohenoja stream

Cross-departmental collaboration in stormwater management

- **Climate and environmental policy unit:** Coordination of climate work & international collaborations
- **City planning unit:** generic stormwater plans, retention requirements and area reservations for NBS



NBS co-creation
workshop in UnaLab project

Cross-departmental collaboration

- **Green areas and stormwaters unit:** organizing stormwater management, stormwater plans, monitoring
- **Construction unit:** NBS implementation in public areas



"Green" facade after winter

Cross-departmental collaboration

- **Environmental protection unit:** species protection & prevention of water pollution
- **Construction control unit:** approves property-specific stormwater plans
- **Tampereen Infra & Tampere Water:** building & maintenance
- **Rescue department:** preparedness & acute crisis management



Flooding in the city center

Involving citizens

- Possibility to comment on master plans, zoning plans, park & stormwater plans
- Deeper co-creation mainly in projects



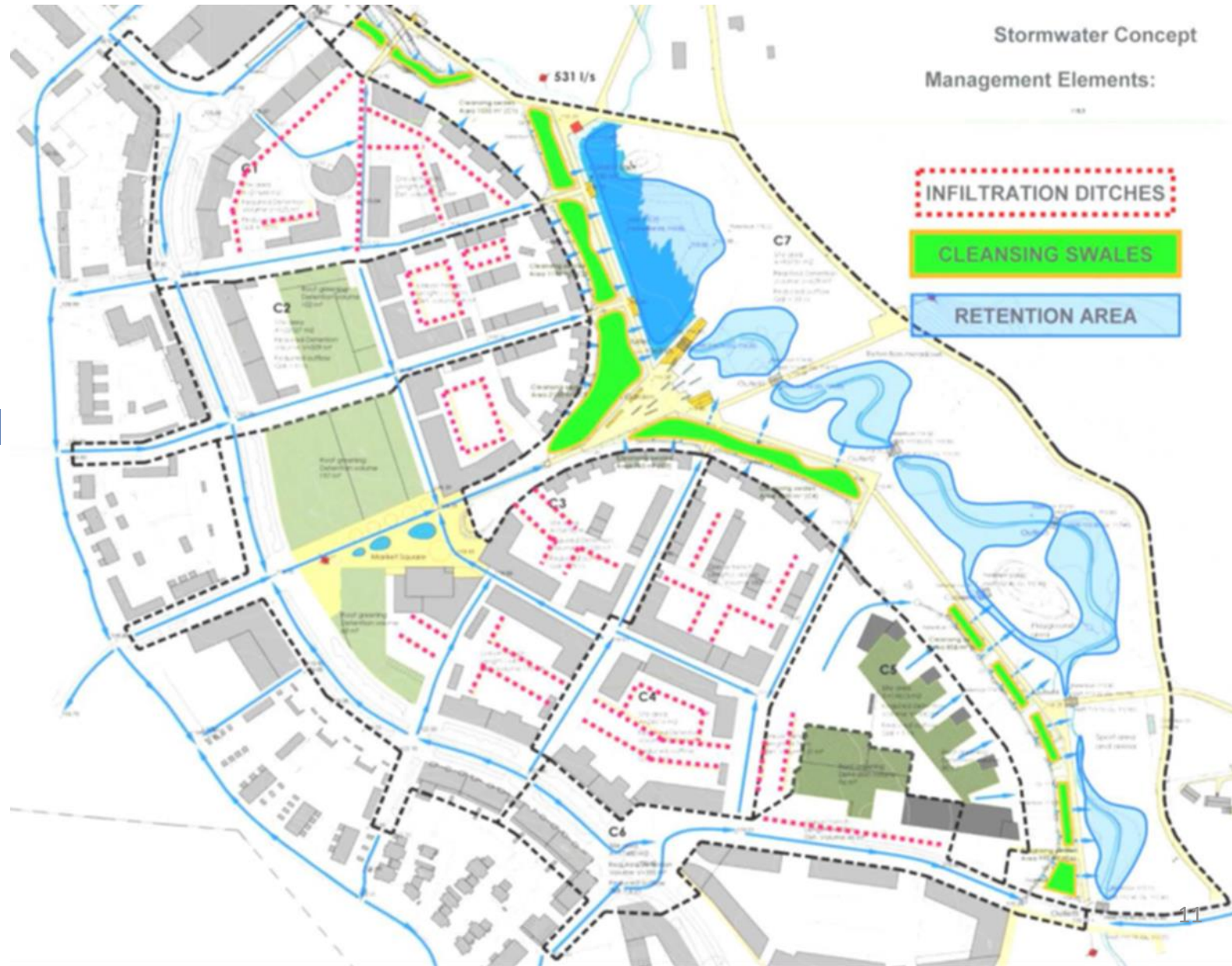
Stormwater management on construction sites

- Treatment according to construction site runoff guidelines: [Tampereen kaupungin työmaavesiohje](#)
- A plan for construction site stormwater management is required for private and public areas
- Retention pond + sand filter effective for pollutant removal
- Close to sensitive waterbodies the use of emulsion-based explosives

Erosion protection is built to a stream bed

Good example of nature-based stormwater management: Vuores

- A new residential area with decentralised stormwater system
- Plot-specific retention requirements in zoning plans (1 m³/100 m²)



Monitoring results Vuores stormwater system

- Effective in retention & purification
- ➔ Decentralised system improves reliability
- ➔ Replication in all other new areas



Spring flood in the alluvial meadows of Vuores

NBS in private areas in Vuores



Permeable surfaces



Rainwater harvesting



Rain gardens



Green roofs

NBS in public areas in Vuores



Green swales



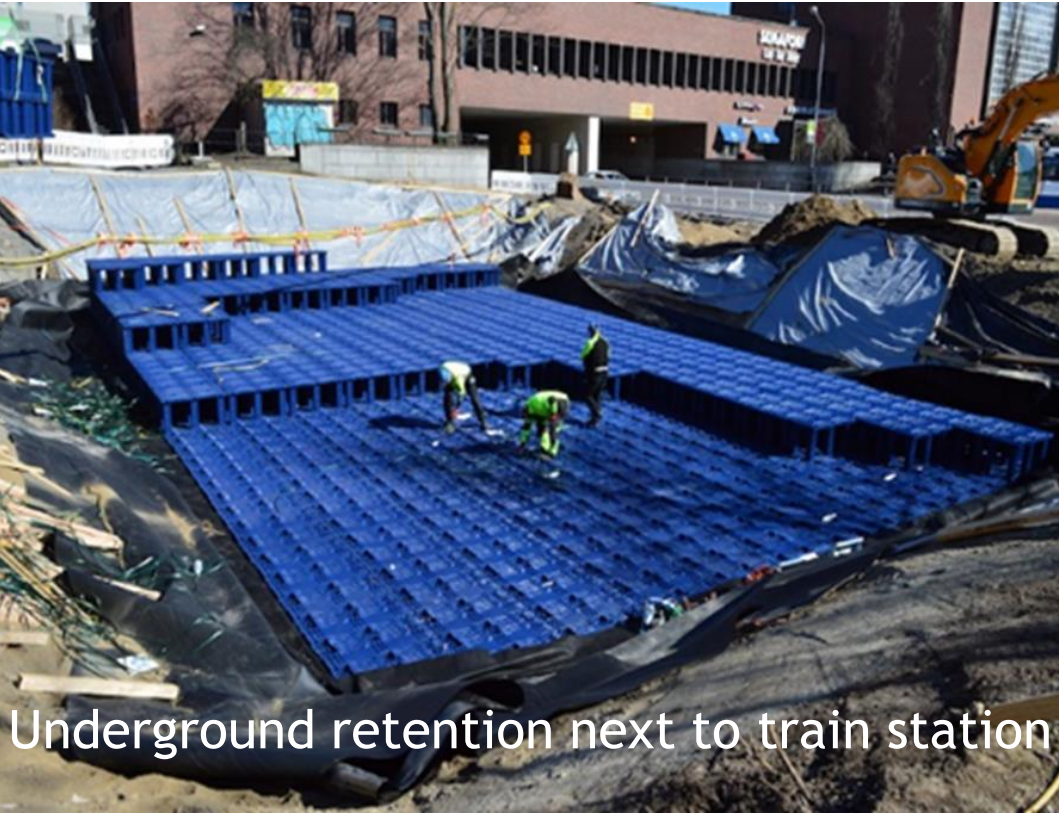
Detention basins



Wetlands

NBS implementation in "old" areas

- With street and park renovations



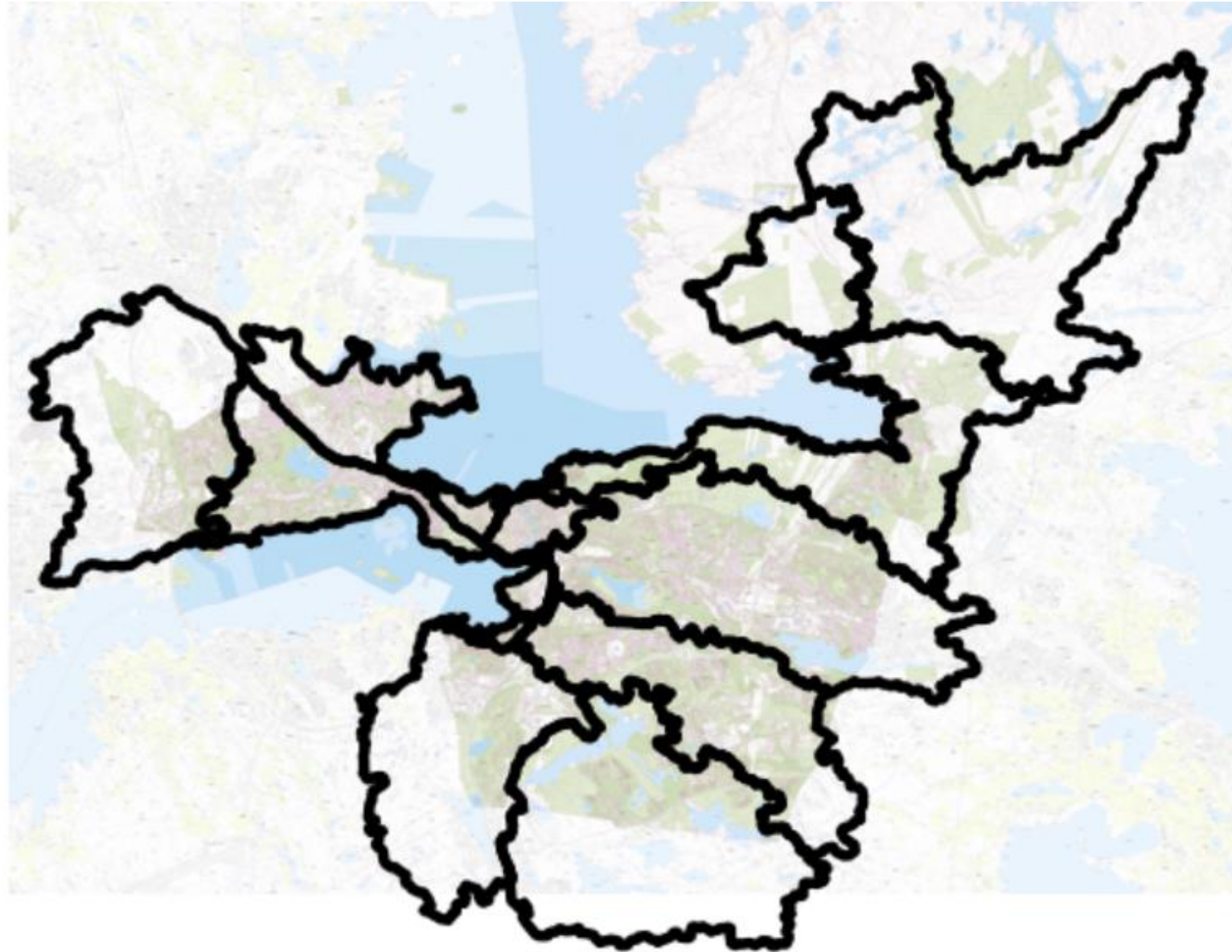
Underground retention next to train station



Retention basin and biofilter in an industrial area

NBS implementation in "old" areas

- Catchment-scale stormwater master plans
 - > mapping areas for stormwater retention
 - > Detailed planning and implementation



City Blues pilot

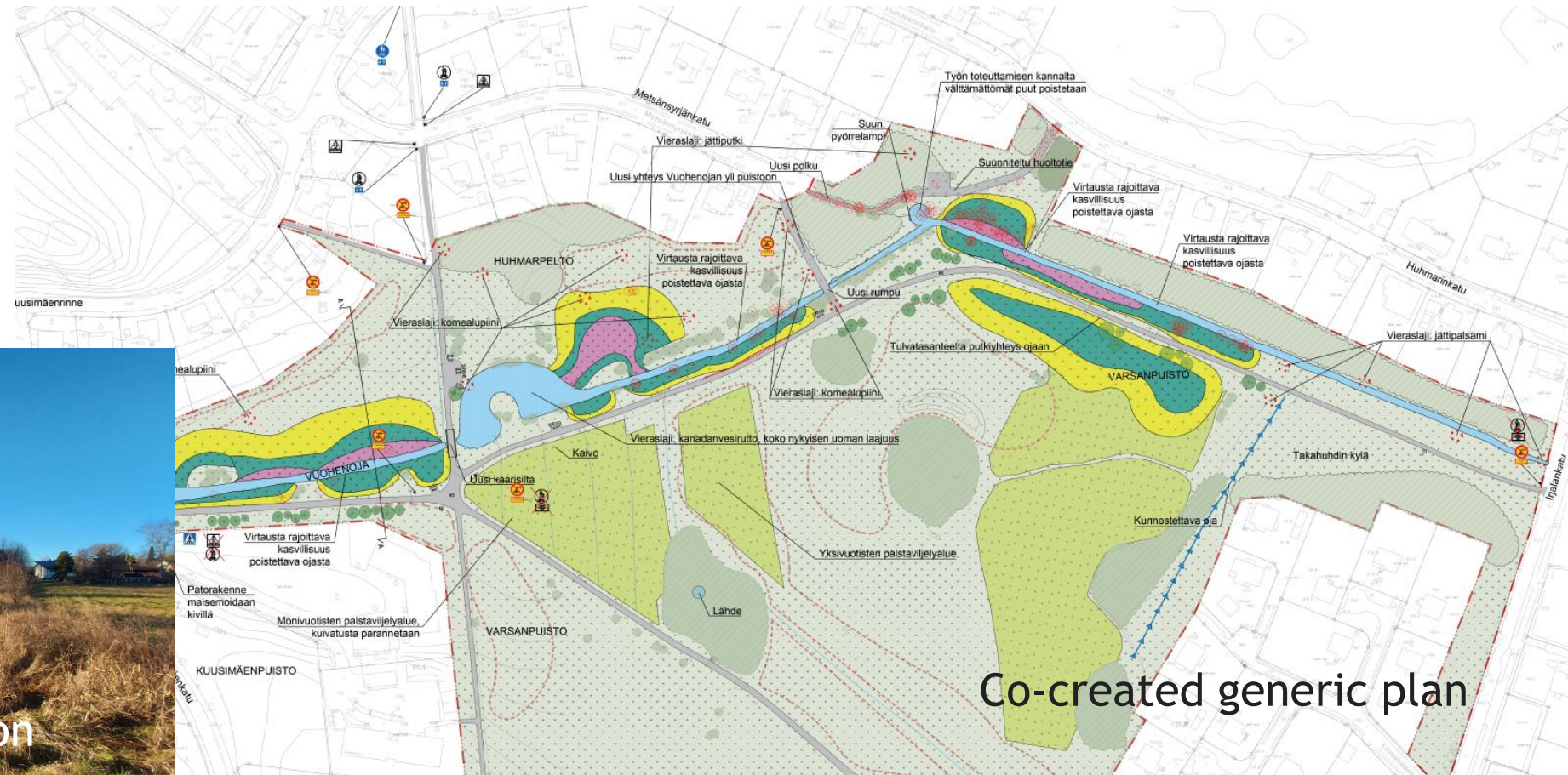
Interreg
Baltic Sea Region



Co-funded by
the European Union

SUSTAINABLE WATERS
City Blues

- Stormwater retention & treatment
- Stream restoration



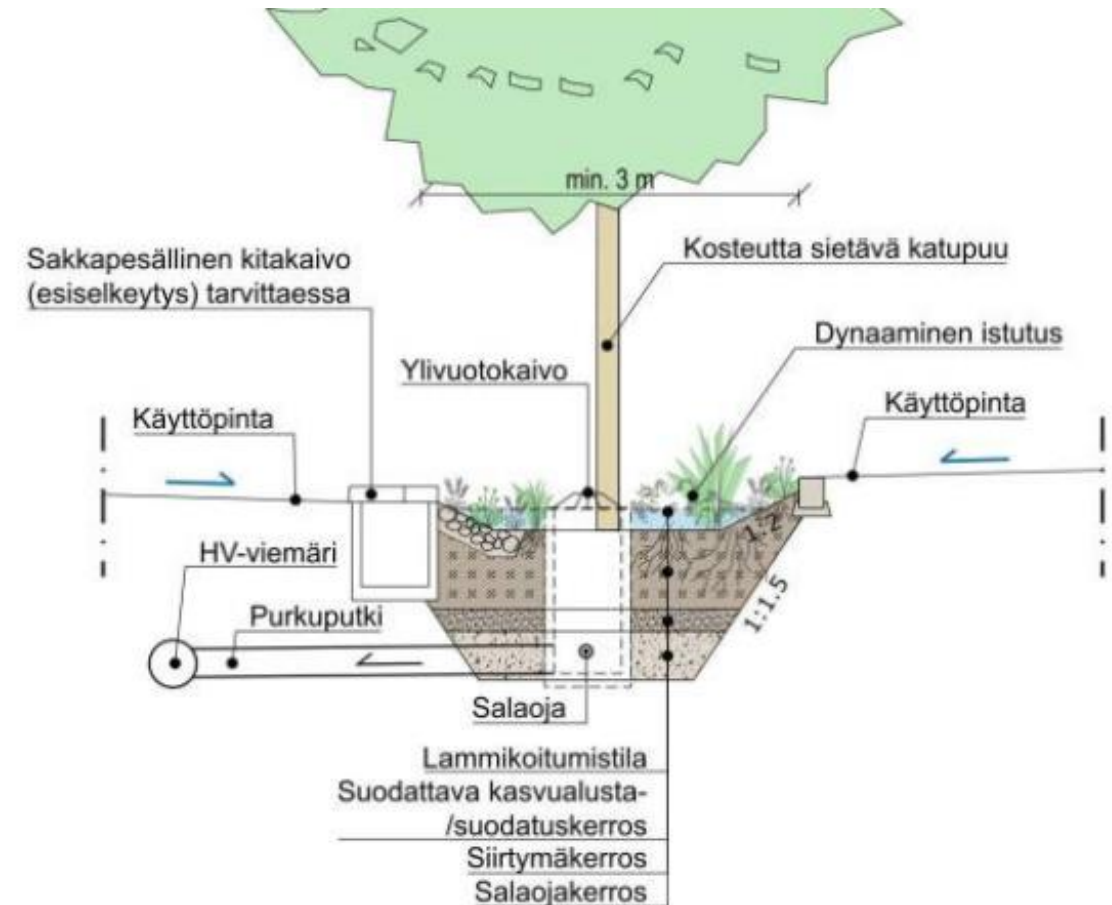
Co-created generic plan



Pilot site before construction

NBS design guidelines

- Good practices compiled to design guidelines according to which the systems will be planned
- Guidelines for wetlands, biofilters, retention basins etc.
- Rain garden guidelines for residents: [tampere.fi/sites/default/files/2023-04/Sadepuutarhakortti Unalab TRE%28002%29.pdf](https://tampere.fi/sites/default/files/2023-04/Sadepuutarhakortti_Unalab_TRE%28002%29.pdf)



Kuva 1 Kasvipeitteinen biosuodatusrakenne katualueella, poikkileikkaus.

Opening and restoring streams



Work in progress



Before: 130 m of a river piped



After: free running river

Maintenance

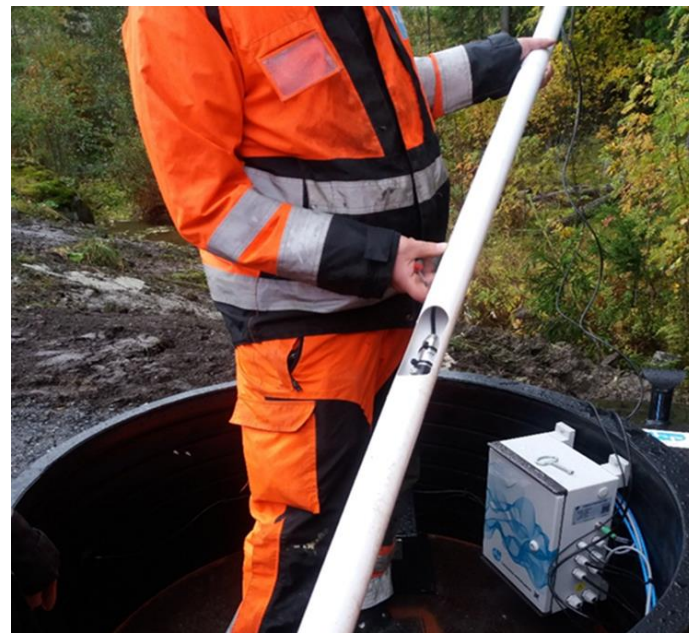
- Site-specific instructions in planning phase
- Challenges faced:
 - invasive plant species
 - different perceptions of aesthetics
 - protected species



Restored Vihioja stream
with alluvial meadows

Performance monitoring of NBS

- Online sensors: water flow, pH, turbidity, conductivity, NO₃-N, COD, temperature, precipitation
- Traditional sampling: Cl, SO₄, P_{tot}, N_{tot}, TSS, metals, fecal coliforms etc.
- Biodiversity studies, CO₂ calculations, surveys, electrofishing etc.



Continuous sensors are used for monitoring stormwater quality & quantity



Traditional water sampling in a stream

Future

- Utilization of stormwater in its places of origin
- Studies of long-term performance of NBS
- Studies of micropollutants and their impact on aquatic biota
- Awareness raising



Stormwaters are directed to vegetation in Ojala district

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Thank you!