A cost-benefit perspective on water protection

Baltic Sea Forum

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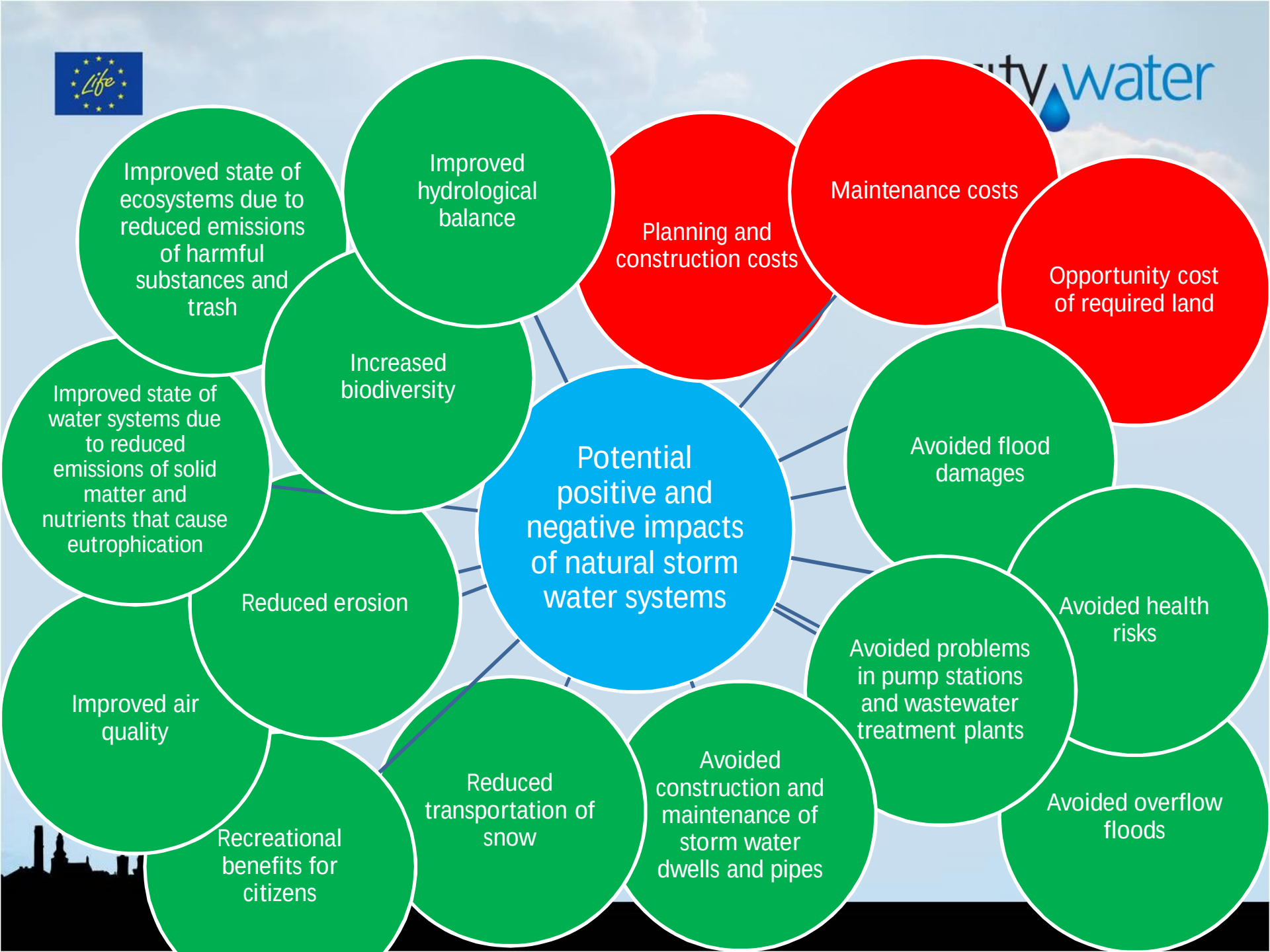
EU LIFE+ project CITYWATER

City of Helsinki Environment Centre


Improved state of ecosystems due to reduced emissions of harmful substances and trash
Improved hydrological balance
Planning and construction costs
Maintenance costs
Opportunity cost of required land
Increased biodiversity
Improved state of water systems due to reduced emissions of solid matter and nutrients that cause eutrophication
Potential positive and negative impacts of natural storm water systems
Avoided flood damages
Reduced erosion
Avoided health risks
Improved air quality
Avoided problems in pump stations and wastewater treatment plants
Recreational benefits for citizens
Reduced transportation of snow
Avoided construction and maintenance of storm water dwells and pipes
Avoided overflow floods

Cost-benefit analysis

- CBA is developed to be a tool that provides information to support decision-making in order to allocate resources efficiently
- In the CBA all relevant impacts of the whole time span of the project or policy are taken into account by measuring them in monetary terms and summing them up
- The result of the CBA is the net present value: it tells is the project socially worthwhile and potential of increment in social welfare

Cost-benefit analysis

- CBA can be used in project appraisal or project evaluation
  - *Ex ante* analysis (before implementation)
    - Which one of alternative projects/policies is the most worthwhile? Which one of them should be implemented?
    - Is the planned project/policy worthwhile?
  - *Ex post* analysis (after implementation)
    - Was the implemented project/policy worthwhile?
    - What can be learned from previous projects?

Main steps of the CBA

1. Specify the set of alternative projects/policies
2. Decide whose benefits and costs count
3. Identify the impact categories, catalogue them, and select measurement indicators
4. Predict the impacts quantitatively over the life of the project
5. Monetize all impacts
6. Discount benefits and costs to obtain present values
7. Compute the net present value for each alternative
   - And benefit-cost ratio or other indicators
8. Perform sensitivity analysis
9. Make a recommendation

Boardman et al 2014: Cost-benefit analysis – Concepts and Practice

Municipalities' FAQs

"Why should money to be put on water protection instead of other needs?"

"Water protection costs – but how much?"

"What municipalities could gain from water protection?"

"How to take benefits into account in decision-making?"

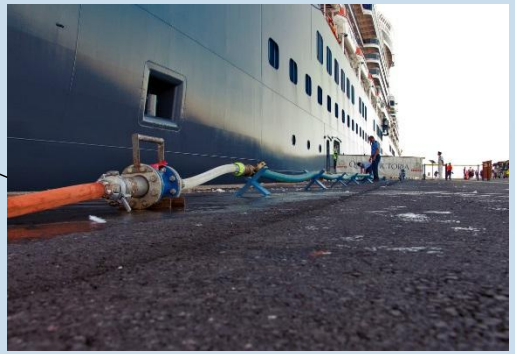
Cost-Benefit Analysis in CITYWATER

Aim: to provide information to support water protection at the local level

- Different water protection measures
- Information on the costs, the benefits, the impacts and the implementation process of the water protection
- Cost-benefit analysis at local level

→ Measures should be diverse, exemplary and easily applicable around the Baltic Sea

Five case studies from Baltic Sea Challenge network



Pictures by:
Suomen Ilmakuva Oy & Pori Water (Pori)
Eliisa Punttila (Turku)
Vilmars Bogovics, Liepaja Water (Liepaja)
Eila Palojärvi; City of Lahti (Lahti)
Mikael Kaplar / Studio POiNT (Helsinki)

Average nutrient reductions (kg/y)

Technical measures

Luotsinmäki WWTP

127,500 kg N/y
31,000 kg P/y

Liepaja WWTP

18,000 kg N/y
1,000 kg P/y

Port of Helsinki

21,000 kg N/y
3,000 kg P/y

Natural measures

Wetland in Lahti

61 kg N/y
2 kg P/y

Buffer zone I in Turku

175-306 kg N/y
35-70 kg P/y

Buffer zone II in Turku

60 kg N/y
4 kg P/y

Buffer zone I in Turku: photo by Timo Sirkiä

Results from case studies

	Major benefit (+) and cost (–) categories
Luotsinmäki WWTP: centralising of wastewater treatment	+ Nutrient reductions to the Baltic Sea – Investment costs
Liepaja WWTP: aerator investment	+ Nutrient reductions to the Baltic Sea + Energy cost savings – Investment costs
PRF in Port of Helsinki: reception of sewage from ships	+ Nutrient reductions to the Baltic Sea – Investment costs – Wastewater treatment costs
Stormwater wetland in Lahti	+ Ecosystem services of wetland – Investment costs – Maintenance costs
Buffer zones in Turku (by river Aurajoki)	+ Nutrient reductions to the Baltic Sea + Increased revenues of farmer
Buffer zones in Turku (by river Vähäjoki)	+ Nutrient reductions to the Baltic Sea – Decreased revenues of farmer

Results from case studies

	Net present value in different scenarios	Major benefit (+) and cost (–) categories
Luotsinmäki WWTP: centralising of wastewater treatment	-40,3 M€ – 120,7 M€	+ Nutrient reductions to the Baltic Sea – Investment costs
Liepaja WWTP: aerator investment	2,1 M€ – 18,6 M€	+ Nutrient reductions to the Baltic Sea + Energy cost savings – Investment costs
PRF in Port of Helsinki: reception of sewage from ships	-7,5 M€ – 76,1 M€	+ Nutrient reductions to the Baltic Sea – Investment costs – Wastewater treatment costs
Stormwater wetland in Lahti	83,000 € – 130,000 €	+ Ecosystem services of wetland – Investment costs – Maintenance costs
Buffer zones in Turku (by river Aurajoki)	41,000 € – 510,000 €	+ Nutrient reductions to the Baltic Sea + Increased revenues of farmer
Buffer zones in Turku (by river Vähäjoki)	- 4,000 € – 20,000 €	+ Nutrient reductions to the Baltic Sea – Decreased revenues of farmer

General conclusions

- Nutrient load reductions were significant
- In addition, the measures provided many other benefits
- The cases differed a lot from each others and provided different benefits
- When the state of the Baltic Sea is poor, the nutrient reductions and actions are very valuable
- All of the measures are likely worth of implementing
- Local measures are in crucial role in protecting the Baltic Sea and the local waters and they all are important steps toward healthier sea

Recommendations for municipalities

1. Use the provided information and the lessons learned of this study to support water protection work

2. Implement different kinds of water protection measures and, when possible, prefer measures having connection to other fields of environmental protection

3. Use cost-benefit analysis as a tool in water protection

4. Put more effort in water protection research and data compilation

5. Utilise the existing networks (e.g. the Baltic Sea Challenge), for sharing ideas, experiences and best practices regarding water protection to get support for your own work

Different approaches to find support for water protection

- Cost-Benefit Analysis
  - Take all relevant impacts into account
  - A holistic, long term perspective
  - Allows comparison of different alternatives

- Qualitative Cost-Benefit Analysis
  - Impacts are identified, categorized and their magnitude is assessed but not monetized if it is not possible
  - Apply cost-benefit thinking: What costs and benefits are relevant? How much they count? Short-term vs. long-term impacts?

- Cost-Effectiveness Analysis
  - Compare costs and measured (non-monetized) impact(s)
  - Suitable if you want to focus on certain target, e.g. only nutrient reduction

Further information

Punttila, Eliisa. 2014. Cost-benefit analysis of municipal water protection measures: Environmental benefits versus cost of implementation. City of Helsinki Environment Centre publications 2014. Helsinki: City of Helsinki & EU Life+ project CITYWATER Benchmarking water protection in cities. Available at http://www.hel.fi/static/ymk/julkaisut/julkaisu-21-14.pdf

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The CITYWATER project www.citywater.fi
The Baltic Sea Challenge www.balticseachallenge.net/
The Baltic Sea Challenge in Facebook www.facebook.com/TheBalticSeaChallenge

Photo: Lotta Henriksson