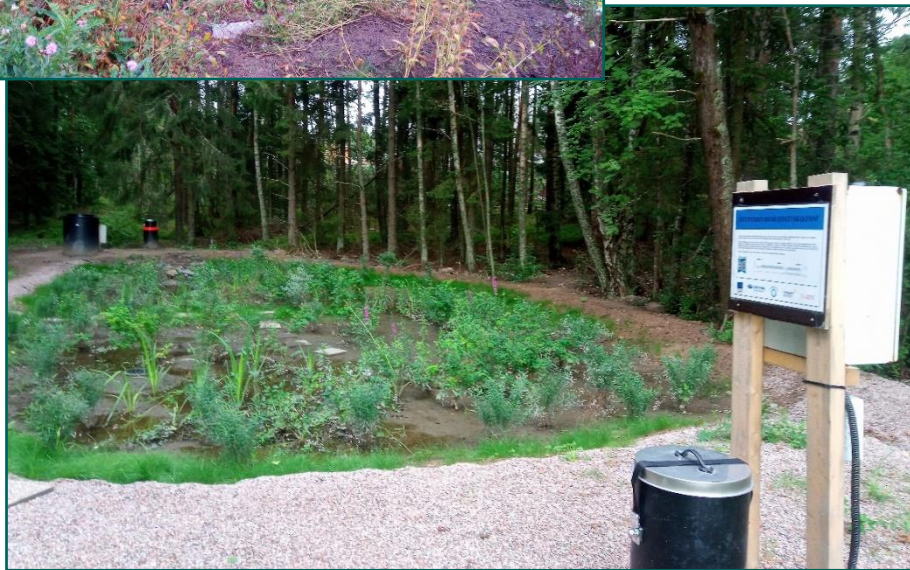


Overview of monitoring outcomes of CleanStormWater pilot sites in Finland

Mr Antti Kaseva, Turku University of Applied Sciences

CleanStormWater pilot sites in Finland



- 2 pilot sites with bioretention basin
- Turku pilot site with 500 m² catchment consisting almost 100% of road area
- Lieto pilot site with 24 ha catchment consisting mainly of developing industrial area
- Goal of the pilot site monitoring was to find out how the solution:
 - influences storm water quality
 - changes the flow patterns
 - operates in changing weather, flow and load situations
- Additional goal was to test 2 different monitoring strategies for storm waters



Results – Turku Pilot

Monitoring method

Quality: flow weighted composite samples

Quantity: online measurement

Results

Quality: >78 - 90 % reduction of TSS, Zn, Cr & Cu
(values at the outlet typically below the detection limit)

Increase in P & N during first 5 months

Quantity: Evens flow variations notably

Overflow in use during heavy rains

Other observations:

Flood in receiving urban brook may exceed the level of bioretention basin outlet.



Water quality changes at Turku pilot

Average concentrations at Turku pilot inlet and outlet.

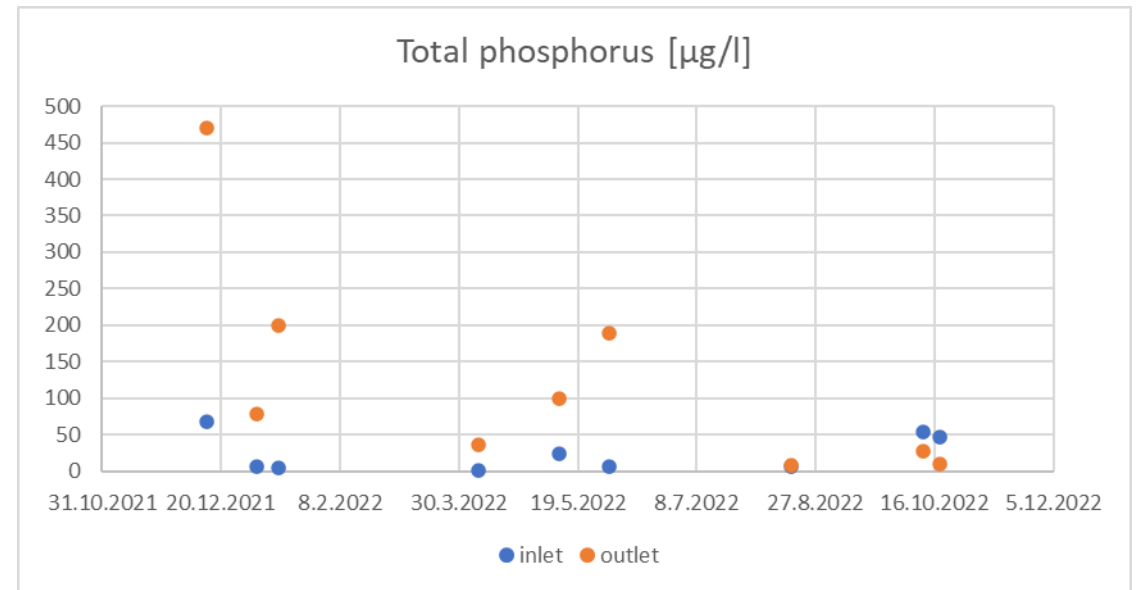
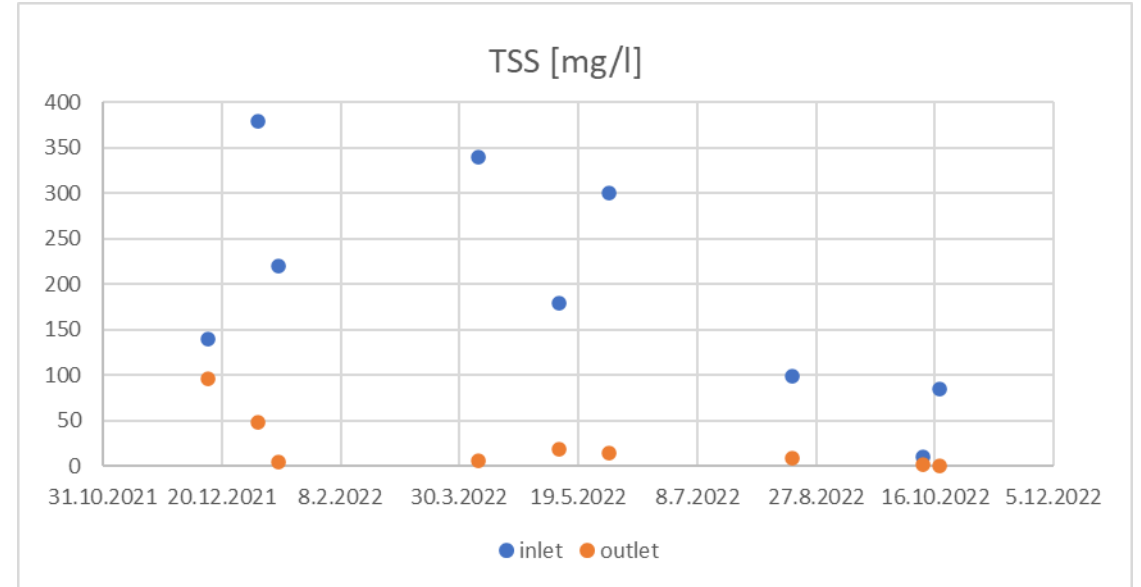
	Inlet	Outlet	Reduktion %
TSS mg/l	195	22,3	89
COD mg/l	171	133	22
P _{tot} µg/l	164	204	-24
N _{tot} µg/l	2620	15030	-474
Lead µg/l	6,4	0,7*	88 *
Zinc µg/l	218	16*	92 *
Chromium µg/l	24	3,1*	86 *
Copper µg/l	52,6	6,3	88
Mercury µg/l	0,012	0,004*	67 *
Nickel µg/l	11*	< 10	62 *
Cadmium µg/l	typically <0,1	< 0,1	31 *

**Includes concentrations below the detection limit. In the calculations, values below the detection limit are replaced with a value that is half of the limit value.*



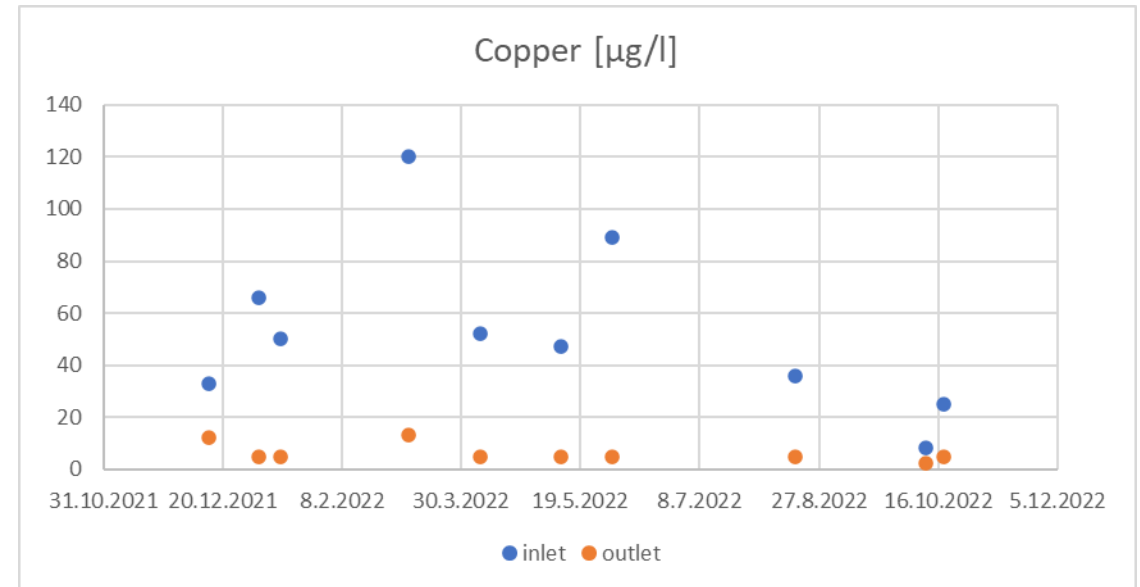
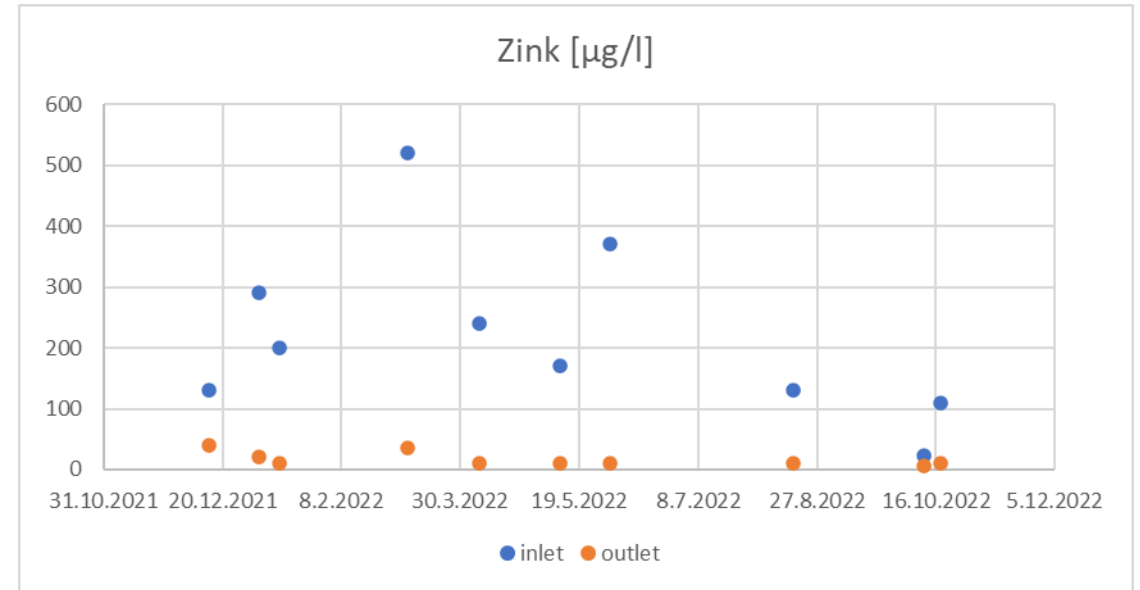
Turku

Water quality results



Turku

Water quality results





Results – Lieto Pilot

Monitoring method

Quality: online measurement + grab samples

Quantity: online measurement

Results

Quality: reduction of TSS & heavy metals

Rapid and big changes in turbidity

Quantity:

Extreme changes in discharge

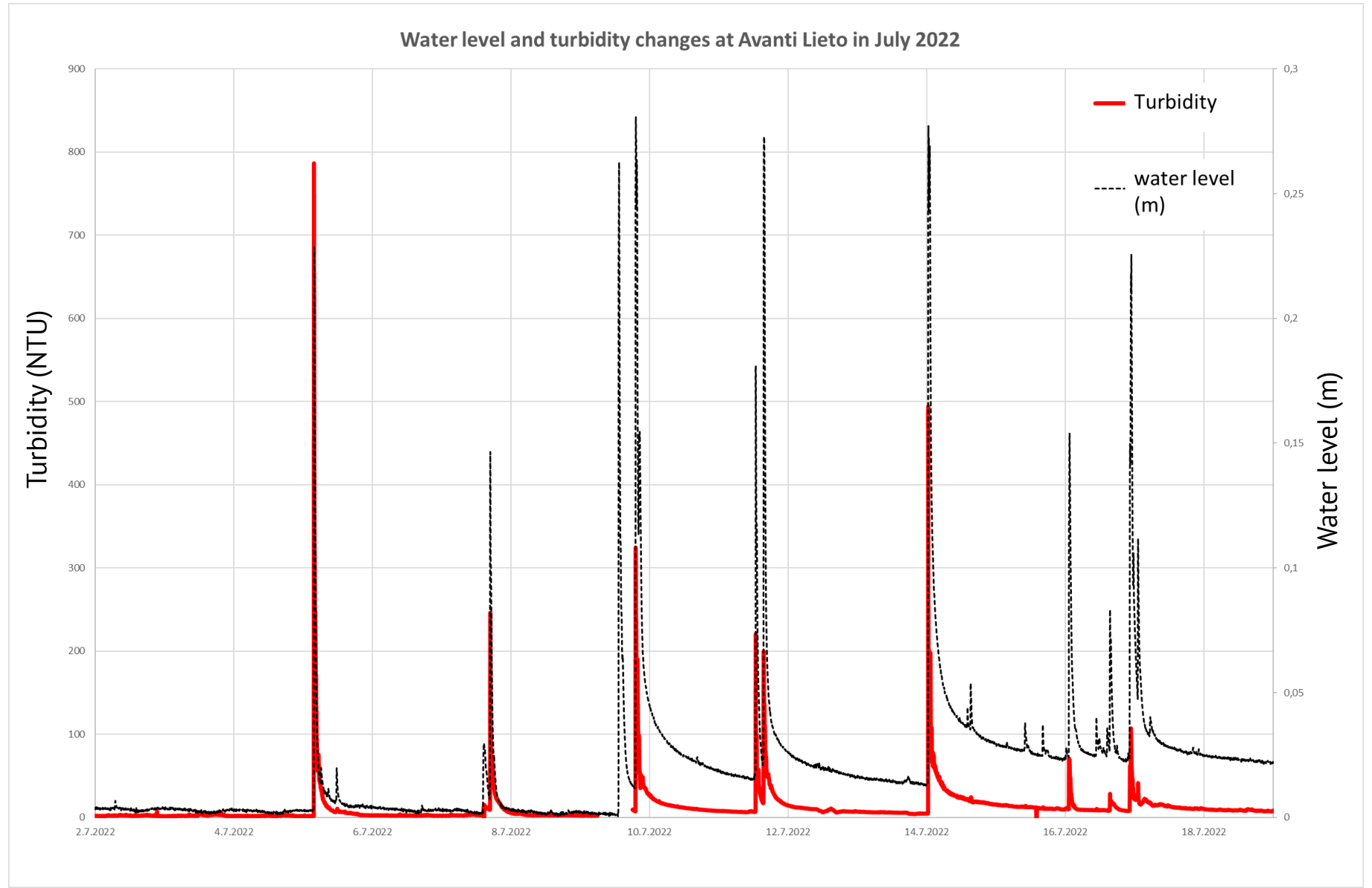
Other observations:

Probable ground water inflows to stormwater system.

Solar panels needed to increase operation time of the dataloggers.



Turbidity of storm water during flow events



Main findings from Finnish pilots

- Bioretention basins are potential solution for heavy metal and solid removal from stormwaters.
- Nutrient leaching in the beginning
- Planted and naturally spread plants survived well (with the irrigation).
- Monitoring of stormwater is challenging and requires site specific monitoring systems.
- Results suggest that the first rains after long dry periods have major influence on total load.
- Systems are not clogged despite the sedimentation at surface of the filter medium.
- Follow up data is needed in assessment of longtime operation.



Thank you!



EUROPEAN UNION
European Regional Development Fund

Contact:

[vesijaymparisto.turkuamk.fi/en](https://www.viimsivald.ee/interreg-cb-project-cleanstormwater)

More information about the CleanStormWater -project:
<https://www.viimsivald.ee/interreg-cb-project-cleanstormwater>