



Monitoring and measuring of NBS pilot sites

Interreg



Co-funded by
the European Union

Central Baltic Programme

MUSTBE

Jurijs Kondratenko,
RTU Water systems and biotechnology
institute

MUSTBE project | NBS performance monitoring

**Water quality analysis
before and after NBS.**

**Real-time water quality
sensing in the pilot sites.**

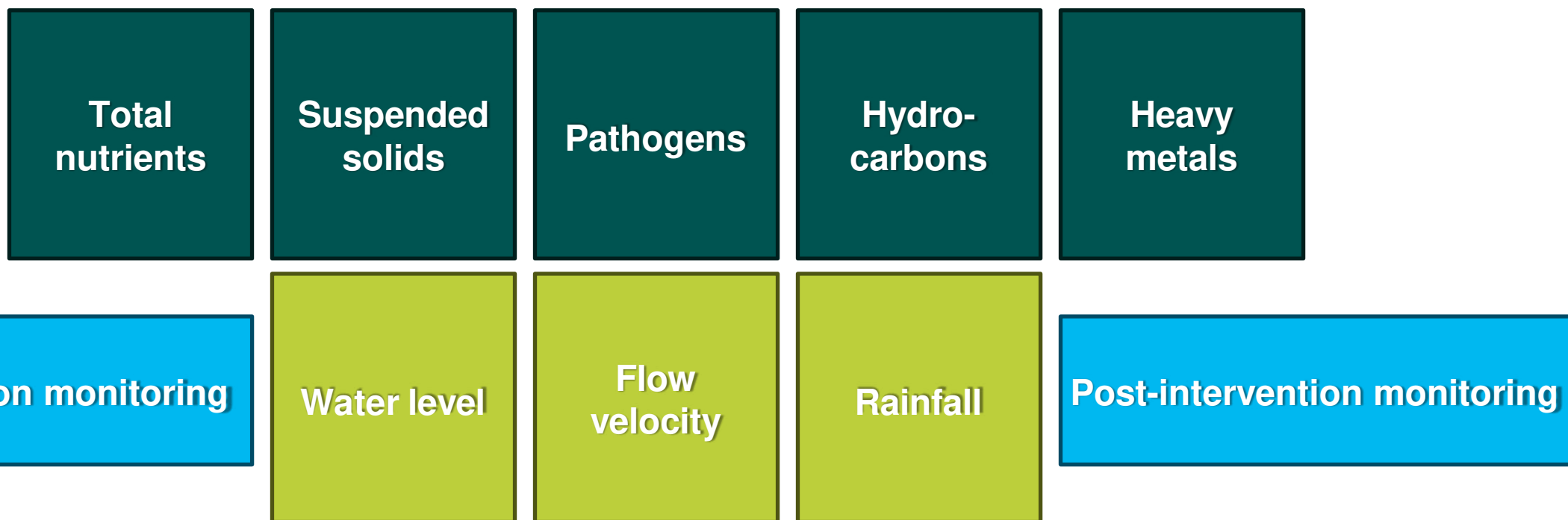
**Hydraulic and water quality
and climate scenario
modelling.**

**Online monitoring and
visualisation system
in project locations.**

**Cost-effective monitoring methods coupled with high
resolution and low-resolution sensors for catchment-
scale monitoring and control.**

**Understanding of future
efficiency and sustainability of
the test sites.**

**Impact of the smart NBS
compared to conventional
treatment solutions.**



MUSTBE project Pilot sites

RĪGA

TALLINN

VIIMSI

SODERHAMN

PORI

Rīga pilot site

- Šmērļupīte – a small water stream collecting stormwater drainage from densely populated urban dwellings and industrial areas.
- Recreational green area
- Possible sewage influx
- Solutions: water flow stoppers, plants
- Sedimentation of suspended solids, nutrients and hazardous substance retention, organics degradation.

Goal: Improve water quality and the ecosystem services



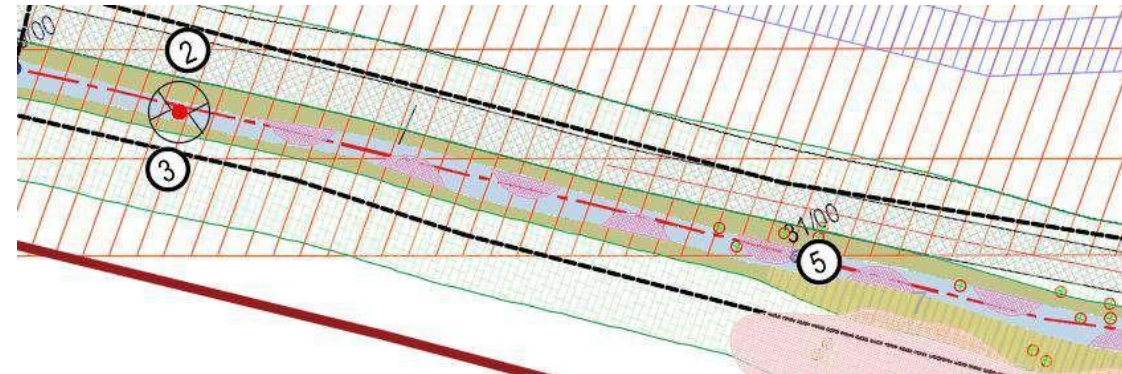
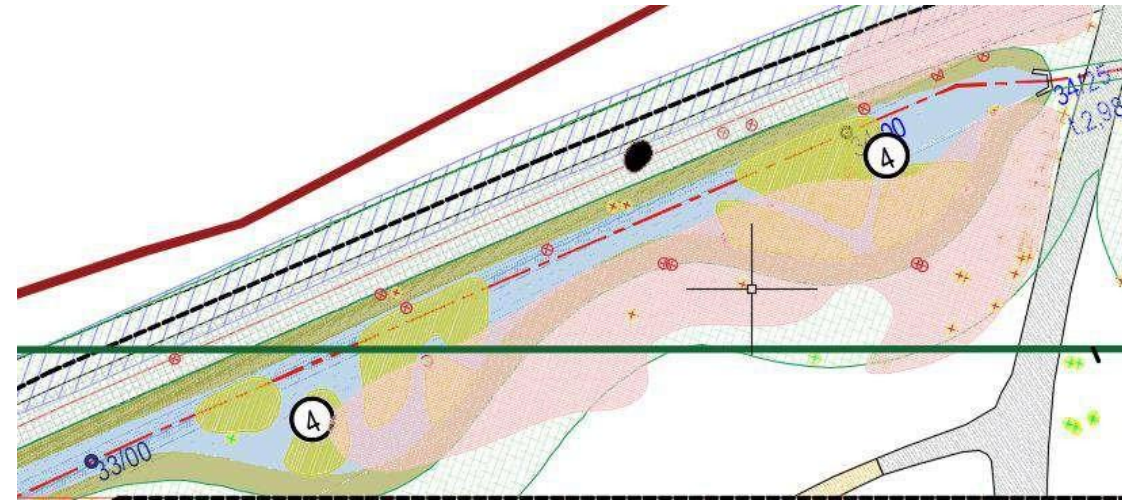
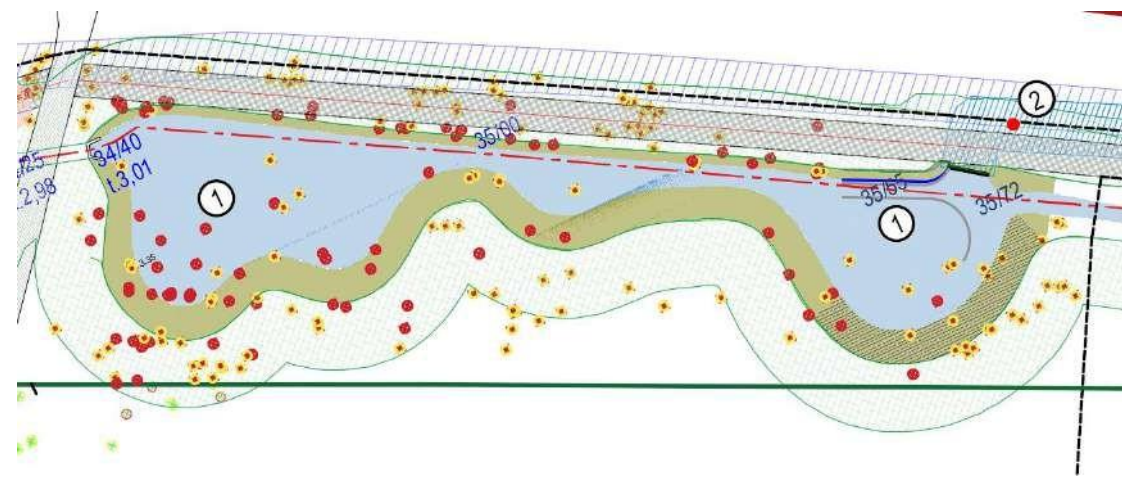
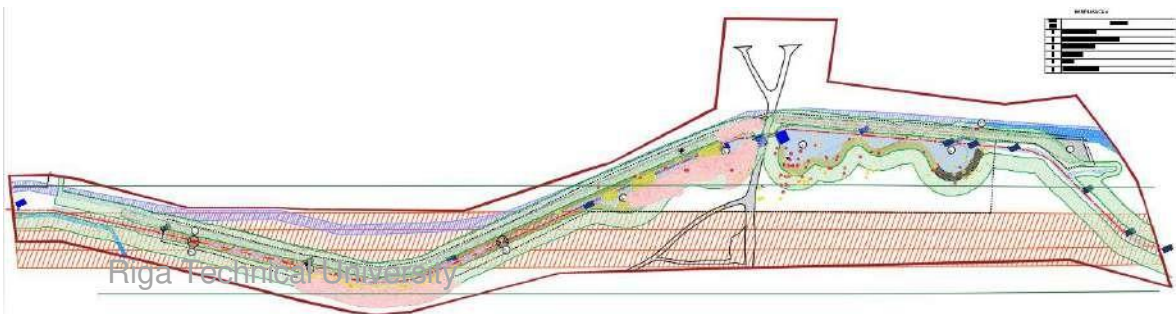
Riga pilot site

	Suspended solids, mg/L	Total Nitrogen, mg/L	E-coli, CFU/100 ml	Hydrocarbons, mg/L	Metals, µg/L
Baseline values	80	3.5	4700*	<0.02	25
Target values	30	1.4	1880	<0.02	15

**estimated from literature*

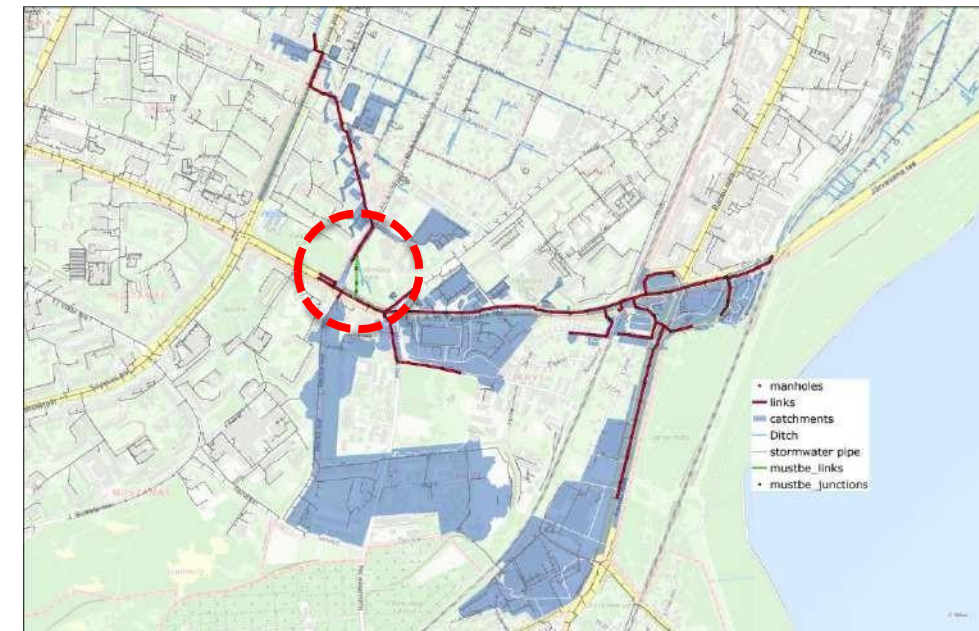
Rīga pilot site monitoring

- Rainfall events and dry weather periods
- Biochemical and Physical water quality
- Flow velocity and water level
- Sensors for pH, EC, temperature, turbidity, other
- Grab sampling for parameters Nutrients, Suspended solids, pathogens, metals and hydrocarbons.



Tallinn pilot site

- Järveotsa stream, flows into Harku lake, direct connection to the Baltic Sea
 - used as headwaters for stormwater
 - Catchment area
 - under persistent real-estate development pressure – careful approach to avoid water quality degradation
 - Poor water quality (WFD)
- Goal:* water quality improvement, technical requirements for the new developments



Tallinn pilot site

	Suspended solids, mg/L	Total Nitrogen, mg/L	E-coli, CFU/100 ml	Hydrocarbons, mg/L	Metals, µg/L
Baseline values	98	1,8	4700*	0,002*	93,4*
Target values	39	1,2	1880	0,001	56

**estimated from literature*

Tallinn pilot site monitoring

- Real time monitoring of flow, temperature, turbidity, oil products, nitrogen
- Key parameters for water quality status improvement (Nutrients, Susp. Solids, BOD)
- **Real time monitoring based water flow regulation for downstream water quality improvement**



Viimsi pilot site

- NBS solution for stormwater retention and reuse, flood prevention
- Newly developed residential area, 0,35 ha
- Stormwater systems overwhelmed by high flowrates

Goal: Create a small park with ponds, rain gardens and fountain to reuse the retained stormwater



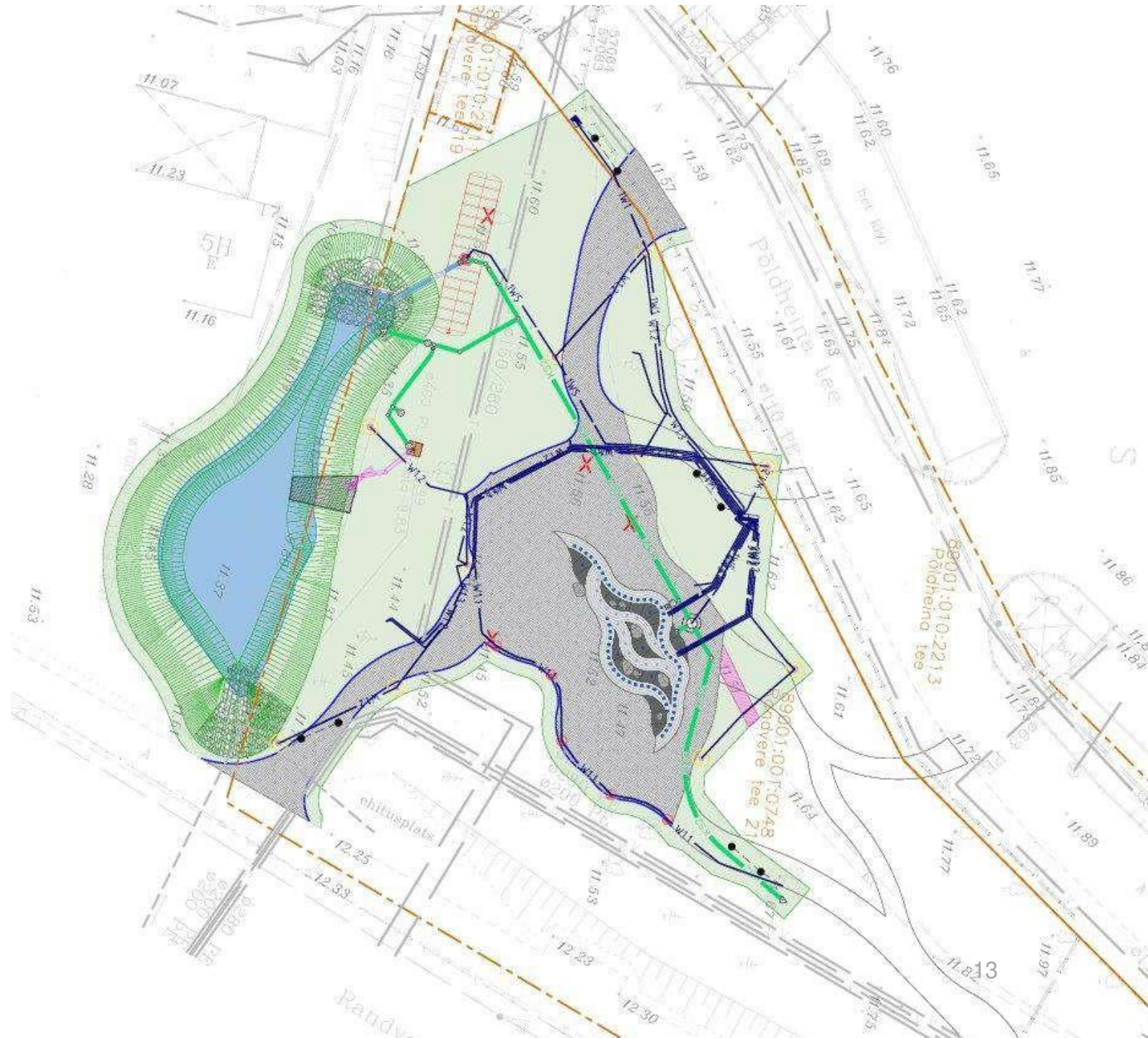
Viimsi pilot site

	Suspended solids, mg/L	Total Nitrogen, mg/L	E-coli, CFU/100 ml	Hydrocarbons, mg/L	Metals, µg/L
Baseline values	282	2	4700*	0,002*	93,4*
Target values	112	1,2	1880	0,001	56

**estimated from literature*

Viimsi pilot site monitoring

- Outflows from NBS - controlled in real time
- Real time water quality sensors will be installed: water level, flow, temperature, turbidity, electrical conductivity
- Manual sampling for nutrients, hazardous substances and toxin detection.



Söderhamn pilot sites

Söderhamnsporten

- New transportation hub - railway, highways and connections to Söderhamn
- Currently undeveloped area with impermeable natural surfaces
- New streets, parking lots, building are planned with combination of amenity areas like parks and walkways
- Söderhamnsan river is passing the district – affected by the stormwater runoff, impact to the the Baltic Sea

Broberg

- New residential area is planned
- Highly affected by the sea-level rise
- Must reduce the impact to Baltic sea
- The multi-objective stormwater treatment solutions are aimed at reducing the inflows of nutrients, hazardous substances, plastics and toxins into the Baltic Sea



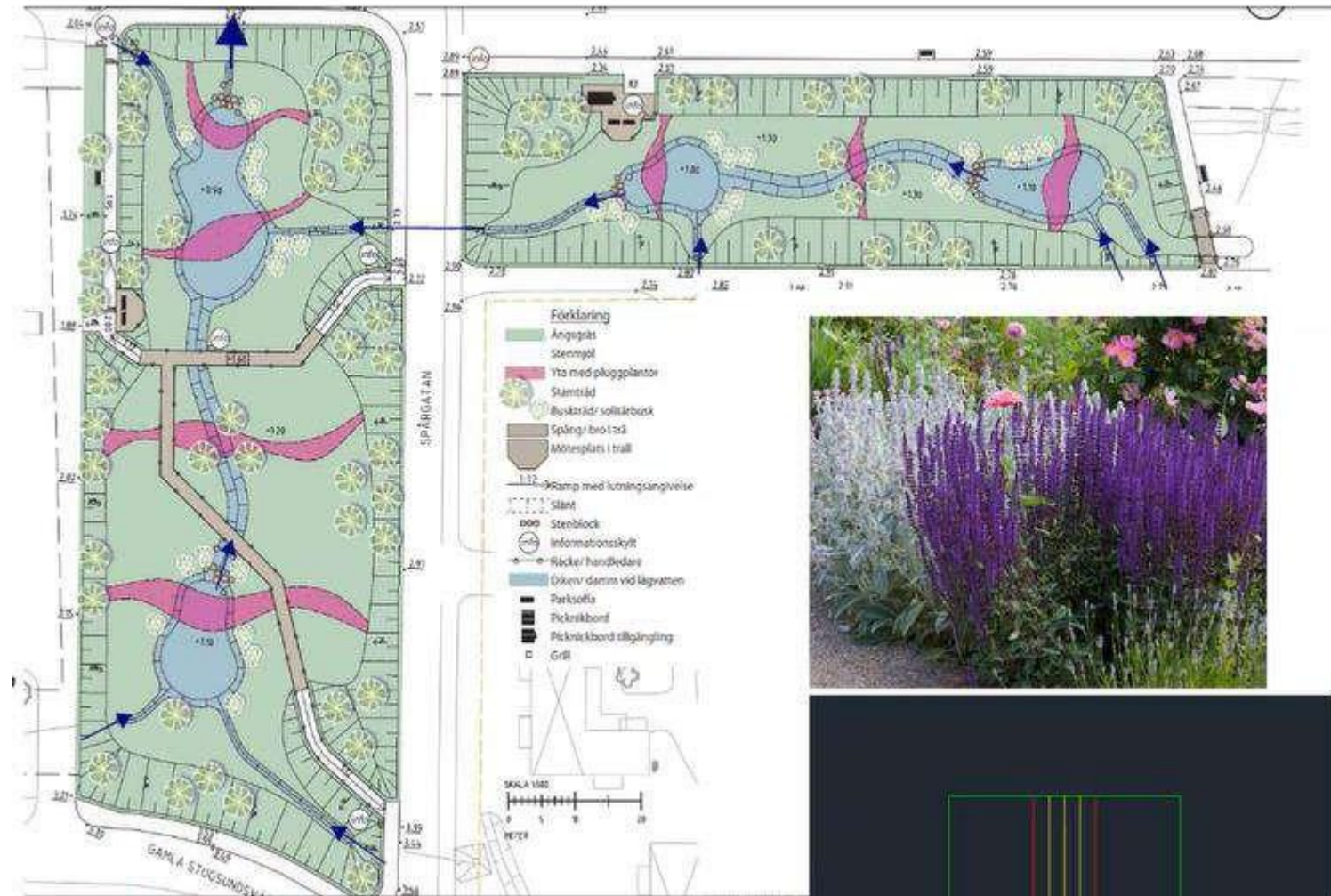
Söderhamn pilot sites

		Suspended solids, mg/L	Total Nitrogen, mg/L	E-coli, CFU/100 ml	Hydrocarbons, mg/L	Metals, µg/L
Baseline values	Söderhamnsporten	174	2.3	4700*	0,002*	93,4*
	Broberg	88	1.3	4700*	0,002*	93,4*
Target values	Söderhamnsporten	69	1.4	1880	0,001	56
	Broberg	35	0.8	1880	0,001	56

**estimated from literature*

Soderhamn pilot sites monitoring

- The monitoring program focused on pH, nutrients, hazardous substances, plastics and toxins
- Combination automated measurements and manual sampling.
- Automatic measurement of pH, EC, DO, ammonium, nitrates, turbidity



Pori pilot sites

- **The Wetland** - 0.3 ha, catchment area - 83 ha.
The catchment area - mostly of fields, the whole area is on acid sulphate soil.

Goal: Restore the wetland; prevent acidic waters runoff.

- **The Stormwater tree** solutions - implemented in tightly built area in Pori.

Goal: Provide shading, retain stormwaters for dry periods.



Pori pilot sites

		Suspended solids, mg/L	Total Nitrogen, mg/L	E-coli, CFU/100 ml	Hydrocarbons, mg/L	Metals, µg/L
Baseline values	Wetland	340	7.5	4700*	1.3	93,4*
	Tree tank	100	2	4700*	0.49	315
Target values	Wetland	136	5	1880	0.65	56
	Tree tank	40	1.4	1880	0.24	189

**estimated from literature*

Pori pilot sites monitoring

Wetland

- Continuous measurement (pH, water temperature)
- Continuous discharge water measurement
- weather station measuring atmospheric pressure, precipitation, air temperature, wind and it's direction, moisture
- Manual sampling for nutrients and metals

Trees

- weather station
- Overflow discharge
- Soil moisture



Next steps



Finalizing the NBS construction



Connecting real-time monitoring from all pilot sites to Online platforms for accessible monitoring data



Synchronizing the monitoring methods for comparable results.

Thank you!



E-mail



Webpage