Interreg
Baltic Sea Region

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SUSTAINABLE WATERS
WaterMan

Overview of the pilot status

Natural stormwater treatment for use in municipal services

Klaipėda District Municipality
Klaipėda University

30 April 2025

Design consideration of stormwater treatment facilities -
retention pond with reuse of retained water

Retention pond's design approach recommended by **sustainable urban drainage systems (SuDS):**

Ponds should contain the following zones:

- **sediment forebay** or other form of upstream pre-treatment system to allow sediment to settle from the incoming stormwater runoff before it is delivered to the permanent pool;
- **permanent pool** which will remain wet throughout the year and is the main treatment zone;
- **temporary storage volume** for flood attenuation, created through landscaped banks to the permanent pool;
- **shallow zone or aquatic bench** which is a shallow area along the edge of the permanent pool to support wetland planting, providing ecology, amenity and safety benefits.

For more info:
https://www.susdrain.org/
CIRIA (Construction Industry Research and Information Association), **SuDS Manual** https://www.ciria.org/

Stormwater sampling

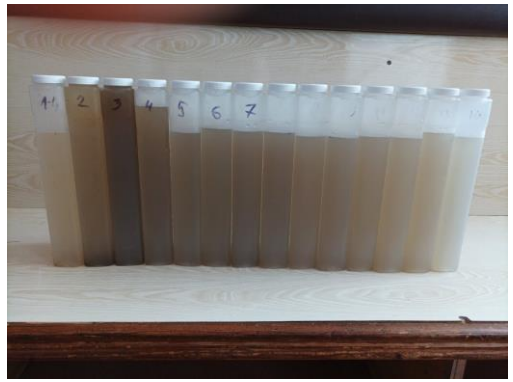
Sampling considerations

The sample should be collected where the wastewater is well mixed. Therefore, the sample should be collected near the center of the sampling well/manhole, at approximately 40 to 60 percent of the water depth, where the turbulence is at a maximum and the possibility of solids settling is minimized.

The sampler programmed to collect aliquots at a 15 minutes frequency after 15 minutes from the start of rain.

So far, two composite sampling campaigns have been conducted with an automatic sampler 14 aliquots/ bottles were collected.

First sampling campaign:
2023-07-18
14 aliquots/ bottles poured into 7 containers (due to lack of water in one bottle for chemical analysis)



Second sampling campaign:
2023-08-17
14 aliquots/ bottles poured into 1 containers.

LT stormwater quality limit values and results of the analysis

Stormwater permissible concentrations

	Endorsed by Stormwater Management Regulations, mg/l				Endorsed by Wastewater Management Regulations, mg/l								
	Suspended solids	BOD_7[1]	BOD_7	Petroleum hydrocarbons	N_{total}	P_{total}	Zn	Pb	Cd	Cu	Hg	As	Cr
Maximum allowable concentration	50	34	10	7	-	-	-	-	-	-	-	-	-
Average annual concentration	30	23	-	5	30	4	0,4	0,1	0,04	0,5	0,002	0,05	0,5

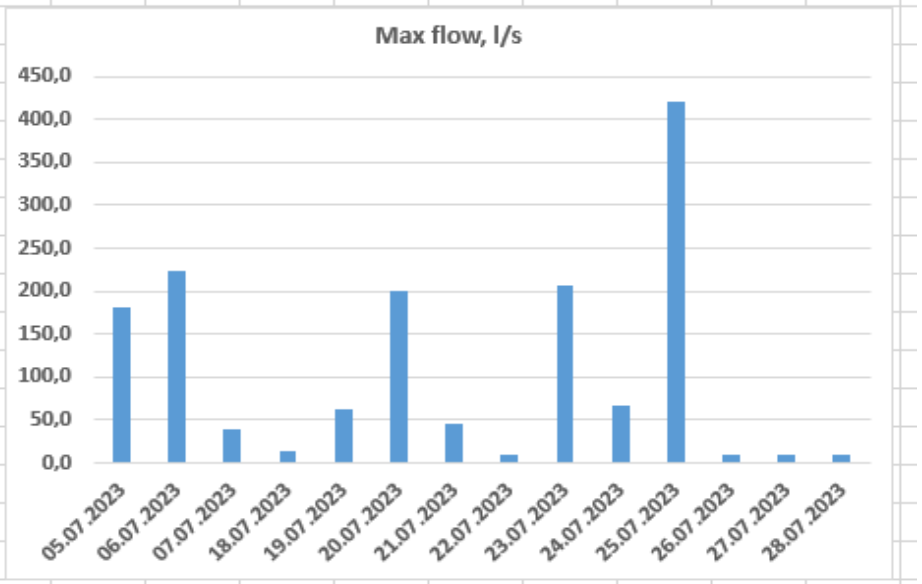
1 BOD parameter must be specified and monitored in stormwater effluents contaminated with organic substances (e.g. agricultural processing, food industry, organic waste management facilities, etc.). In other cases, the maximum allowable concentration of BOD7 is 10 mg O2/l, the average annual concentration is not determined.

Tested results

	pH	Suspended solids	BOD_7	COD	Petroleum hydrocarbons	N_{total}	P_{total}	Sulfates	Chlorides
Grab sampling 2023-04-25 for EIA	7,9	27	**10,4**	54	0,14	1,51	0,18	46	60
First composite sampling (average) 2023-07-18 8:10 – 10:10		5,7	9,9	45,3	0,23	10,2	0,3	21,1	60
Second composite sampling 2023-08-17 10:30 – 14:00 h	7,88	**158**	**34,0**	120	0,32	18,0	1,3	20	26

Flow data

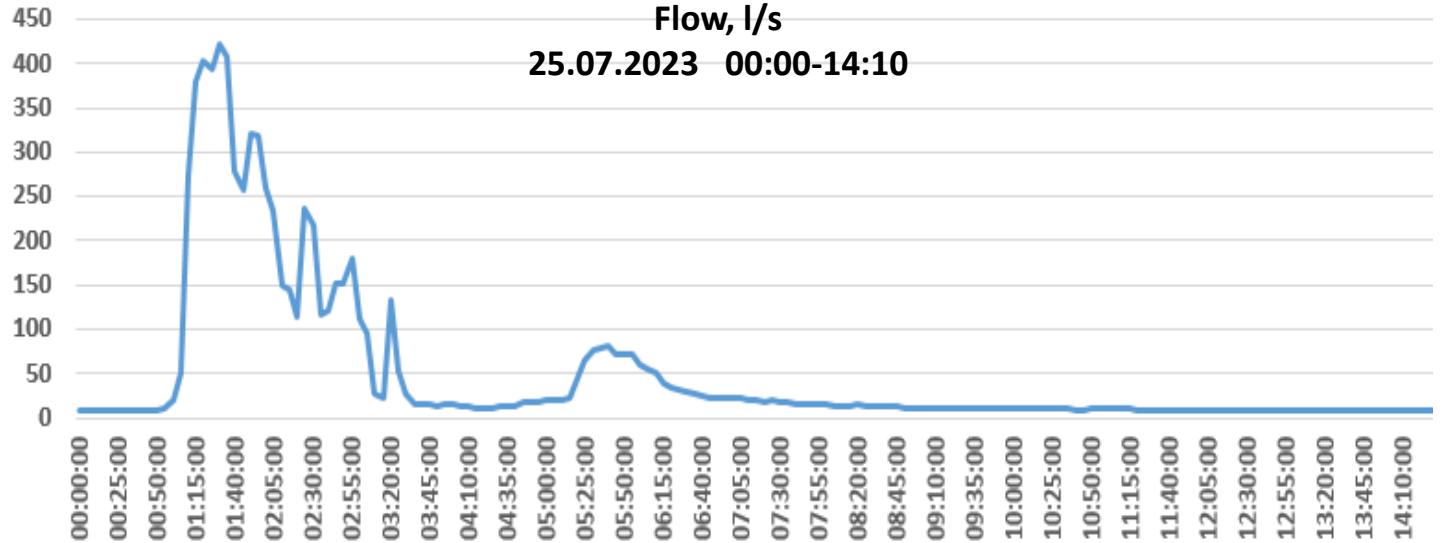
Data	Hr, min	Max flow, l/s
05.07.2023	11:41	182,3
06.07.2023	08:40	222,8
07.07.2023	09:36	39,0
18.07.2023	08:35	13,0
19.07.2023	06:00	61,8
20.07.2023	19:27	199,9
21.07.2023	03:55	45,7
22.07.2023	19:50	9,0
23.07.2023	12:50	207,5
24.07.2023	05:20	67,1
25.07.2023	01:30	420,8
26.07.2023	10:55	9,2
27.07.2023	16:30	10,4
28.07.2023	09:05	9,0



Average flow (l/s)	
25.07.2023	32,8

Base flow without rain ~ 7,8 - 8 l/s

Calculated max flow 500 l/s

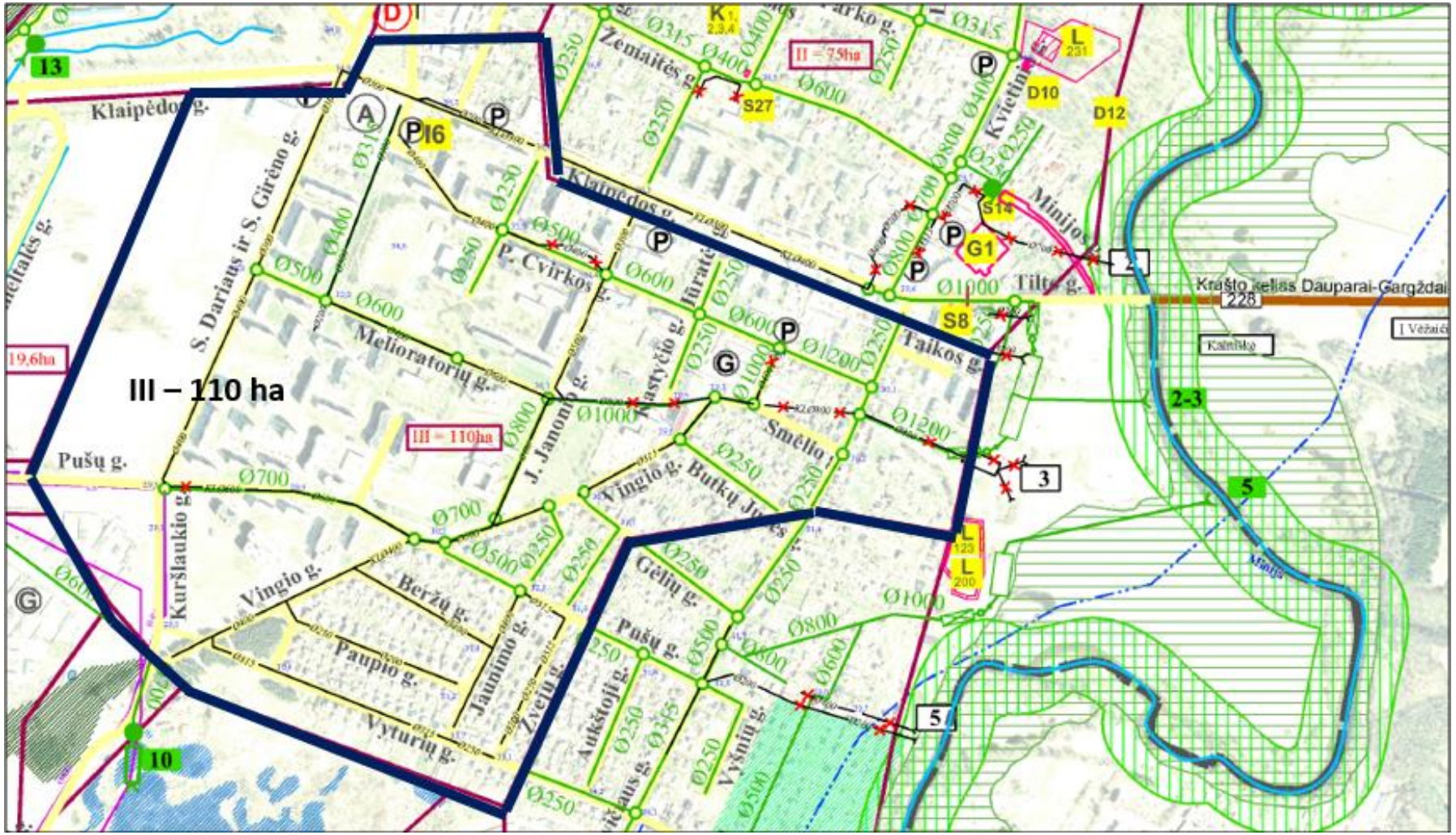


Based on rainfall/flow measurements:

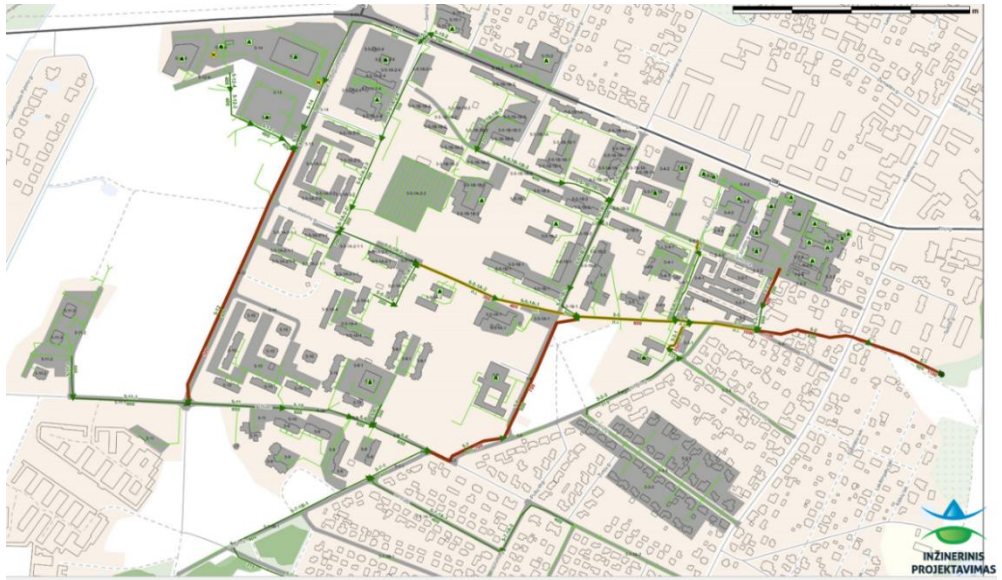
- flow data l/s and m3/d will be used for design purposes, and
- for the prediction of rainfall/runoff trends due to climate change

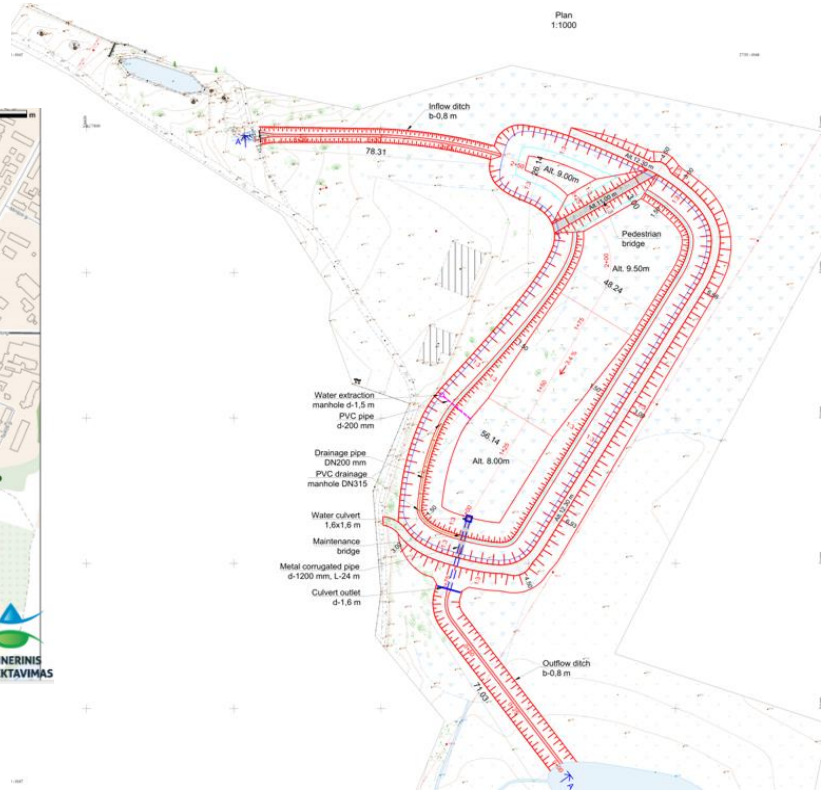
Design and construction of stormwater treatment facilities - retention pond with reuse of retained water

The boundaries of the selected 110 ha storm water drainage area in Gargždai town marked in orange, with outfall no. 3



WaterMan pilot measure - Retention pond in Gargždai town, LT
Designer: UAB "Inžinerinis projektavimas" (Engineering Design Ltd.)





Storm water catchment area – **110 hectares**;
Forebay (upstream) area – **1040 m²**, volume – **1666 m³**;
Main pond area – **7043 m²**, volume – **17400 m³**;
Planned duration of wastewater retention and treatment – **2 days**;

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The envisaged user of the recycled stormwater

During the summer season, the marked in green central part of Gargždai is irrigated with drinking water
Approximately 50,000 - 60,000 square meters of irrigated green area

The envisaged user of the recycled stormwater

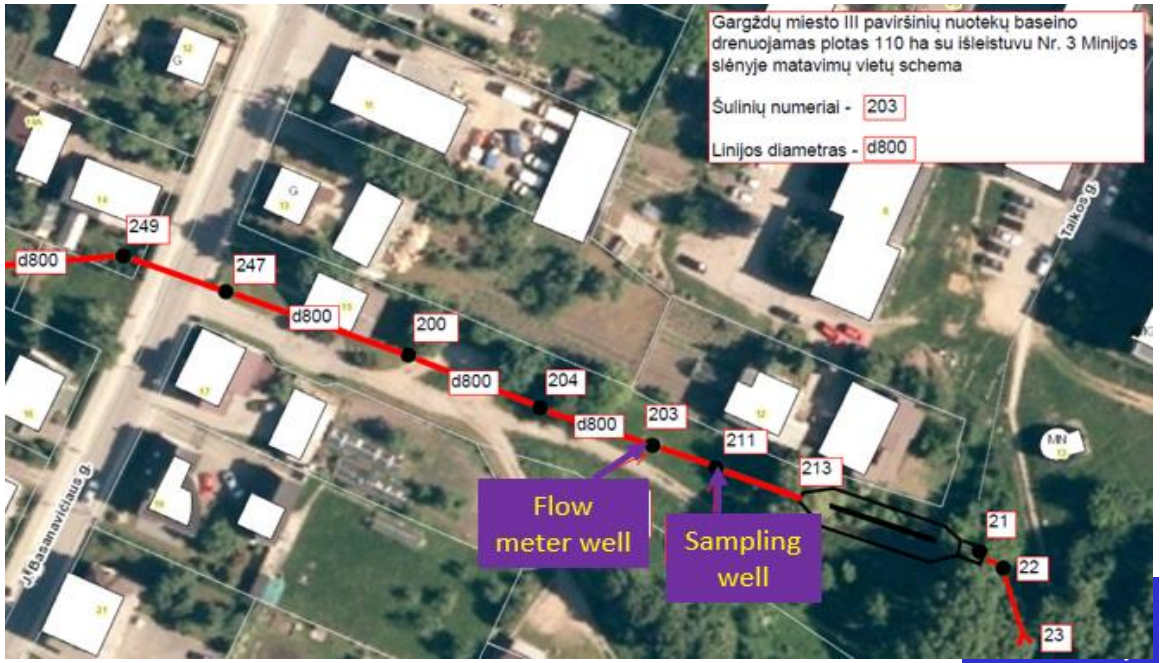
Responsible for irrigation is the Gargždai Town Eldership (smaller municipal administrative unit) of the municipality.

300 cubic meters of drinking water consumed per year/summer season

The methods for evaluating the utilisation of the stormwater

- **2023 stormwater sampling campaign completed: (2 grab and 4 composite samples)**
  For chemicals
  - Suspended solids
  - BOD7
  - COD
  - Petroleum hydrocarbons
  - N_{total}
  - P_{total}
  - Sulfates
  - Chlorides

  And 1 grab and 1 composite sample for pathogens
  - Escherichia coli
  - Intestinal enterococci
  - Legionella



Methods for evaluating the use of stormwater

Sampling and analysis of stormwater runoff in 2023

Chemicals, mg/l

	pH	SS	BOD_7	COD	Petroleum hydrocarbons	N_{total}	P_{total}	Sulfates	Chlorides
LT Average	7,7	64,2	11,1	50,9	0,27	9,2	0,39	29,3	86,8
Regulation 2020/741		A ≤ 10 B-D 35	A ≤ 10 B-D 25						

Microbiological tests (Legionella not detected in both samples)

E. coli (number/100 ml)				**Intestinal Enterococci (number/100 ml)**		
Regulation 2020/741	LT summer sample	LT winter sample (snowmelt water)	LT hygiene norm HN 92:2018 "Beaches and their bathing water quality"	LT summer sample	LT winter sample (snowmelt water)	LT hygiene norm HN 92:2018 "Beaches and their bathing water quality"
A ≤ 10	**2 419,6**	**913,9**	Excellent - 500* Good - 1 000* Sufficient - 900**	**23**	**780**	Excellent - 200* Good - 400* Sufficient - 330**
B ≤ 100						
C ≤ 1 000						
D ≤ 10 000						

* Based on 95th percentile estimate.

** Based on 90th percentile estimate.

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Involving and motivating use groups to use recycled stormwater

After further testing, a final decision will be made by the municipality:

- **Turn off the drinking water taps and replace the drinking water currently used for irrigation in this green marked area with pond water and determine irrigation methods based on test results**

- **Other potential pond water user groups to be further considered:**
  - **Irrigation of other urban green spaces,**
  - **Irrigation of newly planted trees and other plants,**
  - **Industrial processes - cooling water, car washes,**
  - **Fire suppression systems**

Thank you for your attention

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Interreg Baltic Sea Region

Co-funded by the European Union

Access the „BSR Water Recycling Toolbox" here.
https://www.eurobalt.org/waterrecyclingtoolbox/

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The „BSR Water Recycling Toolbox" was elaborated as part of the project "WaterMan - Promoting water reuse in the Baltic Sea Region through capacity building at local level", The project is co-financed by the European Union (European Regional Development Fund) and implemented within the Interreg Baltic Sea Region Programme. More information:

eurobalt.org/WaterRecyclingToolbox
interreg-baltic.eu/project/waterman

WaterMan promotes a region-specific approach to water recycling, which intends to use the alternation of too much and too little water that has become typical in the Baltic Sea Region to make the local water supply more resilient, and supports municipalities & water companies in adapting their strategies.