

Case 2: City of Helsinki

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Helsinki



Helsinki

PLATFORM
BSR WATER

 **Interreg**
Baltic Sea Region



EUROPEAN
REGIONAL
DEVELOPMENT
FUND

Outline of presentation – 3 practices on different levels

1. **Strategic: Helsinki's storm water management program**
2. **Planning: The green area factor (new development areas)**
3. **Practical: SUDS (old areas)**

City of Helsinki's storm water management program



<https://www.hel.fi/static/liitteet/kaupunkiymparisto/julkaisut/julkaisut/julkaisu-03-18-en.pdf>

2018

1. Storm water has been utilized for increasing the attractiveness of the environment, maintaining biodiversity and promoting good condition of surface and ground water

Priority order

- 1** Primarily, storm water will be treated and utilised at the source.
- 2** Storm water will be conveyed away from the source with a system that retains and detains the water.
- 3** Storm water will be conveyed away from the source in a storm water sewer to retention and detention areas located on public areas before conveying the water to a water body (brook).
- 4** Storm water will be conveyed in a storm water sewer directly to the recipient water body.
- 5** Storm water will be conveyed in a combined sewer to the Viikinmäki wastewater treatment plant



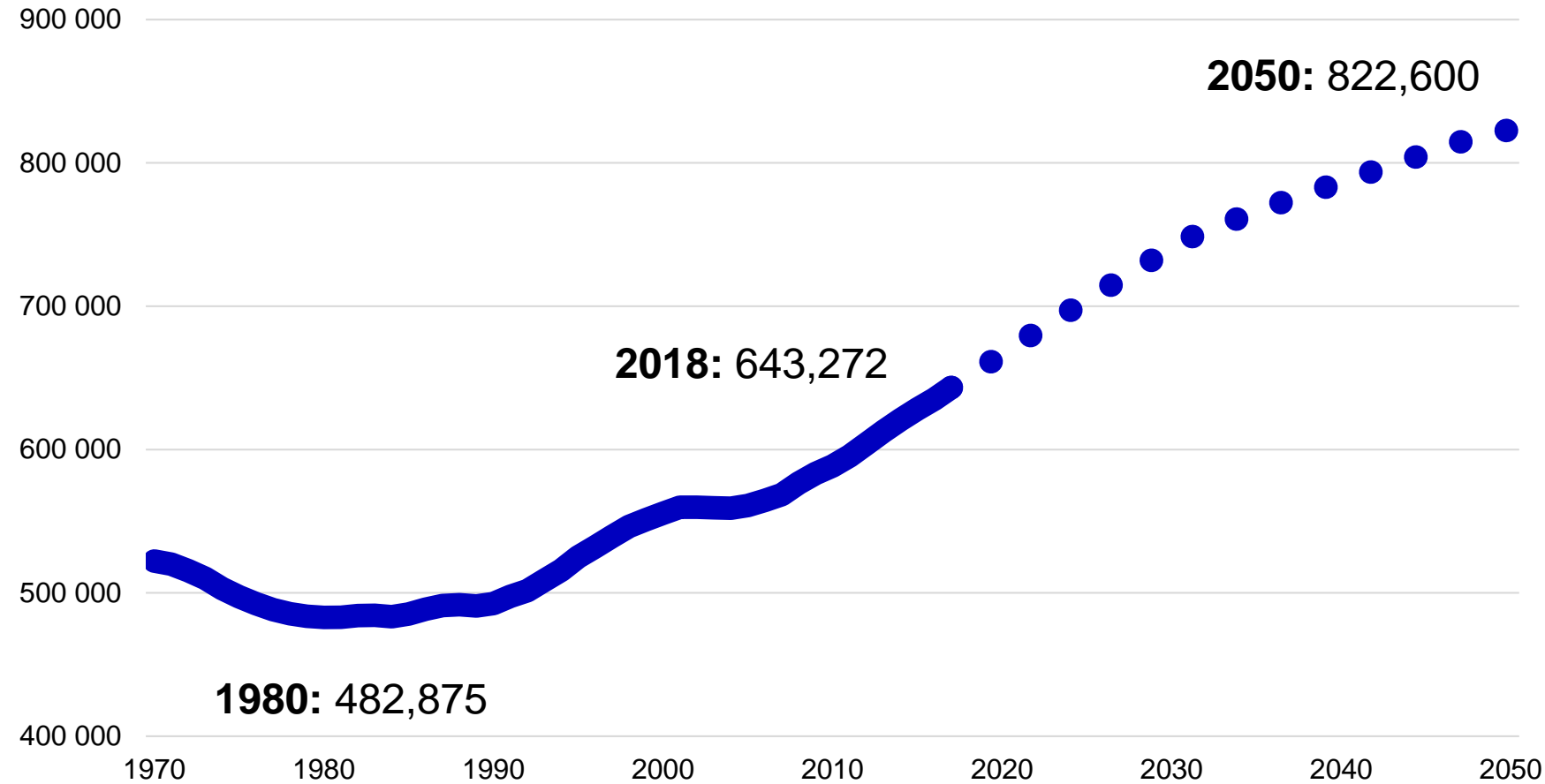
Contents:

1. BACKGROUND	6
2. DEFINITION OF STORM WATER	6
3. NEW CHALLENGES	7
The city becomes more dense	7
Climate changes	7
Legislation requires	7
City organisation develops	8
Storm water quality becomes better	8
Urban environment benefits	9
4. OBJECTIVES	11
5. PRIORITY ORDER	12
6. MEASURES	14
7. MONITORING AND REPORTING	22
8. TRAINING AND COMMUNICATIONS	22

2. Planning: The green area factor (new development areas)

Helsinki is a fast-growing city

Helsinki population 1970–2017 and forecast to 2050



➤ Calls for planning new areas using sustainable storm water management!

A planning tool which ensures sufficient green infrastructure when building new blocks in a dense urban environment

$$\text{Green factor} = \frac{\text{Scored green area}}{\text{Lot area}}$$

GAF excel tool

Five excel sheets

Instructions

Detailed element descriptions

1. Limitations & target value
2. Green elements
3. Results

Element group	Element description
Preserved vegetation and soil	Preserved large (fully grown > 10 m) tree in good condition, at least 3 m (25 m ² each)
	Preserved small (fully grown ≤ 10 m) tree in good condition, at least 3 m (15 m ² each)
	Preserved tree in good condition (1.5–3 m) or a large shrub (3 m ² each)
	Preserved natural meadow or natural ground vegetation
More info	Preserved natural bare rock area (at least partially bare rock surface, not many trees)
Planted/new vegetation	Large tree species, fully grown > 10 m (25 m ² each)
	Small tree species, fully grown ≤ 10 m (15 m ² each)
	Large shrubs (3 m ² each)
	Other shrubs
	Perennials
	Meadow or dry meadow
	Cultivation plots
	Lawn
More info	Perennial vines (2 m ² each)
Pavements	Semipermeable pavements (e.g. grass stones, stone ash)
	Permeable pavements (e.g. gravel and sand surfaces)
More info	Impermeable surface (calculated automatically)
Stormwater management solutions	Rain garden (biofiltration area) with a broad range of layered vegetation
	Intensive green roof / roof garden, depth of substrate 20–100 cm
	Semi-intensive green roof, depth of substrate 15–30 cm
	Extensive green roof, depth of substrate 6–8 cm
	Infiltration basin or swale covered with vegetation or aggregates (no permanent pool of water)
	Infiltration pit (underground)
	Pond, wetland or water meadow with natural vegetation (permanent water surface at least part remains moist)
Retention or detention ¹ basin or swale covered with vegetation or aggregates (permeable soil)	
More info	Retention or detention ¹ pit, tank or cistern (underground, notice units: volume!)
Bonus elements, max score 1 per category	Capturing stormwater from impermeable surfaces for use in irrigation or directing it in a controlled way
	Directing stormwater from impermeable surfaces to constructed water features, such as ponds
	Shading large tree (25 m ² each) on the south or southwest side of the building (especially deciduous)
	Shading small tree (15 m ² each) on the south or southwest side of the building (especially deciduous)
	Fruit trees or berry bushes suitable for cultivation (10 m ² each)

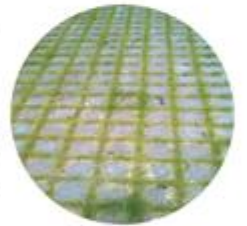
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treatment.

Results – Score card

www.integratedstormwater.eu/content/green-area-factor-and-other-tools

Score card

Date 2.2.2018

Block ID

33397

Lot ID

1

Achieved green area factor

Green Factor calculation

Green Factor	0,90
Target level	0,90

Amount of stormwater handled on the lot

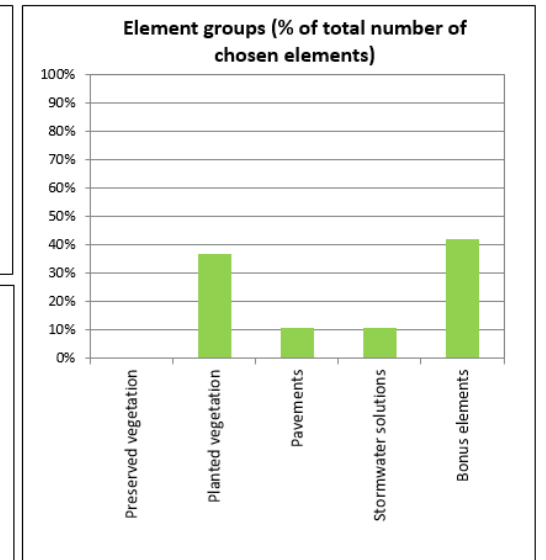
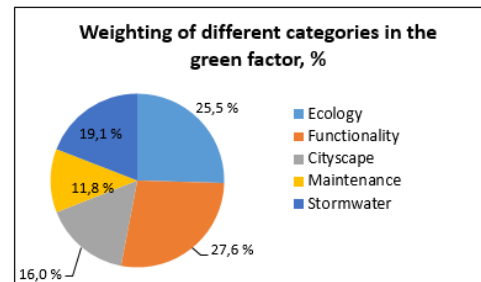
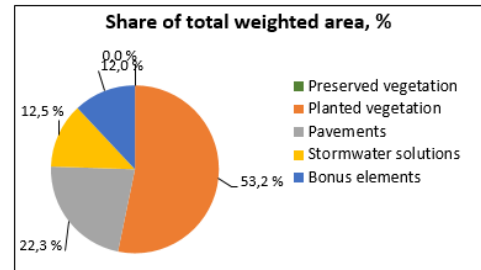
Stormwater volume m ³	
33,1	
Average runoff coefficient C	Possibility to retain stormwater outside blocklot
0,7	Yes
Necessary retention vol. m ³ on the lot	
26,5	
Retention volume of chosen elements m ³	Remaining retention demand m ³
28,0	0,0
Share of total impermeable surface	
58 %	

Elements included in the green factor

Element group	Elements filled	Total number of elements in group
Preserved vegetation	no elements!	5
Planted vegetation	7	10
Pavements	2	2
Stormwater solutions	2	9
Bonus elements	8	12
Total	19	38

Comments

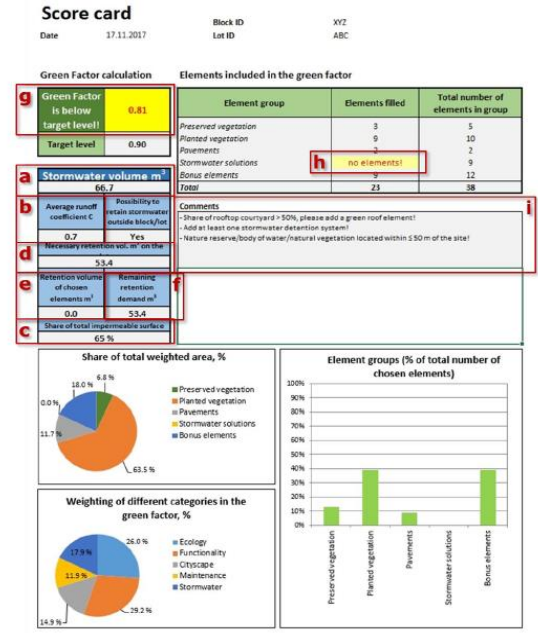
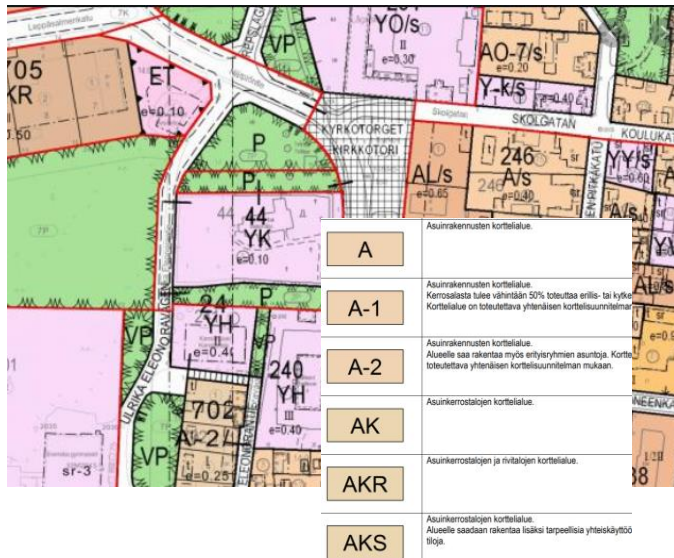
Results are given in graphics and tables



GAF in Helsinki city planning

– how to ensure that it is used?

1b) GAF also in lot assignments and land-use agreements



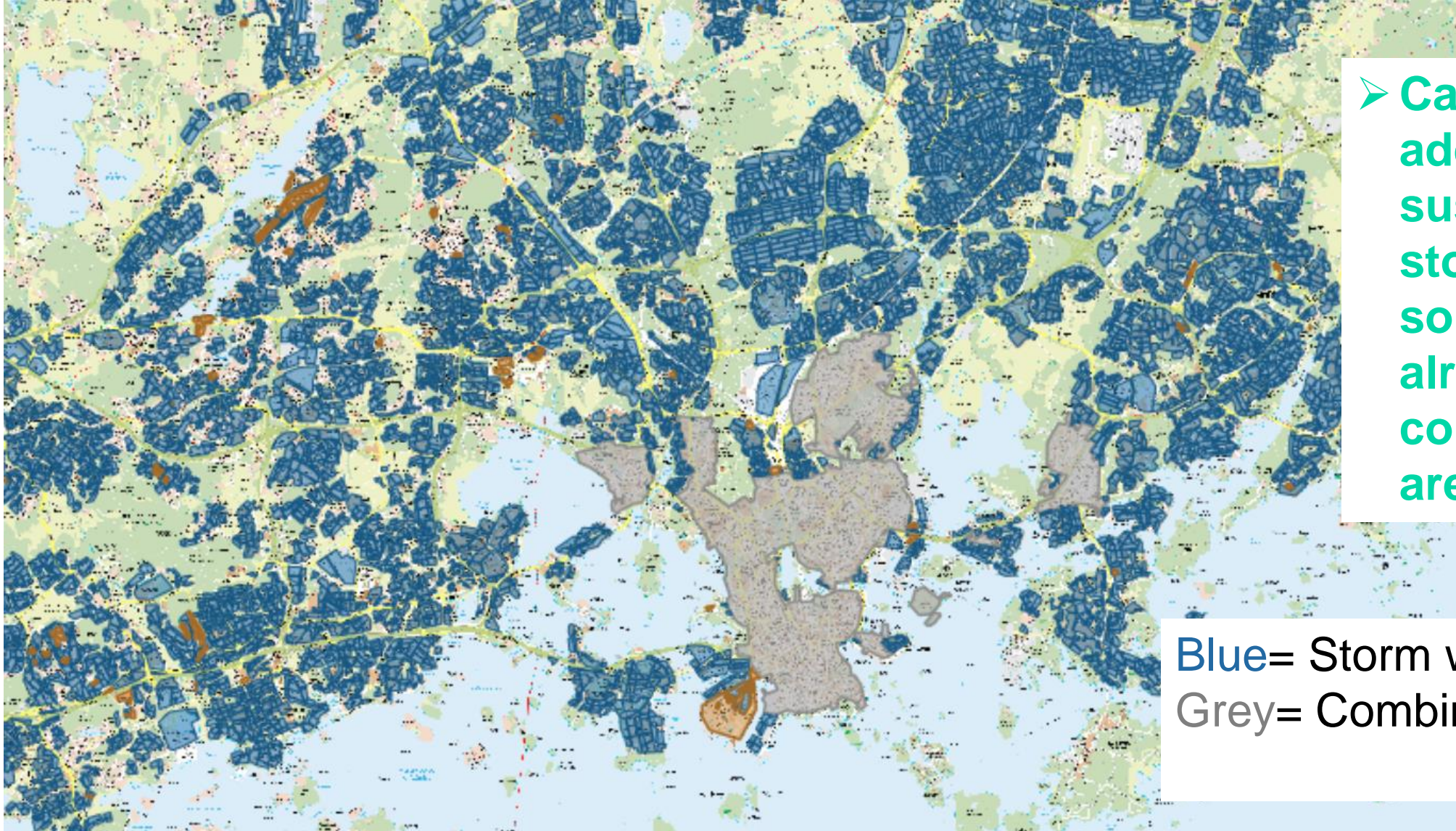
1) GAF requirement in zoning regulations of city plans

2) The garden designer calculates the GAF in the block plan

3) The GAF score card is attached to the building permit and checked by the city construction service

3. Practical solutions: SUDS (old areas)

Storm water and combined sewers



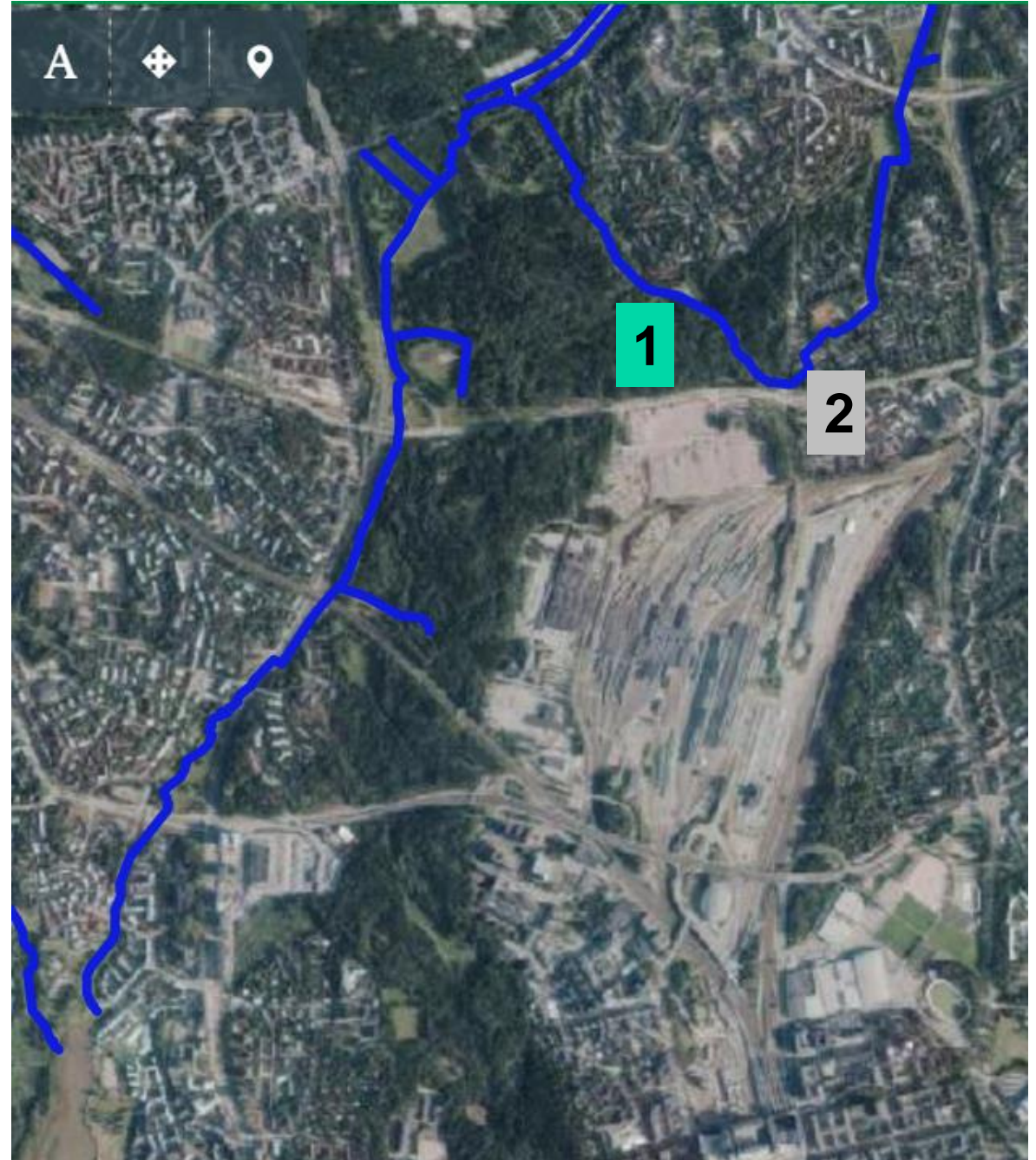
➤ Calls for adding sustainable storm water solutions to already constructed areas!

Blue= Storm water
Grey= Combined sewers

Biofiltration

- Storm water quality improvement
- Protecting of sea trout population breeding in the brook

1. Biofiltration with sand
2. Biofiltration with biochar & crushed stone



1) Biofiltration with sand



Luonnonmukaista hulevesien hallintaa Maunulanpuistossa
– biosuodatus puhdistaa sade- ja sulamisvesiä

Käytännössä hulevesien hallintaa toteutetaan luonnonmukaisilla menetelmillä, jotka hyöntelevät hulevesien luonnonpuhdistuskykyä. Tällaisia menetelmiä ovat esimerkiksi hulevesien kasaaminen, hulevesien suodatus ja hulevesien kasvitieteellinen puhdistus.

Hulevesien kasaaminen tarkoittaa hulevesien keräämistä ja kasaamista hulevesikassaamiseen. Hulevesien kasaaminen on hulevesien hallinnassa tärkeä osa, koska se mahdollistaa hulevesien luonnonpuhdistuksen ja hulevesien kasaamisen avulla voidaan vähentää hulevesien määrää, joka päätyy viemäriin.

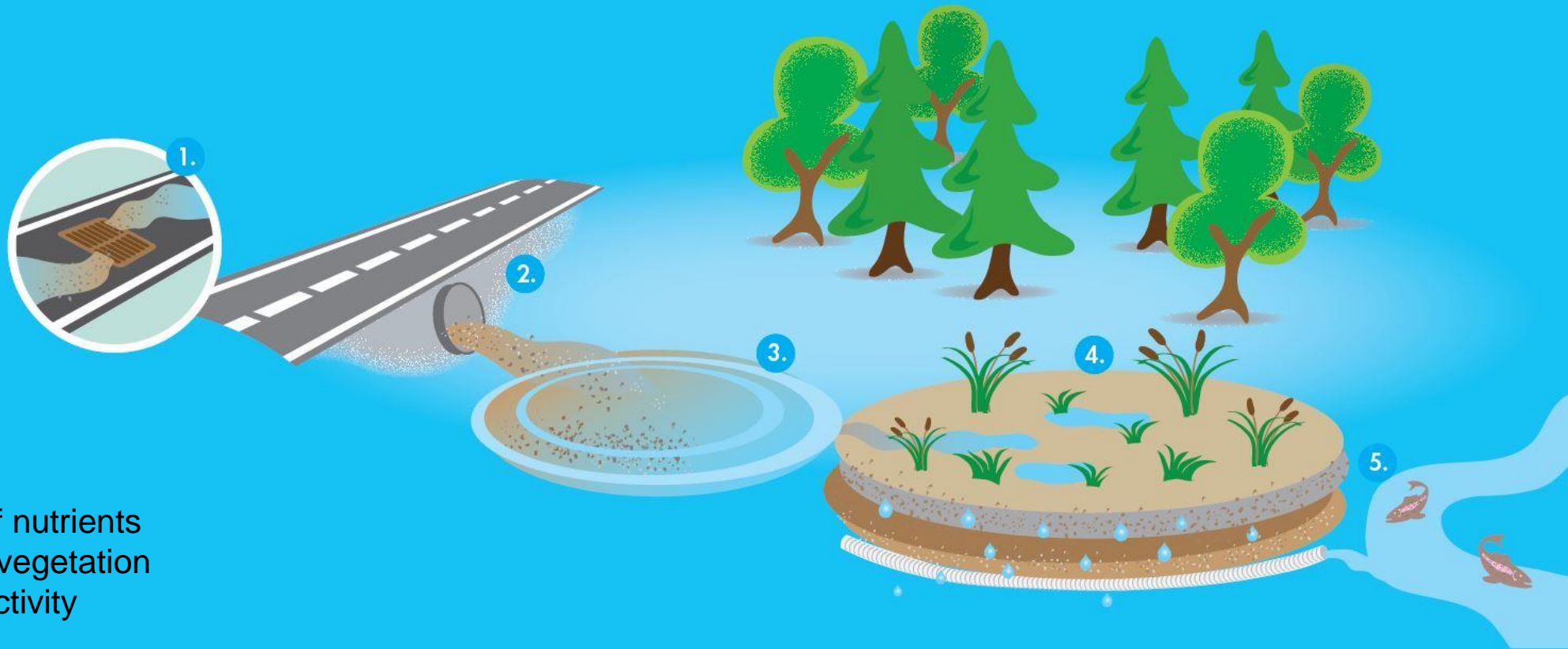
Hulevesien suodatus tarkoittaa hulevesien suodattamista hulevesisuodattimissa. Hulevesien suodatus on hulevesien hallinnassa tärkeä osa, koska se mahdollistaa hulevesien luonnonpuhdistuksen ja hulevesien suodattamisen avulla voidaan vähentää hulevesien määrää, joka päätyy viemäriin.

Hulevesien kasvitieteellinen puhdistus tarkoittaa hulevesien puhdistamista kasvitieteellisesti valittujen kasvien avulla. Hulevesien kasvitieteellinen puhdistus on hulevesien hallinnassa tärkeä osa, koska se mahdollistaa hulevesien luonnonpuhdistuksen ja hulevesien kasvitieteellisen puhdistuksen avulla voidaan vähentää hulevesien määrää, joka päätyy viemäriin.

City of Tampere
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Biofiltration – how does it work?

1. Collection wells
2. Pipes under road
3. Sedimentation basin
4. Biofiltration (uptake of nutrients and heavy metals by vegetation and microbiological activity)
5. Haaganpuro brook





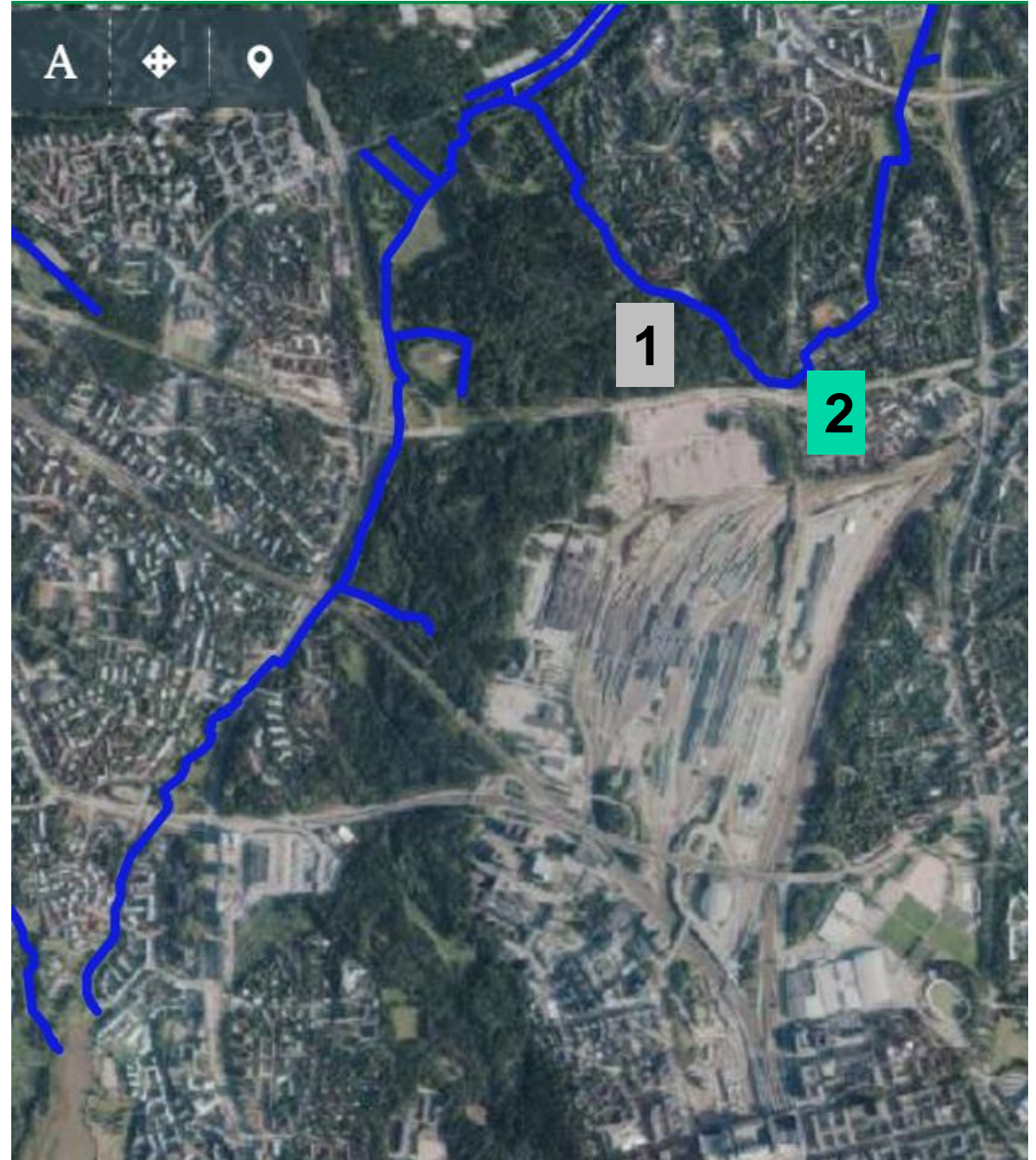
The biofiltration was taken into use 2016 and has been monitored since.

Results show that it works well for reducing suspended solids, phosphorous and most of heavy metals.

Biofiltration

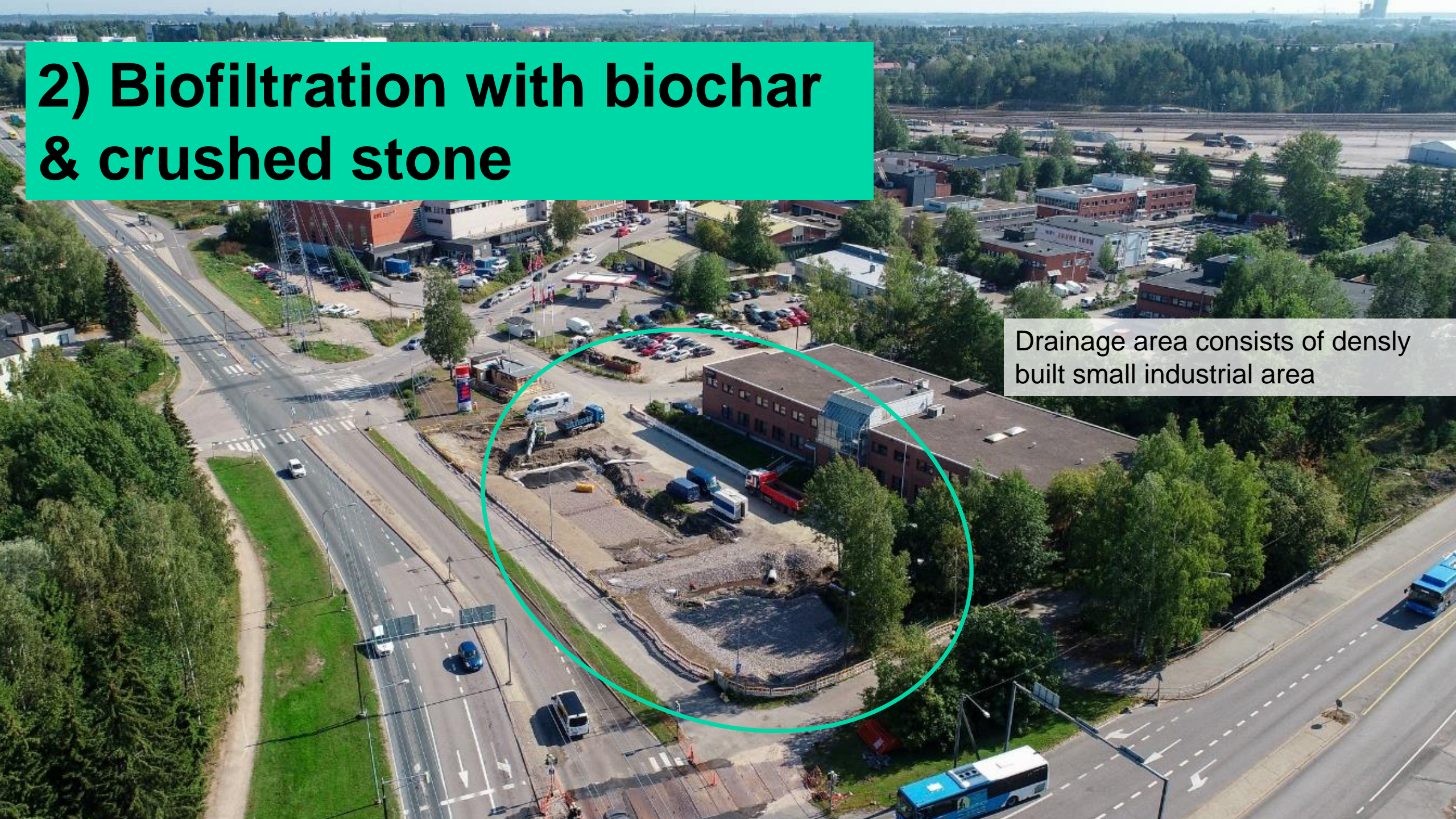
- Storm water quality improvement
- Protecting of sea trout population breeding in the brook

1. Biofiltration with sand
2. **Biofiltration with biochar & crushed stone**



2) Biofiltration with biochar & crushed stone

Drainage area consists of densely built small industrial area



Biochar as a filter media

Biochar is produced by pyrolysis, i.e. burning biomass, mainly wood, in high temperature without oxygen.

Biochar is a potential filter media, because biochar is known to effectively bind excess water, nutrient and other substances.



Picture Wikipedia



The biochar solution was taken in use 12/2019

Preliminary results show, that it already reduces nutrients, heavy metals, bacteria and suspended solids



A few final reflections...

- **Multiple development levels** are important: strategic/ policy level, day-to-day work and piloting
- **New areas** in Helsinki are built more sustainably, infiltration on lots is increasing as well as understanding of the benefits of sustainable storm water management. Green area factor is seen as a good tool
- **Old areas** in city center are a huge challenge due to lack of space and challenging height dimensions – city owned parks, roads and other public areas could be utilized better for storm water management and sustainable solutions
 - When ever something is renewed or renovated, it should be done according to sustainable sw objectives and thus, a new way of doing can be pushed in the normal procedure model (“retrofitting” of court yards, separation of combined pipes, road renovations etc.)
- Focus on **quality management** is growing generally in Finland

Thank you!

Please find presented GAF and biofiltration solutions in the Smart Baltic Water Hub at e.g. <https://www.balticwaterhub.net/solutions/biofiltration-helsinki>

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