



# **The status of lifecycle management of nature-based stormwater solutions in Estonia, Latvia, Finland and Sweden.**

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# Background

- Natural water cycles are disturbed by human activities in multiple ways.
  - Densifying urban areas and climate change are increasing stormwater runoffs and floods.
  - Stormwater quality studies show the various pollutants that are transported by the runoff.
    - nutrients, heavy metals, PFAS, oils...
- All causing harmful effects to aquatic biota in the urban streams and in receiving water bodies.



# Nature-based solutions

- As natural areas are reduced from the cities, the need for nature-based solutions (NBS) for stormwater management has emerged
    - Enhancing the quality of stormwater as well as quantity, benefitting biodiversity and amenity.
  - With bigger demand for the NBS, need for better life cycle management of stormwater management structures has been realized.
  - Collaboration of different actors is needed for achieving well functioning structures.
- Need to specify challenges and best practices in lifecycle management of nature-based stormwater solutions.



# Methods



Questionnaire prepared for municipal officers and consultants working in the field of stormwater management.



Literature research for best management practices to complement the questionnaire



Workshops organized for municipal workers and other experts in each country to gain corrective modifications to the draft guidelines



Practical testing of the materials while piloting activities this year



Modified versions of the fact sheets commented by the stormwater experts in Finland. Final version ready!

- Experts from Estonia, Finland, Latvia and Sweden have been taking part in the development process.

# Life cycle approach



- Five different phases recognized in the life cycle of stormwater treatment structure.
- The aim is to find out the key factors for each phase, leading to high-quality outcomes.



# HOW TO ENSURE QUALITY IN THE PLANNING PHASE

## Common pitfalls

- National guidelines and/or regulations for stormwater quality management are lacking, making it difficult to set purification targets and efficiency estimates.
- Incomplete or missing information on soil type, drainage area or other crucial parameters may result in unwanted surprises in the operation phase of the structure. For example, the flow is much larger or smaller than expected or the filters get blocked by fine soil particles.
- If the planner has not collected sufficient information on the site and has not visited the site personally, he may have missed some important site features that make the plan unrealizable.
- Stormwater plans have been made in isolation from other infrastructure plans – the result may be a drainage pipe leading stormwater into a sewer rather than into the natural stormwater management structure, or a cabling constructed across previously finalized stormwater solution, destroying the plantations and filtering structures.
- The growing conditions have not been considered in vegetation planning, resulting in weak growth of the plants or the invasion of the structure by other plants.

## Best practises

- ✓ The flow can be determined through the rational method or modeling, however both methods use rough assumptions and include many uncertainties. It is always a good idea to test the calculated flow by measuring or observing the flow on-site during a rain event.
- ✓ Planning should also consider the catchment area outside the local plan area. Water flows do not respect plan area boundaries.
- ✓ The climate change will change the precipitation patterns – it is wise to take this into account either by dimensioning the structures according to future climate predictions or by planning the structures so that their capacity can easily be increased if needed.
- ✓ Soil and topography mapping should include at least drainage divisions, areas prone to erosion, possibilities of filtration, ground water level and possible hazardous substances in the soil.
- ✓ It is important to consider the specific climatic conditions, that might affect the functionality of stormwater treatment solutions, such as freezing temperatures.
- ✓ For ensuring cost-efficiency, it is important to choose the return period of the dimension rain by the sensitivity (risk level) of the site.
- ✓ Nature-based solutions are a part of sustainable landscape design. Visually attractive stormwater management structures will contribute to increased acceptance and uptake of natural stormwater management methods by general public.
- ✓ Use local plant species and utilize existing vegetation in the area as much as possible.
- ✓ In SW filtering structures plants should be resistant to both drought and flooding. Choose salt tolerant plants to high traffic areas. Also consider shading and other factors affecting the plants habitat.
- ✓ Consider ordering plants as early as possible, seedlings and plants of local species often need to be ordered even a year before planting
- ✓ A good plan includes also a monitoring and maintenance plan!
- ✓ Require detailed plans from the planner, so that they don't leave space for false interpretations by the constructor.



## **HOW TO ENSURE QUALITY IN THE COMPETITIVE BIDDING**

### **Common pitfalls**

- Bidding documents focus on achieving lowest total price for the contract, overlooking quality factors, which may lead to the selection of a contractor that does not have experience and know-how to build nature-based stormwater management structures.
- Because of the lack of experience in realization of nature-based stormwater management structures in municipalities, there can be difficulties on clearly communicating the needs and aims of the structures.
- In many cases, the person drafting the bidding documents has no expertise in the field of construction or stormwater management

### **Best practises**

- ✓ Make sure everything you require from the contractors is written in the bidding documents. Using standard texts will make things easier.
- ✓ Requirements for stormwater management during the time of construction should be already included within the call for bids.
- ✓ Valorize experience, e.g., consider contractors previous experience from building stormwater structures as a qualification criterion or ask contractors to submit feedback from their previous customers as attachment to the offer.
- ✓ Set clear sanctions for non-compliance of contracts or plans.
- ✓ Define sanctions if problems occur during or after the construction, due to incorrect building practice or materials.
- ✓ If the finished structures do not meet the original plans, contractors must fix the structure so that it will be according to the plan.
- ✓ When dealing with new innovations or designs, organizing a tender competition also for the supervision of the contract can help to achieve the best possible outcome.



## **HOW TO ENSURE QUALITY IN THE CONSTRUCTION PHASE**

### **Common pitfalls**

- Usually, many different companies work in the same construction site. Problems may occur if all relevant information is not passed to everyone.
- Even the best plans can have bad outcomes, if not understood and followed by the contractors.
- Best timing for building the stormwater filtering structures is not easy to determine and plans might be colliding with other working phases.
- Construction site runoff often contains high amounts of silt and eventually also hazardous substances and plastic trash. If not properly managed, these may block or otherwise damage the stormwater management structures.

### **Best practises**

- ✓ Organize a meeting with the planner, constructor, and any other concerned actors in the beginning of the construction project to make sure that all necessary information from the planner is passed on to the constructor and to resolve any questions or concerns raised by the constructor.
- ✓ Check with the main constructor that all important information is passed also to all subcontractors.
- ✓ Build the stormwater filtering structures within dry periods if possible, to reduce erosion and avoid releases of high amounts of silt. During dry spells it is also easier to install.
- ✓ Have regular checkups with the contractor to gain knowledge on the progress of the contract. Visit the construction site regularly to gain better understanding of the things happening at the site.
- ✓ Use existing vegetated areas and depressions as management structures for construction stormwater, alongside with silt fences, erosion blankets etc.
- ✓ Draft a plan how to prevent construction stormwater from causing harmful effects on the receiving waterbodies and environment. If permanent stormwater structures are used for runoff management during the construction period, make sure they are renovated and finalized in the end to ensure functioning!





## **HOW TO ENSURE QUALITY IN THE MONITORING & MAINTENANCE PHASE**

### **Common pitfalls**

- If monitoring of the stormwater management structure has not been planned beforehand, it may be impossible to take samples or carry out troubleshooting when needed
- If servicing procedures, such as silt removal and maintenance of vegetation are neglected, the structure rapidly loses its functionality as well as the acceptance by the local inhabitants
- Maintenance procedures required by the stormwater management structures might not be clear for the maintenance officers.

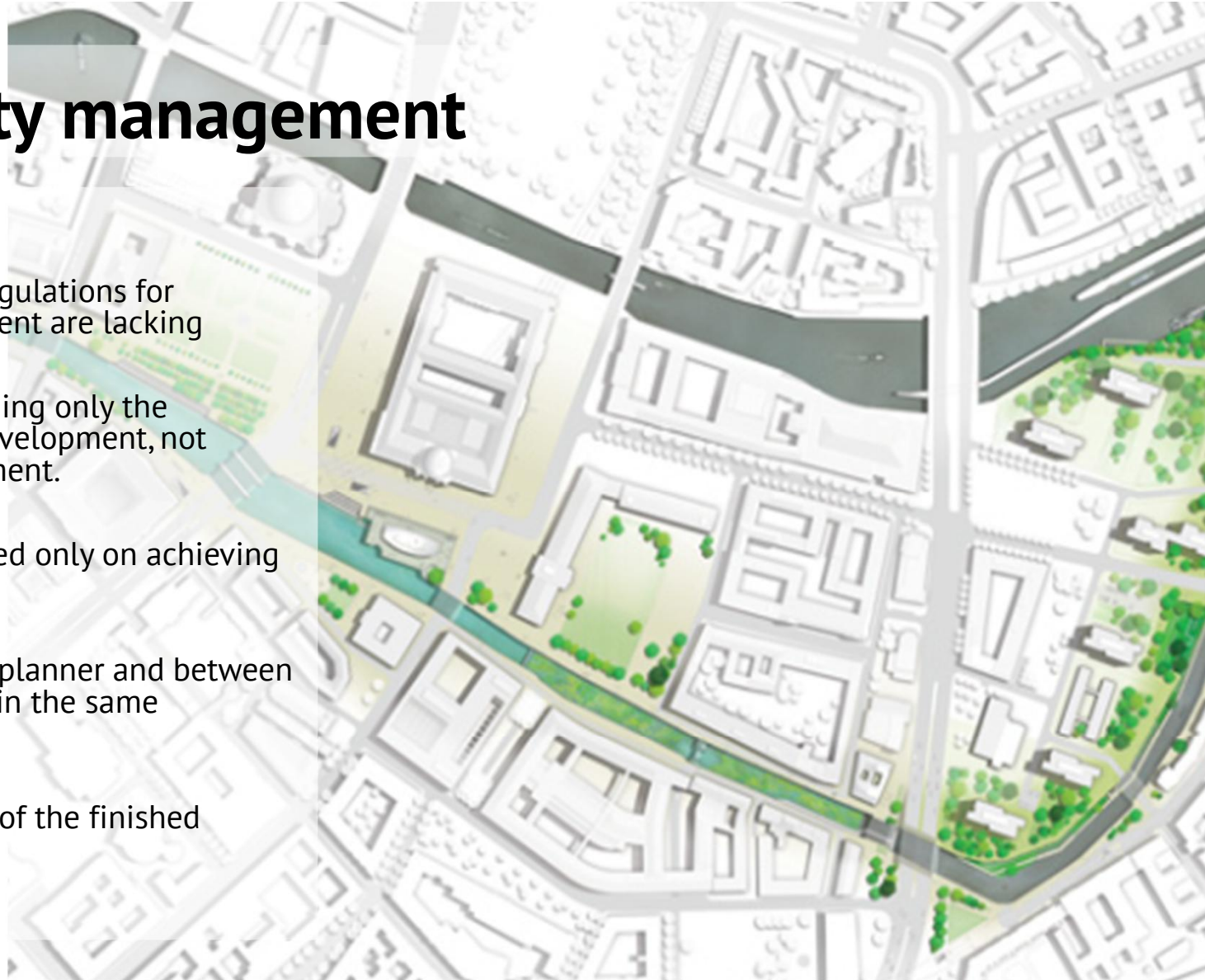
### **Best practises**

- ✓ Water quality sampling and visual assessments should be carried out after the construction has ended to ensure the structure functioning.
- ✓ The roles and responsibilities of the monitoring and maintenance activities needs to be determined.
- ✓ Maintenance sheets for every structure provides information about the actual site and its characteristics, to meet the special maintenance needs of different structures. In some cities, all nature-based stormwater management solutions are entered into a maintenance database for sustaining systematic maintenance intervals and for storing information on their state.
- ✓ If some plants wither or otherwise doesn't succeed, they need to be replaced.

# Life cycle quality management

## Common pitfalls:

- National guidelines and/or regulations for stormwater quality management are lacking
- The plans are usually concerning only the block/planning area under development, not considering the whole catchment.
- Bidding documents are focused only on achieving lowest total price
- Communication between the planner and between different companies working in the same constructions site
- Maintenance and monitoring of the finished structure is neglected.





# Life cycle quality management

## Best practices:

- The flow can be determined through rational method or modeling.
  - Check the situation in the field and notice also climate change
- Ensure and improve the living conditions of local species!
  - Use local plant species and utilize existing vegetation in the area as much as possible.
- Develop standard texts and quality criteria for bidding documents
- Require the planner to make the plans detailed enough, so that they don't leave space for false interpretations by the constructor.
- Draft a plan how to prevent construction stormwater from causing harmful effects on the receiving waterbodies and environment.
- Monitoring and maintenance plan, and organization of the work needs to be done carefully.





# Other findings and conclusions

- Literature review revealed differences in the ways the four countries manage stormwater related issues.
- Multiple benefits (biodiversity, recreation and climate change adaption) gained from stormwater management structures are not always seen by the decision-making personnel in municipalities.
- However, esthetic values and the importance of plants in stormwater management structures are recognized and the interest towards more diverse structures is growing
  - Visually attractive stormwater management structures will contribute to increased acceptance and uptake of nature-based solutions
- All CleanStormWater partner countries are involved in various projects regarding stormwater quality management. The need for monitoring and research data about the long-term effectiveness and functioning of the structures is high.
- There are several pitfalls in lifecycle management of stormwaters –but also best practices available!

# Thank you!



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