

Desk Research

on Existing Reports, Strategies, Plans, Projects and Initiatives

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0.3 v	05.10.2026	LP	Consolidation
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Project	**Baltic Blue Resilience**
Project Acronym	**BBR**
Project Number	**S045**
Project Partners	PP1|FI - Savonia University of Applied Sciences |LP
	PP2|SE - Sustainable Business Hub
	PP3|LT - Klaipeda Science and Technology Park
	PP4|PL - Gdansk-Gdynia-Sopot Metropolitan Area
	PP5|DK - Clean, DK Water & Environment Cluster
Work Package 1	**Group of Activities 1.1**
Authors and Contributors	**PP1|FI:** Monika Wojciechowska, Bailey Lähdesmäki, Tiina Haatainen; **PP2|SE:** Deepshikha Singhania, Jenny Bengtsson; **PP3|LT:** Karolina Jasaitytė, Audronė Liesytė; **PP4|PL:** Grzegorz Walczukiewicz, Karina Rojek, Klaudia Kaźmierczak, Anna Kozub-Lewna; **PP5|DK:** Jack Bruce Reid, Svetlana Korniushina.
Reviewers	**GoA 1.1 Leader:** Karolina Jasaitytė; **CT - Clean:** Jack Bruce Reid; **CT - Savonia UAS:** Monika Wojciechowska, Bailey Lähdesmäki.



Solutions for a green and resilient Baltic Sea region with EU funding.

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Each research-source section is analysed according to the following sub-structure:

- Basic Information
- Governance Arrangements
- Stakeholder Ecosystem
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- Nature-Based Solutions (NBS)
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- Legal and Regulatory Framework
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- Cooperation Mechanisms
- Target Groups and Their Engagement Level
- Gaps and Barriers
- Opportunities for Coordinated Action
- Transferability
- **Relevance for BBR**
- **Key Findings and Recommendations**

I. Acronyms & Abbreviations

Acronym	Full name
AR	Augmented Reality
BBR	Baltic Blue Resilience
BSAP	Baltic Sea Action Plan
BSR	Baltic Sea Region
BSWH	Baltic Smart Water Hub
CoP(s)	Community / Communities of Practice
EEA	European Environment Agency
ERDF	European Regional Development Fund
EUSBSR	EU Strategy for the Baltic Sea Region
FRMP(s)	Flood Risk Management Plan(s)
GI	Green Infrastructure
HELCOM	Baltic Marine Environment Protection Commission (Helsinki Commission)
IoT	Internet of Things
ISWM	Integrated Storm Water Management
LID	Low Impact Development
LL(s)	Living Lab(s)
NBIS	Nature-Based Innovation Systems
NBS	Nature-Based Solutions
NGO	Non-Governmental Organisation
P	Public document
PFAS	Per- and Polyfluoroalkyl Substances
RBMP(s)	River Basin Management Plan(s)
RTC	Real-Time Control
SME(s)	Small and Medium-sized Enterprise(s)
SuDS	Sustainable Drainage Systems
TRL	Technical Readiness Level
UAS	University of Applied Sciences
UBC	Union of the Baltic Cities
UC	Use Case
VET	Vocational Education and Training
WFD	Water Framework Directive
WSUD	Water Sensitive Urban Design
WWTP(s)	Wastewater Treatment Plant(s)
IWAMA	Interactive Water Management
BSR WATER	Platform for Integrated Water Cooperation

I. Introduction

This desk research has been prepared within the **Baltic Blue Resilience (BBR)** project to provide a structured overview of existing reports, strategies, plans, projects, and initiatives relevant to stormwater management, water resilience, climate adaptation, and blue-green infrastructure across participating regions.

The purpose of the review is to identify regional priorities, existing knowledge, good practices, governance approaches, technological solutions, stakeholder ecosystems, and development needs that can support the sustainable management of water resources and increase resilience to climate-related challenges. Particular attention is given to policy frameworks, planning instruments, nature-based solutions, cooperation mechanisms, and successful implementation examples.

The desk research contributes directly to Group of Activities (GoA) **1.1: Improved governance and stakeholder collaboration for resilient water management, by establishing a common knowledge base for all project partners.** The findings will help identify gaps, barriers, opportunities, and transferable practices that can be further explored through regional stakeholder engagement and Working Group activities.

Conducting this desk research is essential for ensuring that BBR builds on existing knowledge and experience rather than duplicating previous efforts. It supports evidence-based decision-making, facilitates comparison between regions, and helps partners identify solutions and approaches that can be adapted and replicated in different Baltic Sea Region contexts. The results will serve as a foundation for the development of regional action plans, stakeholder cooperation mechanisms, and the joint BBR methodology for strengthening blue resilience.



Author: Savonia UAS, Monika Wojciechowska

II. Desk Research on Existing Reports, Strategies, Plans, Projects and Initiatives

1. AMBITIOUS – AIDA UC2.3. Prediction of Potential Urban Floods – I3 Project

1.1. Basic information

Full title	AIDA UC2.3. Prediction of Potential Urban Floods, Smart Water Management Use Case, AMBITIOUS project within I3 Instruments with EU funds
Author / Lead Organisation	Savonia University of Applied Sciences as a lead partner for AIDA UC2.3 with SMEs: Funlus Oy, Hienox Oy, Mittausguru Oy and City of Kuopio
Period covered / Project duration	01.10.2023-31.12.2026
Main objectives	AIDA UC2.3 is a flood prevention pilot implemented in the City of Kuopio, Finland, within the AMBITIOUS project. It combines IoT-based stormwater and rainfall monitoring with AI-driven forecasting and edge-fog-cloud computing to support early flood detection and proactive municipal decision-making. The system uses water-level sensors, LoRaWAN and NB-IoT connectivity, and advanced data analytics to strengthen climate resilience and data-driven water management. The pilot is developed in cooperation between Savonia University of Applied Sciences, Funlus Oy, Hienox Oy, Mittausguru Oy, and the City of Kuopio, with the aim of demonstrating an approach that can be adapted and replicated in other European municipalities.
Countries / Regions	One region: Finland, North Savo Region, Kuopio with EU-level dissemination and transfer potential.
Geographic scope	Municipality (City of Kuopio) with potential replication to other EU municipalities.
Type	Interregional Innovation Investments Instrument (I3) Project
Link	https://ambitious-project.eu/

1.2. Governance Arrangements

AIDA UC2.3 applied a project-based governance model involving Savonia UAS, the City of Kuopio, and SME partners (Funlus, Hienox and Mittausguru), who jointly participated in planning, implementation, and validation activities.

The governance arrangement provides a useful example of operational cooperation between public authorities, research organisations and SMEs in the development of flood resilience solutions. However, it is limited to a single pilot and one region and does not address long-term governance structures, policy integration or broad stakeholder

participation, which are important elements of the BBR approach. Therefore, it represents a relevant but not primary source for governance development within BBR.

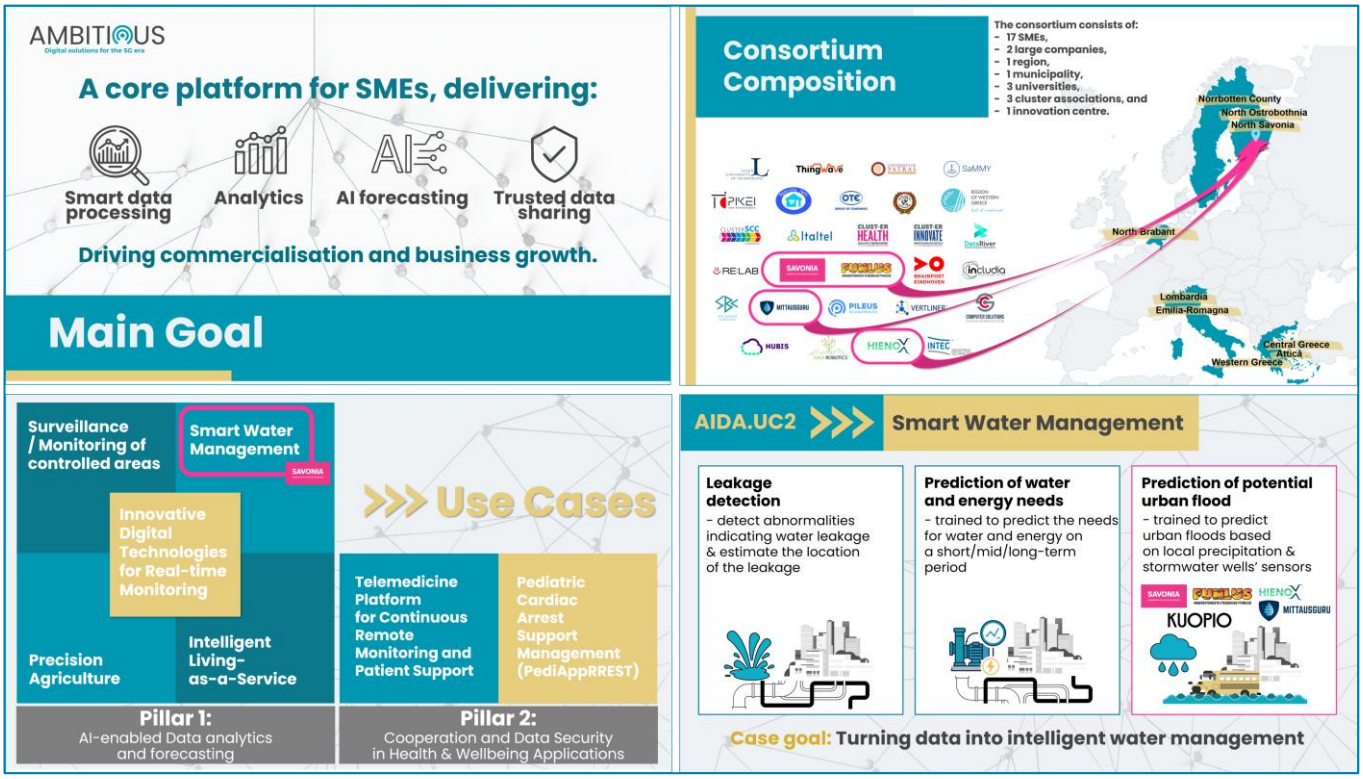


Figure 1.1. Overview of the AMBITIOUS project, consortium composition and AIDA UC2 Smart Water Management use cases, including UC2.3 Prediction of Potential Urban Floods.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.3. Stakeholder Ecosystem

The stakeholder ecosystem consisted of a municipality, research organisation and SME technology providers involved in pilot design, implementation, testing and validation.

The stakeholder ecosystem provides a useful example of local cooperation between a municipality, a research organisation and SMEs. However, its relevance for BBR is limited because the cooperation was confined to a single region and focused primarily on one pilot implementation. The absence of broader stakeholder participation and lack of interregional or transnational cooperation reduce its applicability to BBR's wider stakeholder engagement, co-creation and Baltic Sea Region cooperation objectives.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.4. Regional Water Priorities

Stormwater management, climate adaptation and water resilience are central themes throughout the pilot. The developed solution integrates continuous monitoring, sensor networks, meteorological data and AI-based forecasting to support more proactive management of stormwater-related risks. By improving flood preparedness and supporting evidence-based decision-making, the pilot contributes directly to municipal climate adaptation efforts and enhances resilience against increasingly unpredictable rainfall and flooding events.

The priorities identified in AIDA UC2.3 are strongly aligned with the objectives of BBR. Both initiatives address flood risk management, stormwater management, climate adaptation and increased resilience of urban environments.

The identified regional water priorities are highly relevant to BBR because they directly address stormwater management, flood prevention, climate adaptation and urban water resilience. These challenges are shared across many Baltic Sea Region municipalities and correspond closely with BBR objectives. However, the pilot was implemented in a single municipality and region and focuses primarily on technological solutions rather than broader regional planning, governance approaches or nature-based solutions.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.5. Stormwater Management

The pilot focused on proactive stormwater management through real-time monitoring and prediction of urban flood risks. The approach combined IoT sensors, hydrological and meteorological data, and AI-based analytics to improve situational awareness and support early responses to stormwater-related flooding.

The integrated solution progressed from TRL 6 to TRL 7 and was demonstrated through two pilot actions under operational conditions in Kuopio, involving five organisations. It improved monitoring coverage, data availability, prediction reliability, and operational

decision support. However, it was not adopted as a permanent municipal service, with data protection and privacy requirements identified as barriers to further operational deployment.

The pilot shows that continuous monitoring, reliable data, predictive analysis, municipal involvement, and cooperation between public, research, and private-sector actors can strengthen flood preparedness and evidence-based stormwater planning. For BBR, these lessons may inform recommendations and Joint Action Plans concerning monitoring needs, risk assessment, data governance, and institutional cooperation, even though BBR does not plan to pilot such technologies.

Stormwater management provides practical and documented experience in urban stormwater monitoring, flood preparedness, municipal involvement, and data-informed decision-making. However, it concentrates on a digital prediction solution rather than comprehensive stormwater planning or blue-green measures, so it is highly relevant but not a key source covering the full scope of BBR stormwater activities.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	4/5
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

1.6. Technologies and Innovations

AIDA UC2.3 developed an AI-based flood prediction solution integrating IoT water level sensors, rainfall monitoring, LoRaWAN and NB-IoT communication technologies, and predictive analytics. The solution addresses challenges related to urban flooding, increasing climate-related stormwater risks, and the need for more proactive and data-driven stormwater management.

The technologies were tested in a real municipal environment in Kuopio, demonstrating their technical feasibility and practical applicability for real-time monitoring and flood prediction. Reported benefits include improved situational awareness, enhanced preparedness, and support for decision-making. Limitations relate to data quality, sensor coverage, integration requirements, and the need for long-term maintenance of monitoring infrastructure.

Although BBR is not focused on technology development, the solutions provide useful examples of how digital tools can support stormwater management and climate resilience. They can inform BBR discussions on risk assessment, monitoring needs, evidence-based

planning, and the role of digital innovation in supporting blue-green resilience strategies and decision-making processes.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

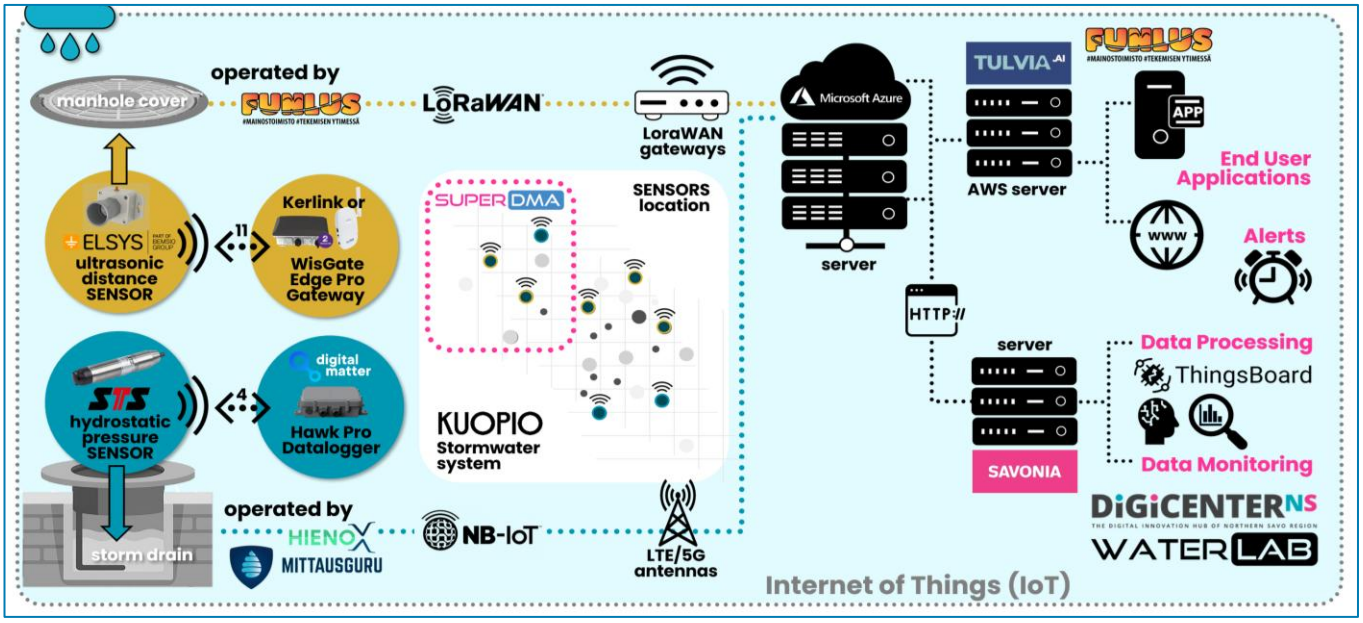


Figure 1.2. Technologies and innovations in AMBITIOUS project use case regarding flood prediction.

1.7. Nature-Based Solutions (NBS)

Nature-based solutions are not described or assessed in AIDA UC2.3. Therefore, this section does not provide information that could directly support BBR activities related to NBS planning, implementation, or governance.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**0/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.8. Green Infrastructure (GI)

Green infrastructure measures are not addressed in AIDA UC2.3. Therefore, this section does not provide information that could directly support BBR activities related to green infrastructure planning, implementation, or governance.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**0/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.9. Legal and Regulatory Framework

The project identified GDPR-related considerations relevant to the use of digital solutions, but it did not focus on legal, regulatory, or policy frameworks related to water management, climate adaptation, or governance.

The project highlighted that data protection, privacy requirements and information access arrangements may influence the implementation of digital water management solutions and stakeholder engagement activities.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.10. Roles and Responsibilities

Roles and responsibilities were clearly allocated among project partners according to their expertise and project responsibilities. The arrangement was local, project-specific, and limited in scope, providing only limited lessons for broader governance and stakeholder cooperation within BBR. No major overlaps or conflicts were identified during pilot implementation. It provides limited insights into governance structures, long-term responsibility sharing, or multi-level stakeholder cooperation relevant to BBR.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.11. Cooperation Mechanisms

Cooperation within UC2.3 operated at two levels: local cooperation among Savonia UAS, the City of Kuopio, Funlus, Hienox and Mittausguru, and project-wide cooperation among the use cases and partners across the AMBITIOUS consortium to achieve common project results, exchange knowledge and coordinate consortium-level reporting.

Effective cooperation was supported by clear project objectives, complementary expertise, regular communication, and active involvement of both technology providers

and end users. Information exchange across the wider AMBITIOUS consortium facilitated knowledge sharing between use cases and supported project-wide learning.

The pilot highlights the value of combining local implementation partnerships with wider project-level cooperation and knowledge exchange. While the mechanisms were relatively simple and project-driven, the experience demonstrates the importance of regular communication, cross-sector collaboration, and sharing lessons learned between different pilot initiatives.

The project provides examples of both local stakeholder cooperation and knowledge exchange across a larger international project consortium. However, the cooperation mechanisms remained primarily project-driven and operational in nature, offering only limited guidance for the more strategic, multi-level cooperation structures planned within BBR.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.12. Target groups and their engagement level

Municipal authorities, SMEs, and researchers were engaged at a high level, participating in planning, implementation, testing, monitoring, and evaluation activities. Citizens had a low level of engagement, acting mainly as an intended beneficiary group rather than active participants in decision-making or co-creation processes.

The pilot identifies several stakeholder groups that are also relevant for BBR, particularly municipalities, researchers, and SMEs. However, engagement activities were primarily focused on project partners, with limited participation of citizens and broader stakeholder groups, reducing the applicability of the engagement approach to BBR's wider stakeholder involvement objectives.

Table 1.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
	Regional authorities			
	National authorities			
X	Water utilities			X
	Environmental agencies			
X	SMEs and businesses			X

	NGOs			
X	Citizens / residents	X		
	Landowners			
X	Researchers / academia			X
	Planners and consultants			
	Policymakers			
	Other:			

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.13. Gaps and Barriers

Several barriers were identified during the implementation of the pilot. The solution was developed and tested within a single municipality and a relatively narrow stakeholder ecosystem consisting mainly of project partners. The pilot did not address nature-based solutions (NBS), green infrastructure (GI), broader community needs, or wider stakeholder engagement beyond the core consortium.

A key barrier to wider deployment was the intended use of the solution by citizens. GDPR and data governance requirements, cybersecurity considerations, licensing requirements, server infrastructure needs, and the costs associated with operating a secure citizen-facing service limited the practical implementation of this component. In addition, the project budget and scope focused on technology development and validation rather than the establishment of long-term public services or large-scale user engagement.

The pilot highlights the importance of addressing legal, organisational, financial, and operational barriers from an early stage. It also demonstrates that technological solutions alone are insufficient to ensure implementation if governance arrangements, stakeholder engagement, long-term operational responsibilities, and user-related requirements are not adequately addressed. These lessons are particularly relevant for BBR activities related to governance, stakeholder cooperation, and the development of realistic Joint Action Plans.

While the identified barriers originate from a technology-focused pilot, they provide valuable lessons for BBR regarding stakeholder engagement, governance, implementation feasibility, legal constraints, and long-term sustainability of proposed actions. Understanding such barriers may be as important as identifying good practices when developing regional resilience strategies and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.14. Opportunities for Coordinated Action

While UC2.3 itself provides limited examples of coordinated action, participation in the wider AMBITIOUS consortium demonstrates valuable experience in managing cooperation across multiple regions, organisations, and use cases. The lessons learned regarding consortium coordination, communication, reporting, and dissemination are moderately relevant to BBR's transnational cooperation activities.

The AMBITIOUS consortium demonstrated how partners from multiple regions can exchange knowledge, share implementation experiences and jointly disseminate results. Similar approaches could support BBR Working Groups and regional Joint Action Plans.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.15. Transferability

The approach can be transferred to municipalities facing urban flooding and stormwater challenges. Successful transfer requires monitoring infrastructure, environmental data, technical expertise and cooperation between municipalities, researchers and technology providers. The monitoring and prediction concepts may be relevant for all BBR partner regions, although adaptation to local conditions and governance arrangements would be required.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.16. Relevance for BBR

The source scores highly in Regional Water Priorities, Stormwater Management, Gaps and Barriers, and Technologies and Innovations, reflecting its strong contribution to understanding flood risks, climate adaptation, and implementation challenges.
However, it scores very low in several BBR core areas, including Nature-Based Solutions, Green Infrastructure, Legal and Regulatory Framework, Roles and Responsibilities, and

Cooperation Mechanisms. As a result, while the source provides useful complementary insights, it does not address many of the key governance, stakeholder, NBS, and GI themes central to BBR.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

1.17. Key Findings and Recommendations

Key findings:

1. Stormwater management, flood preparedness and climate adaptation are strongly aligned with BBR objectives.
2. Real-time monitoring and data-driven decision-making can support more proactive management of stormwater-related risks and evaluating and monitoring the impact of NBS and GI solutions.
3. Cooperation between municipalities, research organisations and SMEs supported successful pilot implementation.
4. GDPR, data governance and operational requirements can significantly influence implementation of innovative solutions.
5. Large transnational projects can create valuable opportunities for knowledge exchange, benchmarking and dissemination across regions and thematic areas.

Key barriers:

1. Limited stakeholder involvement beyond project partners, particularly citizens, NGOs and wider community actors.
2. GDPR requirements, cybersecurity needs, licensing issues and infrastructure costs limited wider deployment.
3. The pilot was implemented in a single municipality and did not address NBS, GI or broader governance challenges.

Key opportunities:

1. Strengthening cooperation between municipalities, researchers and businesses in stormwater management and climate adaptation.
2. Applying lessons learned related to implementation barriers and governance considerations during development of Joint Action Plans.
3. Using experiences from the AMBITIOUS consortium to support transnational cooperation, knowledge exchange and dissemination within BBR.

Recommendations for BBR:

1. Consider implementation barriers such as GDPR, organisational capacity and long-term operational responsibilities when developing regional actions.
2. Strengthen stakeholder engagement beyond municipalities and project partners by involving citizens, NGOs and other relevant actors.
3. Use consortium-level cooperation, reporting and knowledge-sharing practices as inspiration for BBR Working Groups and regional collaboration mechanisms.

Author(s): Savonia UAS, Monika Wojciechowska

2. Water Smart Connect – Horizon Europe Project

2.1. Basic information

Full title	Water Smart Connect
Author / Lead Organisation	Project leader/coordinator: Savonia University of Applied Sciences (Finland); Project participants: CLEAN (Denmark), Aquanova (France), Water Alliance (Netherlands), ZINNAE (Spain), and Catalan Water Partnership (Spain).
Period covered / Project duration	01.06.2024-30.06.2025
Main objectives	To strengthen connected, inclusive and efficient water innovation ecosystems across European regions, using digitalisation as an enabler for a water-smart society. Water Smart Connect applies a quadruple-helix approach, bringing together public authorities, businesses, research organisations and civil society to identify regional innovation priorities, capacity and competence gaps, and opportunities for collaboration. The project supports the development of cross-regional action plans and innovative project concepts addressing climate adaptation, flood and drought resilience, sustainable water use and integrated water management.
Countries / Regions	Finland, Denmark, France, the Netherlands and Spain. The consortium includes organisations and regional partners from these five countries, including Région Occitanie, Région Centre-Val de Loire, Provincie Fryslân and Aragón.
Geographic scope	EU / cross-regional
Type	Horizon Europe Coordination and Support Action (HORIZON-CSA), European Innovation Ecosystems Project
Link	https://cordis.europa.eu/project/id/101134869

2.2. Governance Arrangements

Water Smart Connect uses a quadruple helix governance approach that brings together public authorities, research organisations, businesses and civil society through stakeholder mapping, workshops, working groups and joint roadmap development. The model promotes cross-sector cooperation, knowledge exchange and joint priority setting across regions.

The governance model supports broad stakeholder engagement, cross-regional collaboration and collaborative action planning. However, cooperation is largely based on voluntary participation rather than formal decision-making authority. The report also identifies challenges related to maintaining long-term stakeholder commitment, data sharing and coordination between organisations.

The findings are highly relevant for BBR because they provide practical methods for stakeholder mapping, establishing cross-regional Working Groups, organising co-creation workshops for Joint Action Plans, and developing a replicable governance methodology. BBR should adopt a similar stakeholder engagement and working group approach to strengthen cooperation between municipalities, utilities, authorities and researchers involved in stormwater management.

Water Smart Connect offers directly transferable governance practices that support BBR's objectives of strengthening stakeholder cooperation, improving governance structures, and developing joint action plans across regions.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.3. Stakeholder Ecosystem

Water Smart Connect engages a broad stakeholder ecosystem including public authorities, water utilities, research and educational institutions, businesses, SMEs, cluster organisations, and civil society actors. These stakeholders contribute expertise, identify regional challenges, and support the development of solutions and action plans.

Stakeholder engagement is based on the quadruple helix approach and includes stakeholder mapping, Entrepreneurial Discovery Workshops (EDWs), regional workshops, cross-regional working groups, peer-learning activities, joint roadmap development, and knowledge-sharing platforms. The approach emphasises co-creation, stakeholder participation, and collaboration across sectors and regions.

For BBR, this stakeholder ecosystem is highly relevant because it provides practical examples of engaging municipalities, utilities, researchers, businesses, and citizens in collaborative planning and governance processes. Key strengths include strong stakeholder participation, cross-sector cooperation, and shared ownership of actions, while maintaining long-term transnational engagement beyond project funding remains a challenge.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.4. Regional Water Priorities

Water Smart Connect identifies climate change adaptation, water scarcity, drought resilience, flood risk management, water quality, and sustainable water use as key regional priorities. The project highlights the need for integrated water management, improved governance, and stronger cooperation between stakeholders to address increasing climate-related pressures on water systems. These priorities are closely aligned with BBR's focus on stormwater management, climate adaptation, water resilience, and stakeholder cooperation.

Water Smart Connect addresses several of the same challenges as BBR, particularly climate resilience, flood management, integrated water governance, and collaborative approaches to sustainable water management, making it a highly relevant reference for the project.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.5. Stormwater Management

Water Smart Connect does not focus specifically on stormwater management but addresses related challenges such as flood risk, climate change adaptation, water resilience, and integrated water management. The report highlights the need for NBS, better water governance, improved stakeholder cooperation, and cross-regional knowledge exchange to strengthen resilience to climate-related water challenges. It also identifies gaps in coordination and data sharing between organisations.

For BBR, the most relevant lessons are the emphasis on integrated planning, stakeholder collaboration, climate adaptation, and joint action planning, which are essential for effective stormwater governance and resilience building.

Although stormwater management is not a primary focus, the project provides limited indirect insights through its broader work on flood resilience, climate adaptation, integrated water management and stakeholder cooperation. Its direct relevance to BBR's stormwater management activities is therefore very limited.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.6. Technologies and Innovations

While the project refers to digital water management, data-driven decision-making and knowledge-sharing approaches, it does not focus specifically on stormwater technologies or provide detailed evidence on their application or performance. Its direct relevance to BBR in terms of technologies and innovations is therefore very limited.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.7. Nature-Based Solutions (NBS)

Water Smart Connect promotes NBS as part of climate adaptation, flood risk reduction, and sustainable water management. The project highlights NBS as important tools for improving water retention, increasing resilience to extreme weather events, and supporting ecosystem health. While specific implementation results are limited, the project emphasises the need to integrate NBS into regional planning and water management strategies.

For BBR, the main lessons relate to using NBS to improve stormwater management, enhance climate resilience, and support cooperation between stakeholders responsible for water management and land-use planning.

NBS are strongly connected to BBR's objectives on stormwater management, climate adaptation, and water resilience, making Water Smart Connect a relevant source of inspiration and good practices.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.8. Green Infrastructure (GI)

Water Smart Connect highlights green infrastructure as part of integrated water management and climate adaptation strategies. The project promotes measures that enhance water retention, reduce flood risks, improve ecosystem services, and strengthen resilience to climate change. GI is closely linked with nature-based solutions and is considered an important component of sustainable water planning.

For BBR, the main lessons relate to integrating GI into stormwater management, urban planning, and climate adaptation initiatives. The project also highlights the importance of cross-sector cooperation and long-term planning when implementing GI measures.

GI directly supports BBR's objectives related to stormwater management, climate resilience, and sustainable urban water management. The approaches presented in Water Smart Connect provide valuable examples that could inform regional Joint Action Plans and stakeholder cooperation activities.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.9. Legal and Regulatory Framework

Water Smart Connect recognises that effective water management is influenced by regional, national, and EU policies related to climate adaptation, water quality, and sustainable water use. The project highlights the importance of better coordination between sectors and governance levels, while identifying regulatory fragmentation and differing regional frameworks as challenges for implementing innovative water solutions. It also emphasises the need for supportive policies that enable cooperation, knowledge sharing, and integrated water management.

For BBR, these findings are relevant because successful stormwater management, NBS, and GI often require cooperation across administrative boundaries and alignment between planning, environmental, and water-management regulations.

Although the project does not focus specifically on stormwater legislation, it highlights governance and regulatory challenges that are highly relevant to BBR's objectives of improving cooperation, planning, and implementation across different stakeholder groups and regions.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.10. Roles and Responsibilities

The Water Smart Connect project identifies public authorities, water agencies, research organisations, SMEs, clusters and civil society as key actors in water governance.

Responsibilities are shared through stakeholder mapping, regional workshops and cross-regional working groups rather than assigned to a single organisation. Public authorities and water agencies lead planning and implementation, research organisations support innovation and monitoring, SMEs provide technologies, and clusters facilitate cooperation and knowledge exchange.

The project highlights governance challenges including fragmented responsibilities, limited coordination between sectors, and gaps in data sharing and monitoring systems. Strengthening stakeholder cooperation and clarifying roles are identified as important priorities.

For BBR, these findings are highly relevant because the project aims to address fragmented stormwater governance and improve cooperation between municipalities, utilities, regulators and other stakeholders. The stakeholder mapping approach, identification of governance gaps and use of cross-regional working groups provide useful practices for BBR governance development and stakeholder engagement.

The project directly addresses stakeholder roles, governance gaps and cooperation mechanisms that align closely with BBR's objectives and planned activities.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.11. Cooperation Mechanisms

The Water Smart Connect project describes several cooperation mechanisms, including stakeholder mapping, Entrepreneurial Discovery Workshops (EDWs), regional workshops, stakeholder interviews, cross-regional working groups, matchmaking activities, webinars and knowledge-sharing platforms. These mechanisms involved public authorities, water agencies, research organisations, SMEs, clusters and civil society actors.

Effective cooperation was supported by a structured stakeholder engagement process, cross-regional dialogue, shared challenges, and the use of working groups to exchange knowledge and identify joint actions. Key barriers included fragmented governance structures, limited data sharing, insufficient coordination between sectors, and varying regional capacities.

Several lessons are directly relevant for BBR, particularly the use of stakeholder mapping, cross-regional working groups, collaborative workshops, matchmaking activities and joint

action planning. These mechanisms help improve coordination, strengthen stakeholder engagement and support the development of shared solutions to common water challenges.

The cooperation mechanisms described closely match BBR activities related to Working Groups, stakeholder engagement, cross-regional knowledge exchange and Joint Action Plans, making Water Smart Connect a highly relevant reference source for BBR.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**5/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

2.12. Target groups and their engagement level

Water Smart Connect engages a wide range of stakeholders, including municipal and regional authorities, water utilities, environmental agencies, SMEs, researchers, policymakers, and civil society organisations. These groups are involved throughout the project in stakeholder mapping, workshops, consultations, cross-regional working groups, and roadmap development. Engagement is generally based on consultation and co-creation, with stakeholders actively contributing to planning, knowledge exchange, and the development of joint actions.

For BBR, the most relevant target groups are municipalities, water utilities, environmental authorities, researchers, businesses, planners, and policymakers. The project's use of workshops, working groups, and collaborative planning provides useful examples for BBR stakeholder engagement activities and Joint Action Plans.

Water Smart Connect demonstrates strong multi-stakeholder engagement through consultation, co-creation, and cross-regional cooperation. These approaches closely align with BBR's objectives of involving key stakeholder groups in governance development, Working Groups, and Joint Action Plans.

Table 2.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
X	Regional authorities			X
X	National authorities		X	
X	Water utilities			X
X	Environmental agencies			X
X	SMEs and businesses			X

X	NGOs		X	
X	Citizens / residents	X		
	Landowners			
X	Researchers / academia			X
X	Planners and consultants		X	
X	Policymakers			X
	Other:			

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.13. Gaps and Barriers

Water Smart Connect identifies several barriers to sustainable water management, including fragmented governance structures, limited coordination between organisations, challenges in data sharing and integration, and differing regional priorities and regulatory frameworks. The project also highlights the need for stronger stakeholder cooperation, knowledge exchange, and long-term commitment to support implementation of water-related actions. These organisational and governance-related barriers are considered key obstacles to effective collaboration and integrated water management.

For BBR, these findings are highly relevant because similar challenges can hinder stormwater management, climate adaptation, and the implementation of nature-based solutions. Addressing coordination gaps, improving stakeholder cooperation, and strengthening knowledge sharing should be important areas for further development within BBR.

The barriers identified in Water Smart Connect closely reflect the governance, cooperation, and implementation challenges that BBR aims to address, making this a highly relevant source for understanding and overcoming obstacles to effective water and stormwater management.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.14. Opportunities for Coordinated Action

Water Smart Connect identifies significant opportunities for coordinated action through cross-regional cooperation, stakeholder working groups, knowledge exchange, and joint

roadmap development. The project encourages collaboration between public authorities, water utilities, researchers, businesses, and other stakeholders to address shared water and climate challenges. Key opportunities include joint planning, sharing good practices, developing common approaches, and strengthening long-term stakeholder networks.

For BBR, these approaches could be directly applied through Working Groups and Joint Action Plans focused on stormwater management, climate adaptation, NBS, and governance development. The emphasis on stakeholder cooperation and cross-sector collaboration is particularly relevant for addressing complex water-management challenges.

Water Smart Connect provides practical examples of coordinated action, stakeholder cooperation, and joint planning that closely support BBR's objectives of developing collaborative solutions and regional Joint Action Plans.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.15. Transferability

The Water Smart Connect project demonstrates strong potential for transferability across regions through its stakeholder mapping approach, cross-regional working groups, collaborative workshops, joint action planning processes, and long-term cooperation strategy. The project was specifically designed to identify common challenges, exchange good practices, and develop solutions that can be adapted across different regional contexts.

Successful transfer requires active stakeholder engagement, cross-sector cooperation, sufficient institutional capacity, and mechanisms for knowledge sharing and coordination. The project also highlights the importance of common analytical frameworks, stakeholder validation processes, and cross-regional dialogue to ensure that approaches can be adapted to different governance and environmental conditions.

For BBR, the most transferable elements include stakeholder mapping, cross-regional Working Groups, knowledge exchange activities, collaborative development of Joint Action Plans, and the use of a replicable methodology for stakeholder engagement. These approaches could be applied across all BBR partner regions, including Finland, Sweden, Denmark, Lithuania and Poland, although adaptations may be needed to reflect local

governance structures, stakeholder networks and stormwater management responsibilities.

The project was developed specifically to create transferable cooperation models and shared approaches across multiple European regions. Its stakeholder engagement methods, working groups and collaborative planning processes are directly applicable to BBR activities and support the development of a transferable governance methodology for stormwater management.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.16. Relevance for BBR

The Water Smart Connect project is highly relevant to BBR because it addresses many of the same challenges, including climate adaptation, water resilience, stakeholder cooperation, governance development and cross-regional collaboration. The project developed a structured process for stakeholder mapping, regional workshops, cross-regional working groups and joint action planning, which closely aligns with BBR's planned activities.

The most useful findings for BBR are the quadruple helix stakeholder engagement model, the use of cross-regional working groups, the identification of governance gaps, and the development of collaborative roadmaps and action plans. These approaches provide practical examples for organising BBR Working Groups, engaging stakeholders, and developing Joint Action Plans.

BBR could directly apply the Water Smart Connect methodology for stakeholder mapping, governance analysis, cross-regional knowledge exchange and structured co-creation processes. The project also demonstrates how common water challenges can be transformed into joint actions through stakeholder cooperation and long-term networking.

A key recommendation for BBR is to use similar stakeholder mapping and cross-regional working group approaches to identify governance gaps, strengthen cooperation between municipalities, utilities and regulators, and support the development of a transferable stormwater governance methodology across the Baltic Sea Region.

Water Smart Connect provides directly transferable methods, governance practices and cooperation mechanisms that support BBR objectives and can be applied in stakeholder engagement, Working Groups, Joint Action Plans and methodology development. It should be considered a highly relevant methodological reference for BBR.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

2.17. Key Findings and Recommendations

Key findings:

1. Climate adaptation, flood resilience, and sustainable water management are shared priorities across regions.
2. The quadruple helix model enables broad stakeholder participation in water governance.
3. Cross-regional working groups and knowledge exchange support joint learning and action development.
4. Nature-based solutions and green infrastructure are important tools for climate resilience.
5. Effective water governance requires strong stakeholder engagement, coordinated planning, and long-term collaboration.

Key barriers:

1. Fragmented governance structures and unclear responsibilities among stakeholders.
2. Limited data sharing and coordination between organisations and regions.
3. Maintaining long-term stakeholder commitment and cooperation beyond project activities.

Key opportunities:

1. Establishing cross-sector and cross-regional working groups to address common water challenges.
2. Expanding the use of nature-based solutions and green infrastructure for climate adaptation and flood resilience.
3. Strengthening knowledge exchange, joint planning, and collaborative action development among stakeholders.

Recommendations for BBR:

1. Apply a structured multi-stakeholder engagement approach involving municipalities, utilities, authorities, researchers, businesses, and citizens.
2. Promote nature-based solutions and green infrastructure as key measures for stormwater management and climate resilience.
3. Establish Working Groups and Joint Action Plans that improve coordination, knowledge sharing, and governance across sectors and regions.

Author(s): Savonia UAS, Tiina Haatainen

3. COP: Circular Ocean-bound Plastic – Interreg South Baltic Project

3.1. Basic information

Full title	COP – Circular Ocean-bound Plastic
Author / Lead Organisation	Clean, The Danish Water and Environment Cluster – Project Lead
Period covered / Project duration	09.2023-08.2026
Main objectives	This project content/result is mainly focused on below points: Reduce plastic waste entering the South Baltic Sea; Investigate, test, and demonstrate solutions for the collection, cleaning, recycling, and reuse of ocean-bound plastic (OBP); Identify and promote business opportunities for Small and Medium-sized Enterprises (SMEs); Implement pilot activities in coastal urban areas to test innovative waste removal technologies in the water column and water streams; It is important to note that the COP is not directly relevant to stormwater or NBS.
Countries / Regions	Sweden, Denmark, Poland, and Germany
Geographic scope	South Baltic Sea Region, specifically focusing on pilot areas in Aarhus (Denmark), Rostock (Germany), and Gdańsk (Poland), with Malmö (Sweden) as an associated area
Type	Interreg South Baltic Project
Link	https://circularoceanplastic.eu/

3.2. Governance Arrangements

The governance framework of the Circular Ocean-bound Plastic (COP) project is anchored in the EU Interreg South Baltic Programme 2021–2027, co-funded by the European Union across Denmark, Sweden, Germany, and Poland. Governance operates through a cross-border Quadruple-Helix model led by Clean bringing together public regional entities, research institutes and universities, industry clusters, and waste management stakeholders.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.3. Stakeholder Ecosystem

The COP stakeholder ecosystem includes cluster organisations (Clean, Ocean Plastic Forum, Danish Materials Network, Sustainable Business Hub), academic and research institutions (Leibniz Institute for Baltic Sea Research, University of Rostock, University of Gdańsk), and municipal organisations and foundations (Gdańsk Water Foundation, Gdańsk Sport Center). This core network also engages broader target groups, including local municipalities, environmental and waste operators, blue and green SMEs, and civil society

organisations. However, not all stakeholders within this ecosystem are directly relevant to the BBR project. For example, the Danish Materials Network, Gdańsk Sport Center, and Ocean Plastic Forum have a more limited connection to BBR's thematic focus.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**3/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

3.4. Regional Water Priorities

Regional water priorities across the South Baltic Sea focus on intercepting ocean-bound plastic (OBP) upstream in urban rivers, canals, and harbours before it leaks into the marine environment. The main focus area was to address challenges around macro plastics in water and developed different methods to collect it at its main source level. The priority is establishing an integrated 7-step value chain that links spatial leakage risk detection, multi-compartment field monitoring, localized waste collection, polymer sorting, cleaning, quality testing, and circular market reuse. In regard to BBR project, these 7-steps value chain method could be modified to get actions for storm water or nature-based solutions.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**2/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

3.5. Stormwater Management

Beyond the scope of the COP project: Stormwater systems are mentioned strictly as one of several land-to-sea leakage pathways through which urban plastic waste enters waterways. Specific stormwater management measures, drainage infrastructure, or filtration hardware are beyond the scope of the project and have not been addressed in the COP project report.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**0/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

3.6. Technologies and Innovations

In the COP project, one collection device – a metal basket – was installed beneath stormwater drains/wells to collect cigarette butts before they entered the city canal. Additionally, technologies evaluated in COP concentrate on plastic recovery and material

processing across several stages: multi-compartment riverine monitoring (paddleboard observations, 100 m riverbank transects, drone surveys), site-specific collection hardware (booms/barriers, fixed systems, mobile devices). These technologies focus strictly on plastic handling and are not related to stormwater management or NBS.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**2/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

3.7. Nature-Based Solutions (NBS)

Beyond the scope of the project: While shoreline vegetation and reed beds (*Phragmites australis*) are noted as physical natural compartments that trap floating plastic litter along river corridors, NBS as active green restoration interventions, eco-engineering measures, or biological degradation methods are beyond the scope of the project and have not been addressed in the COP project report.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**1/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

3.8. Green Infrastructure (GI)

Beyond the scope of the project: The project applies GIS spatial mapping within a 100 m waterfront buffer to identify potential human activity hotspots (cafés, shops, pedestrian routes). However, specific Green Infrastructure (GI) measures, vegetated buffer design, or sustainable urban drainage planning are beyond the scope of the project and have not been addressed in the COP project.

Moreover, GI in parks and other high-activity public spaces works best when supported by well-designed waste collection systems. Ensuring that adequate and conveniently placed bins are available helps prevent plastic litter from entering stormwater pathways and ultimately reaching nearby waterbodies. This simple measure strengthens the overall effectiveness of nature-based solutions by keeping the environment clean and reducing pollution at the source.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**2/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

3.9. Legal and Regulatory Framework

It is important to emphasize that the legal and regulatory analysis in the COP project does not focus on stormwater management or NBS regulations. Instead, the project evaluates legal frameworks and policy drivers specifically governing land-based plastic waste, Extended Producer Responsibility (EPR), and circular material value chains across the South Baltic Sea.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**0/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.10. Roles and Responsibilities

Responsibilities are distributed across the project value chain according to institutional strengths: public municipal authorities guide policy and local urban access needs; research organizations execute monitoring surveys, technology SMEs and clusters evaluate recycling potential and market opportunities; and waste management operators handle practical collection, sorting, and feedstock preparation. Additionally, there was dialogue between municipalities and utility providers regarding stormwater drains/wells and street-level rainwater storage systems.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.11. Cooperation Mechanisms

Formal cooperation is maintained through the cross-border EU Interreg partnership across four countries, combining complementary spatial, environmental, chemical, and material testing experience into a single consolidated 7-step methodology. Informal collaboration includes multi-stakeholder local knowledge workshops used to complement spatial GIS mapping and identify unrecorded pollution sources.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.12. Target groups and their engagement level

The project identifies five key target groups: public authorities/municipalities, research institutions, blue/green SMEs/clusters, waste/environmental operators, and civil society/NGOs. Engagement levels involve tailored technical reporting, providing municipalities with hotspot and collection decision tools, R&D actors with monitoring and material testing data, and SMEs with recycling feedstock specifications.

Table 3.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
X	Regional authorities		X	
X	National authorities	X		
X	Water utilities	X		
X	Environmental agencies		X	
X	SMEs and businesses			X
X	NGOs			X
X	Citizens / residents			X
	Landowners			
X	Researchers / academia			X
	Planners and consultants			
X	Policymakers		X	
	Other:			

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.13. Gaps and Barriers

This section is not relevant for the BBR assessment. The reviewed material does not identify any technical, financial, legal, organisational, institutional, knowledge-related or social gaps that fall within the scope of BBR, nor does it provide evidence of barriers that would require follow-up through BBR activities.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**0/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.14. Opportunities for Coordinated Action

Coordinated action is not applicable at this stage, as the COP project has been completed and no further joint activities are foreseen. However, some cooperation methods developed during the project, particularly the workshop approaches and facilitation practices, may provide limited transferable insights for future initiatives.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.15. Transferability

Transferability is rooted in the repeatable 7-step decision framework rather than copying specific hardware or treatment recipes. The sequence: identify risks → monitor → collect → document/classify → clean/prepare → assess quality → select utilization route is fully adaptable to different cities, hydrological conditions, and waste infrastructure contexts. Another transferable approach is COP's process for organising stakeholder workshops across regions to raise awareness and gather input.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.16. Relevance for BBR

The COP methodology provides low relevance for BBR objectives by supplying an evidence-based, cross-border operational blueprint to detect land-to-sea plastic leakage, intercept riverine waste upstream, standardize secondary plastic preparation, and connect recovered marine debris to circular economy value chains.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

3.17. Key Findings and Recommendations

Key findings:

1. Standardized 100 m riverbank surveys across 40 sites recorded 544 litter items, of which 61.2% (334 items) were plastic, confirming it as the primary waste fraction in urban river corridors.
2. Free-floating debris represents only a small fraction of riverine litter; field surveys along the Warnow River revealed that only 14.3% of observed litter was moving freely at the water surface, while 85.7% was stranded on shorelines, submerged, or trapped in riparian vegetation.
3. Site-Specific Operational Dependencies influence the selection and effectiveness of mitigation measures; therefore, solutions should be adapted to local pollution sources, pathways, waterway characteristics and implementation conditions rather than applied uniformly across locations.

Key barriers:

1. Material Degradation – In the long run if macro plastic trapped by the NBS, might degrades to micro plastic, it can be considered to be a barrier for implementing NBS.

Key opportunities:

1. To prevent macroplastic from reaching water bodies, NBS or other upstream interception measures could be considered.
2. Upstream Interception: Intercepting waste upstream in urban rivers, canals, and harbours stops any kind of impurities leakage before it enters marine environments where collection and documentation are far more difficult.

Recommendations for BBR:

1. Use a standard set of workshop materials to streamline stakeholder invitations, workshop delivery and evaluation, and to enable comparable outcomes across regions.
2. Use of 7 Step Key approach.

Author(s): Sustainable Business Hub, Deepshikha Singhania, Jenny Bengtsson

4. Symbioter – Interreg BSR Project Platform

4.1. Basic information

Full title	Symbioter – Strengthening Circular Water Economy through microsymbiosis
Author / Lead Organisation	Chamber of Economy "Polish Waterworks"
Period covered / Project duration	07.2026 – 10.2028
Main objectives	Circular water economy, water and nutrient reuse, recycling and recovery, stormwater and rainwater management, climate adaptation, flood risk management, nature-based solutions (NBS), wastewater reuse, nutrient recovery, capacity building and cross-sectoral cooperation.
Countries / Regions	Poland, Finland, Germany, Sweden, Norway, Lithuania
Geographic scope	Local / municipal; transnational; Baltic Sea Region. The project supports local water symbioses while facilitating knowledge exchange and cooperation across the BSR.
Type	Interreg BSR Project Platform
Link	https://interreg-baltic.eu/project/symbioter/

4.2. Governance Arrangements

The governance framework of the Symbioter project is anchored in the EU Interreg Baltic Programme 2021–2027, co-funded by the European Union across Poland, Finland, Lithuania, Sweden, Germany and Norway. Symbioter applies a cross-sectoral and transnational cooperation model involving municipalities, water service providers, businesses, research organisations, NGOs and other local interest groups.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.3. Stakeholder Ecosystem

The Symbioter project involves municipalities, water utilities, research institutions, regional development agencies, foundations, and public authorities. According to the project, these stakeholders participate through training packages, mentoring, policy dialogue, and local "microsymbioses," where municipalities and utilities work together to apply circular water solutions. Research partners provide knowledge and tools, while regional actors support coordination and communication. Engagement happens mainly through capacity-building activities, stakeholder networks, and collaborative local arrangements; at this stage, the project does not describe formal decision-making or monitoring structures.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.4. Regional Water Priorities

Symbioter identifies several water-related challenges connected to the transition toward a circular water economy. The project page highlights issues such as fragmentation between sectors, missing competencies, and the need for better cooperation between municipalities, utilities, businesses, and public authorities. It also emphasises development priorities like water reuse, nutrient recovery, stormwater recycling and local microsymbioses that help actors work together on practical circular solutions.

Stormwater management, climate adaptation and water resilience are explicitly addressed within Symbioter's REUSE pillar, which covers rainwater and stormwater management, NBS and flood-risk tools. The overall priorities therefore support broader climate-related water resilience, even though these terms are not directly stated publicly.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.5. Stormwater Management

One of the priorities is REUSE rainwater and stormwater management. It is based on WaterMan, CATCH, CityBLues, NOAH. They are about stormwater management, flood prevention, Extreme Weather Layer, NBS for stormwater management in growing cities, flood control approaches, and heavy-rain mapping guidance.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.6. Technologies and Innovations

The Symbioter project page describes circular water solutions related to reuse, recycling and nutrient recovery, mainly through its REUSE, RECYCLE and RECOVER training packages. These approaches aim to address fragmentation, missing competencies and the need for practical cooperation between municipalities, utilities and businesses. Symbioter aims to transfer and disseminate solutions already developed in nine projects, rather than develop new solutions.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.7. Nature-Based Solutions (NBS)

Related to NBS, Symbioter draws on City Blues, which advances nature-based solutions for stormwater management and green-blue infrastructure in growing cities; Nursecoast II, which develops innovative and nature-based solutions for seasonal wastewater challenges in tourist areas; and WaterMan, which includes NBS approaches for stormwater management.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.8. Green Infrastructure (GI)

Related to green infrastructure, ReNutriWater is about green areas irrigation; WaterMan addresses irrigation of green areas; and NBS use for irrigation and stormwater management. Nenuphar focuses on nutrient recycling in green infrastructure. CityBlues is also about NBS = green infrastructure.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.9. Legal and Regulatory Framework

Symbioter is aligned with the EU and Baltic Sea Region policy framework for water reuse, nutrient recovery and water resilience, including the EU Water Resilience Strategy, EUSBSR Policy Area Nutri and HELCOM Baltic Sea Action Plan. Regulation (EU) 2020/741 is relevant to specific agricultural water-reuse applications but does not cover the project's full thematic scope.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.10. Roles and Responsibilities

Symbioter distributes roles and responsibilities across different types of actors involved in developing local water symbioses. Local public authorities initiate and coordinate local cooperation on water and nutrient management, while infrastructure and service providers, including wastewater treatment plants, stormwater managers and utilities, are responsible for putting circular water solutions into practice. NGOs, businesses and academic organisations provide specialised knowledge and support stakeholder connections. At project level, the partnership combines expertise from water-sector organisations, public authorities, research institutions and regional organisations across the Baltic Sea Region. Knowledge transfer is supported through training, mentoring, local workshops, study visits and transnational exchange, enabling experienced organisations and experts to support municipalities and utilities in developing practical water and nutrient symbioses.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.11. Cooperation Mechanisms

The Symbioter project page describes informal cooperation mechanisms such as local microsymbioses, training packages, mentoring, stakeholder networks and policy dialogue. Municipalities, water utilities, research institutions, regional agencies, foundations and public authorities participate in these activities. Cooperation is supported by shared training, mentoring and knowledge-exchange formats, while fragmentation, missing competencies and limited cross-sector cooperation hinder effective coordination and information flow.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.12. Target groups and their engagement level

The Symbioter project targets local public authorities, infrastructure and service providers, and interest groups. More specifically, these include municipalities, water and wastewater service providers, businesses, NGOs and academia. Stakeholders are engaged through training, mentoring, transnational exchange, local workshops, study visits and other knowledge-sharing activities aimed at supporting the development and implementation of local water symbioses.

Table 4.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
	Regional authorities			
	National authorities			
X	Water utilities			X
	Environmental agencies			
X	SMEs and businesses			X
X	NGOs		X	
	Citizens / residents			
	Landowners			
X	Researchers / academia			X
	Planners and consultants			
	Policymakers			
	Other:			

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	4/5

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.13. Gaps and Barriers

The Symbioter project page identifies several gaps and barriers, including fragmentation between sectors, missing competencies, lack of cross-sector cooperation and misunderstandings between stakeholders. The most critical barriers are fragmentation and missing competencies, as these directly hinder the uptake of circular water solutions and are repeatedly highlighted in the project description. The project page explains that these issues limit cooperation, slow implementation and create coordination problems, but it does not provide detailed evidence or technical assessments.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	3/5

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.14. Opportunities for Coordinated Action

Several opportunities have been identified, particularly capacity building, competence development and cross-sector cooperation. Mentoring programmes could provide an additional mechanism for supporting implementation.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	4/5

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.15. Transferability

The transferable knowledge and approaches consolidated by Symbioter originate from nine EU-funded projects:

- ReNutriWater – Interreg BSR: Focuses on water and nutrient reuse, providing tools, guidance, and mentoring to support local symbiosis. To share: WaterSave tool, mentoring method, practical handbook.
- NOAH – Interreg BSR: Strengthens climate-resilient stormwater planning using holistic approaches and smart drainage. To share: Extreme-weather planning guide.
- WaterMan – Interreg BSR: Supports water reuse through shared solutions, expert access, and engagement tools for public authorities. To share: Recycling Toolbox, expert platform, awareness roundtables.
- VillageWaters – Interreg BSR: Improves small-scale wastewater treatment in rural areas to reduce nutrient loads. To share: Information tool for rural wastewater solutions.
- Nursecoast II – Interreg BSR: Develops solutions for seasonal wastewater challenges in tourist areas using innovative and nature-based systems. To share: Best practice report, pilot insights.
- Aquares – Interreg Europe: Enhances water reuse management and supports authorities in improving policy and exchanging solutions. To share: Modular industrial water reuse system.
- CityBlues – Interreg BSR: Advances nature-based solutions for stormwater and green–blue infrastructure in growing cities. To share: NBS modelling results and municipal cooperation insights.
- CATCH – Interreg North Sea: Helps midsize cities strengthen climate resilience through improved urban water management strategies. To share: Flood control approaches, heavy-rain mapping guidance, water-sensitive community recommendations.
- NENUPHAR – Horizon Europe: Promotes circular nitrogen and phosphorus (N/P) recovery for cleaner environments and new fertiliser value chains. To share: GIS platform, N/P emission method, techno-economic insights, circular N/P handbook.

Successful transfer of these approaches requires adaptation to local institutional and regulatory frameworks, available financing, technical capacity and specific environmental and infrastructure conditions. For BBR, the most relevant transferable elements relate to stormwater management, NBS, knowledge exchange and cross-sector cooperation and

could support regional Working Groups and Joint Action Plans. Transfer should therefore focus on adapting proven tools and practices to the needs and capacities of individual BBR partner regions rather than replicating them directly.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.16. Relevance for BBR

Symbioter is highly relevant to BBR due to its focus on circular water management, stormwater and rainwater reuse, NBS, climate adaptation, nutrient recovery and cross-sectoral cooperation. Its main value for BBR lies in consolidating and transferring tested solutions from previous EU projects into local practice through capacity building, mentoring, knowledge exchange and local water symbioses. These approaches can support BBR stakeholder cooperation, Water "Owner" Working Groups, capacity building and Joint Action Plans. As Symbioter has only recently started, its practical results are still under development, but its methodology and accumulated knowledge provide strong potential for future exchange and cooperation with BBR.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

4.17. Key Findings and Recommendations

Key findings:

1. Integrated stormwater management requires stronger cross-sectoral governance and coordination.
2. NBS and green infrastructure can improve flood resilience, runoff control and water quality.
3. Clear roles and responsibilities are essential for effective stormwater planning and management.
4. Stakeholder cooperation and knowledge exchange are important for developing locally appropriate solutions.
5. Successful approaches need to be adapted to local regulatory, institutional and environmental conditions.

Key barriers:

1. Fragmentation of responsibilities, governance and planning.
2. Regulatory and institutional differences that hinder coordinated implementation.
3. Limited capacity, knowledge exchange and long-term cooperation between relevant actors.

Key opportunities:

1. Cooperation between sectors and regions can create a bigger and more coordinated impact.
2. Wider integration of NBS and green infrastructure into stormwater and climate-resilience planning.
3. Transfer and adaptation of good practices, knowledge and tested approaches between regions.

Recommendations for BBR:

1. Strengthen cross-sectoral cooperation through BBR Working Groups and clarify roles and responsibilities.
2. Use relevant NBS, GI and stormwater management practices as input for regional Joint Action Plans.
3. Facilitate cross-regional knowledge exchange and adapt transferable practices to local governance, regulatory and environmental conditions.

Author(s): Sustainable Business Hub, Deepshikha Singhania, Jenny Bengtsson

5. WaterMan: Promoting water reuse in the BSR (…) – Interreg BSR Project

5.1. Basic information

Full title	WaterMan – Promoting water reuse in the Baltic Sea Region through capacity building at local level.
Author / Lead Organisation	Lead Partner: Region Kalmar County (Region Kalmar län), Sweden. The project was initiated by the Water Core Group of Euroregion Baltic (ERB).
Period covered / Project duration	01.01.2023 – 31.12.2025
Main objectives	Water recycling and reuse, circular water use, rainwater and stormwater retention and recirculation, reuse of treated municipal wastewater, local water-supply resilience, climate adaptation, capacity building and transfer of practical water-recycling solutions.
Countries / Regions	Sweden, Denmark, Germany, Poland, Lithuania and Latvia. Partner regions: Kalmar and Västervik (SE), Bornholm (DK), Berlin-Brandenburg (DE), Braniewo (PL), Klaipėda Region (LT) and Kurzeme (LV). The project also drew on experience from Murcia (ES), Flanders (BE) and Zeeland (NL).
Geographic scope	Local / municipal; regional; transnational; Baltic Sea Region. The project developed a BSR-specific approach based on pilots and regional strategies.
Type	Interreg BSR Project
Link	https://interreg-baltic.eu/project/waterman/

5.2. Governance Arrangements

WaterMan is coordinated by Region Kalmar County as Lead Partner, with 15 partner organisations (municipalities, water companies, universities, regional development bodies) across Sweden, Denmark, Germany, Poland, Lithuania and Latvia; the project was initiated by the Water Core Group of Euroregion Baltic (ERB), which also runs a BSR-wide stakeholder dialogue outside the project's own lifetime. Governance works on two levels: pilot implementation is fully devolved to each partner region or municipality, while cross-regional coordination and policy dialogue run through Kalmar and ERB, including two Roundtable Discussions held in Brussels that connected regional practitioners with national and EU policymakers. The model links local pilots to EU-level policy debate convincingly, but it is project-bound and time-limited with no permanent joint decision body – BBR could reuse the two-tier "local pilot ownership + central cross-country coordinator" structure for its own Working Groups, with Savonia in the Kalmar-equivalent role.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.3. Stakeholder Ecosystem

Stakeholders are concentrated in the public and utility sector: municipalities, municipal water companies, regional/national authorities and research institutes (e.g. Gdańsk University of Technology, Klaipėda University, Berlin Centre of Competence for Water) that coached the "hands-on" partners through seminars and "peer & expert review sessions." Engagement happens mainly between the partners themselves, reinforced by two Dialogue Forums with the ERB Water Core Group and study visits to more advanced regions (Flanders, Zeeland). Citizens, NGOs and SMEs are not structured stakeholder groups in WaterMan – the main gap relative to BBR's broader ambition, so BBR would need to add these groups rather than copy WaterMan's stakeholder map directly.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.4. Regional Water Priorities

WaterMan frames water resilience mainly as a supply problem – protecting local water supply against increasingly extreme swings between too much and too little water – rather than as a pollution or flood problem. Even so, several regional pathways address stormwater directly: retaining and treating runoff (Gargzdai, Västervik) cuts flood risk while creating a reusable water source. This is a narrower framing than BBR's, but the underlying climate driver (heavier, more erratic Baltic precipitation) and several concrete measures overlap closely enough to be directly comparable, especially for the Klaipėda region shared by both projects.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.5. Stormwater Management

Two WaterMan pilots are essentially stormwater-management installations: a retention pond in Gargzdai (Klaipėda District, Lithuania) that purifies runoff from a 110-hectare residential catchment through sedimentation alone and now substitutes up to 300 m^3/year of drinking water for street cleaning and irrigation, and a network of "multi-dam"

stormwater ponds in Västervik (Sweden) built around an 80-hectare catchment, later scaled down into smaller "mini-multi" units placed closer to end users once long-distance transport proved impractical. Both report real operating results, not just design studies, making them the most directly transferable elements of WaterMan for BBR's stormwater-management work, particularly given the shared Klaipėda geography.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.6. Technologies and Innovations

The toolbox documents six operating real-world pilots (July 2024–Sept 2025) plus five feasibility studies: a low-tech filter for treated-wastewater reuse in agriculture (Bornholm), a mobile disinfection unit for irrigation water (Kalmar), natural-purification retention ponds (Gargzdai, Saldus) and a rain garden (Braniewo). All are low-tech, low-capex solutions validated through a formal "peer & expert review" process rather than lab trials – exactly the implementation-readiness level most municipalities in BBR's target regions would need. Readiness is well evidenced; novelty is intentionally low.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.7. Nature-Based Solutions (NBS)

NBS-type measures appear in most WaterMan pilots: the Gargzdai and Saldus retention ponds and the Västervik multi-dams rely entirely on natural sedimentation and ecosystem-based purification, with no added technical treatment, and are credited with biodiversity and nutrient-load co-benefits alongside water reuse. The Braniewo rain garden is the clearest classic-NBS example (a vegetated infiltration feature greening a car park). These are concrete, monitored examples of the wetland/pond-type NBS BBR wants to scale, though documentation stays at pilot level rather than offering a general NBS design methodology.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.8. Green Infrastructure (GI)

Green infrastructure appears mainly through the Braniewo rain garden and, more loosely, the vegetated buffers around the Västervik and Gargzdai ponds, but WaterMan does not treat GI as a planned network integrated into wider spatial or urban planning – GI features sit inside individual water-recycling pilots rather than city-scale blue-green infrastructure. This is markedly thinner than City Blues' treatment of the same theme, so WaterMan's GI value for BBR is limited to specific site examples rather than planning methodology.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.9. Legal and Regulatory Framework

WaterMan's clearest contribution here is at policy level: its two Brussels Roundtables debated whether the EU Water Reuse Regulation (2020/741) – currently scoped to agricultural irrigation – should be extended to the broader reuse cases relevant to humid Baltic regions, and whether a dedicated regulatory framework is needed at all; recordings, agendas and summaries from both events are published. The Västervik pilot also targets EU water-quality "Class D" under Reg. 2020/741, showing partners already operating within (and at the edges of) that regulation. This is a ready-made starting point for BBR to map legal constraints on stormwater reuse rather than starting from a blank page.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.10. Roles and Responsibilities

Region Kalmar County holds overall coordination and financial-management responsibility; each of the seven pilot regions/municipalities owns and operates its own pilot, with local water companies (Kalmar Water, Bornholm Energy & Utility, etc.) as technical operators and universities providing coaching and review. Role allocation is clear at the level of "who runs which pilot," but the project does not publish an analysis of overlaps or responsibility gaps between organisations – a documentation gap BBR would need to fill itself if reusing the model.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.11. Cooperation Mechanisms

Cooperation runs through several concrete mechanisms: the 15-partner Interreg consortium itself, "peer & expert review sessions" used to jointly refine pilot designs, coaching/seminars by research partners, two international Dialogue Forums on Water Recycling (Nov 2023, Nov 2025) convened with the ERB Water Core Group, and two EU-level policy Roundtables in Brussels. This combination of practitioner-to-practitioner review plus a separate policy-dialogue track is close to what BBR is planning with its water-owner Working Groups and could largely be adopted as-is.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.12. Target groups and their engagement level

Interreg's own project record lists WaterMan's target groups as infrastructure/public-service providers, general "interest groups," and local, regional and national public authorities – an almost entirely public-sector and utility audience. NGOs, SMEs, landowners and citizens are not named as target groups and are reached, if at all, only indirectly as beneficiaries of pilots (e.g. residents using irrigated green spaces). Engagement of the named groups is solid – municipalities and utilities co-design and operate pilots; national/regional bodies are consulted mainly through the Brussels roundtables – but the overall breadth is narrower than what BBR intends.

Table 5.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
X	Regional authorities			X
X	National authorities	X		
X	Water utilities			X
	Environmental agencies			
	SMEs and businesses			
	NGOs			
	Citizens / residents			
	Landowners			
X	Researchers / academia			X
	Planners and consultants			
X	Policymakers	X		
	Other:			

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.13. Gaps and Barriers

Two barriers are explicitly documented: transporting recycled or retained water over any distance quickly becomes impractical, which pushed the Västervik team toward smaller, decentralised "mini-multi" units instead of one large facility; and the EU Water Reuse Regulation's agricultural-only scope was repeatedly flagged at the Brussels roundtables as a poor fit for other humid-region reuse cases. A further gap, visible from WaterMan's own target-group list rather than stated outright, is the absence of NGOs, SMEs and citizens from the stakeholder base. No consolidated "lessons learned/risks" report was found within the public toolbox; BBR may want to request this directly from Region Kalmar County or Euroregion Baltic.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.14. Opportunities for Coordinated Action

WaterMan explicitly positions itself for "wider roll-out in the medium & long term," publishing a reusable BSR Water Recycling Toolbox (use cases, regional pathways, practical guidelines, policy-dialogue materials) built for exactly this. The ERB Water Core Group's Dialogue Forums are an existing, standing cross-border venue BBR could join rather than duplicate, and the Brussels roundtable format is a ready template for a future BBR legal/regulatory session with national and EU-level actors.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.15. Transferability

Transferability is a stated project goal: solutions are described as "replicable and validated technical-organisational solutions (...) adapted to the specific conditions of the Baltic Sea Region," with study visits to more advanced water-recycling regions (Flanders, Zeeland) used explicitly as adaptation benchmarks. The Gargzdai pilot's direct overlap with a BBR partner region (Klaipėda) is the strongest transfer case; the Västervik multi-dam concept is also readily adaptable at smaller scale for other BBR municipalities.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.16. Relevance for BBR

WaterMan is moderately-to-highly relevant to BBR: it supplies tested, quantified stormwater-retention pilots in the same country/region as a BBR partner, an active EU-level legal dialogue on water-reuse regulation BBR can build on directly, and a proven cross-border cooperation format (peer review + policy roundtables) close to BBR's own planned Working Groups. Its main limitation is scope – WaterMan's framing and stakeholder base centre on water scarcity/reuse rather than flood- and pollution-driven stormwater management, and it does not engage NGOs, SMEs or citizens the way BBR intends to. BBR should treat WaterMan as a strong technical/legal reference and a direct regional contact (Klaipėda), not as a governance template to copy wholesale.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

5.17. Key Findings and Recommendations

Key findings:

1. Gargzdai (Klaipėda district) stormwater retention pond purifies runoff from a 110-ha catchment purely through natural sedimentation and already substitutes up to 300 m^3/year of drinking water – the same region as a BBR partner.
2. "Multi-dam" stormwater ponds (Västervik) show that small, decentralised units close to end users work better than one large central facility – a design lesson for catchment-scale NBS.
3. WaterMan's two Brussels Roundtables (Jan 2025, Nov 2025) opened an EU-level debate on extending the Water Reuse Regulation (2020/741) beyond its current agricultural focus – a legal opening BBR can reference.
4. Regional pathways only succeed where there is "a local driver willing to make the change happen" – a committed local champion, not just funding.
5. WaterMan's toolbox and stakeholder dialogue are coordinated by Euroregion Baltic's Water Core Group, a standing cross-border platform that could be a natural cooperation partner for BBR.

Key barriers:

1. Transporting recycled or retained stormwater over longer distances is impractical, favouring small, distributed installations over centralised ones.
2. The current EU water-reuse regulation is written for agricultural irrigation and does not clearly cover other reuse cases relevant to Baltic municipalities.
3. Engagement stayed largely within the public/utility sector; NGOs, SMEs and citizens were not structurally included, unlike BBR's intended stakeholder base.

Key opportunities:

1. Direct geographic and thematic overlap in the Klaipėda region gives BBR a ready reference pilot and contact point (Klaipeda Region association / Klaipėda District Municipality).
2. The ERB Water Core Group's Dialogue Forums are an existing cross-border venue BBR could use for its own stakeholder-mapping and dissemination activities.
3. The Brussels policy-roundtable format (regional, national and EU-level actors together) is a ready-made template for a BBR legal/regulatory working session and a platform for BBR's policy dialogues in, for example, 2027.

Recommendations for BBR:

1. Contact the Gargzdai / Klaipėda District Municipality team for design parameters and monitoring data on the retention pond as a benchmark NBS case for BBR's Lithuanian pilot.
2. Use WaterMan's Roundtable materials on the EU Water Reuse Regulation (2020/741) as a starting reference when BBR maps the legal/regulatory framework for stormwater reuse.
3. Explore a liaison with the ERB Water Core Group / Euroregion Baltic to avoid duplicating stakeholder- mapping work in overlapping BSR regions, and suggest cooperation at the European Water Resilience Forum event in 2027.

Author(s): Klaipeda Science and Technology Park, Karolina Jasaitytė, Audronė Liesytė

6. City Blues – Interreg BSR Project

6.1. Basic information

Full title	City Blues – Bluegreen nature-based solutions for climate change adaptation and citizen wellbeing.
Author / Lead Organisation	Lead Partner: City of Tampere, Finland
Period covered / Project duration	11.2023 – 10.2026
Main objectives	Catchment-based, nature-based stormwater management (NBS) for urban flood-risk reduction, water-quality improvement, biodiversity and citizen wellbeing; developing a shared NBS operational model and self-assessment tool for cities.
Countries / Regions	5 countries: Denmark, Sweden, Norway, Finland, Estonia (plus Germany as a research partner, no pilot). 5 pilot cities: Aarhus (DK), Malmö (SE), Stavanger (NO), Tampere (FI, Lead), Tartu (EE).
Geographic scope	Baltic Sea Region
Type	Interreg BSR Project
Link	https://interreg-baltic.eu/project/city-blues/

6.2. Governance Arrangements

City Blues does not describe one governance model but an explicit, reusable governance framework: it maps how political commitment, financing, planning, design, construction and maintenance each need a different combination of municipal departments (urban planning, public works, environmental services), water utilities, developers, landowners and communities, and shows that "governance models differ in different cities [but] the core operational contexts remain the same" across its five pilot cities (Aarhus, Malmö, Stavanger, Tampere, Tartu). Its clearest strength is naming, stage by stage, who must hold responsibility ("mission holder") versus who is merely informed or consulted. This staged governance/engagement matrix is close to directly usable by BBR when designing its own cross-country Working Group governance.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.3. Stakeholder Ecosystem

City Blues maps an unusually complete stakeholder ecosystem: municipal planning/public-works/ environmental departments as mission holders, water utilities as co-financers, city development agencies coordinating developers, private investors, construction firms, maintenance/asset-management departments, landscape contractors, ecologists, housing associations/property owners and community groups/volunteers. Engagement is explicitly staged from "inform" through "consult," "involve," "collaborate" up to "empower" (the

level given to community stewards during long-term maintenance), and the project flags maintenance/operation as the stage where participation most often – and most damagingly – drops off. This range and staged-engagement logic matches BBR's target groups (public authorities, utilities, NGOs, SMEs) closely and is one of the most reusable elements found.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.4. Regional Water Priorities

All five City Blues pilot cities share the same regional priority: urban flooding, stream-bank erosion, biodiversity loss and pollution from stormwater runoff, driven by climate change and addressed through catchment-scale rather than site-by-site nature-based solutions. This is essentially BBR's own problem statement restated at city level, which makes City Blues' regional priorities the closest available match to BBR's among the two sources reviewed.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.5. Stormwater Management

Stormwater management is City Blues' central subject, not a side pilot: guidance covers the full lifecycle from catchment-integrated spatial planning through design, construction and long-term maintenance, illustrated with city-level practice (Aarhus's formal rainwater-handling-plan guidance; Malmö's stormwater programme running since the 1990s; Tartu's conversion of former industrial land into a climate-resilient blue-green area). A dedicated cross-city study catalogued 36 documented failure modes across this lifecycle and found most failures trace back to early, site-level rather than catchment-level planning decisions – concrete, transferable evidence BBR can use directly in its own stormwater recommendations and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.6. Technologies and Innovations

City Blues' main "technology" is not hardware but a decision-support-tool: a public NBS Model web tool and self-assessment instrument (nbsmodel.tampere.fi) plus a Catalogue of Practices and city-by-city Transition Stories, letting a municipality benchmark its own institutional readiness for catchment-fit NBS. This is evidenced through direct use by the five pilot cities and built for reuse by outside cities, but it does not focus on physical treatment technologies.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.7. Nature-Based Solutions (NBS)

NBS is City Blues' core subject: wetlands, rain gardens, bioswales, retention basins and blue-green corridors implemented across Aarhus, Malmö, Stavanger, Tampere and Tartu, explicitly designed as "catchment-fit" so a plot-scale intervention still makes sense at neighbourhood, catchment and city scale. Reported benefits span hydraulic performance (flood/runoff reduction), ecological gains and social value (amenity, recreation), while the 36-failure-modes study also documents where and why NBS underperform. This is the single most relevant source reviewed for BBR's NBS criterion.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.8. Green Infrastructure (GI)

Green infrastructure is treated as inseparable from NBS in City Blues: guidance explicitly requires that any individual measure "make sense" as part of a wider blue-green infrastructure network across plot, neighbourhood, catchment, city and country scales. Tartu's pilot – converting former industrial land into a high-quality, climate-resilient blue-green area – is the clearest case of GI integrated into city redevelopment planning. This catchment-to-city planning logic is directly applicable to how BBR structures its own regional Joint Action Plans.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.9. Legal and Regulatory Framework

City Blues documents that Aarhus and Malmö both built strong policy support for catchment-fit NBS around EU Water Framework Directive obligations and national climate-adaptation requirements, but – importantly – that most cities with a structured NBS policy got there only after a serious, damaging flood event forced the issue, rather than through proactive regulation. Aarhus has since published formal municipal guidance for preparing rainwater-handling plans (linked from the project as a public PDF). This "regulation usually follows disaster" pattern is a useful, honestly-reported legal/regulatory finding for BBR's own barrier analysis.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.10. Roles and Responsibilities

Roles are set out stage by stage with named responsibility levels: municipal project managers/ procurement safeguard design intent as "mission holder" during construction; maintenance/asset- management departments hold that role during operation; utilities, developers and future maintenance operators are "informed" or "collaborate" depending on the phase. The project explicitly names the most common point of failure as organisational – responsibility drifting between stakeholders as a project moves between phases – a specific, evidenced risk directly useful for how BBR allocates roles in its Joint Action Plans.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.11. Cooperation Mechanisms

Formal cooperation runs through the five-city transnational partnership itself, the shared NBS Model/self-assessment tool, and active exchange with adjacent EU initiatives – notably a 2026 working meeting with the LIFE LATESTadapt project in Tallinn and a public webinar on using the NBS Model. Within cities, the main documented cooperation mechanism is cross-departmental coordination between urban planning, public works and environmental services, escalated to leadership by a named coordinator – a lightweight mechanism BBR's own Working Groups could copy directly.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.12. Target groups and their engagement level

Interreg's own listing names City Blues' target groups as infrastructure/public-service providers, "interest groups," local public authorities and NGOs; the project's own stakeholder-engagement material additionally engages private developers/investors, construction firms, landowners, housing associations and citizen/community groups, each at a level matched to their influence and project stage. This is both broad and very precisely staged target-group treatment, and lines up closely with BBR's own target-group list (public authorities, utilities, NGOs, SMEs).

Table 6.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
	Regional authorities			
	National authorities			
X	Water utilities			X
	Environmental agencies			
X	SMEs and businesses		X	
X	NGOs		X	
X	Citizens / residents			X
X	Landowners		X	
X	Researchers / academia			X
X	Planners and consultants			X
X	Policymakers		X	
	Other:			

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.13. Gaps and Barriers

City Blues is the strongest source reviewed on this criterion: a dedicated cross-city study identified 36 distinct failure modes across the NBS lifecycle and concluded that failures are almost never a single technical flaw but a cascade starting from site-level rather than catchment-level planning; operation-and-maintenance problems (under-resourcing, changing urban conditions) were flagged as harder to control but foreseeable earlier. A

second, governance-level barrier is that NBS policy is typically only institutionalised reactively, after flood damage. BBR could use this study almost directly as a starting risk register for its own Working Groups.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.14. Opportunities for Coordinated Action

City Blues offers concrete joint-action and knowledge-transfer opportunities: its open NBS Model/self-assessment tool is designed for reuse by cities outside the consortium, its exchange with the LIFE LATESTadapt project shows an active appetite for cross-project cooperation, and its closing event “From City Blues to Blue-Green Futures” provides additional lessons and implementation experiences that can be reviewed and potentially transferred to BBR.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.15. Transferability

Transferability is built into the project’s design: the NBS Model, Catalogue of Practices and Transition Stories are published as a generic, open resource rather than tied to one city, and the five pilot cities themselves started from markedly different institutional maturity levels, yet the same operational framework applied to all of them. That is direct evidence the approach can transfer across BBR’s five partner countries, which also differ substantially in existing NBS/stormwater governance maturity.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.16. Relevance for BBR

City Blues is one of the closest matches to BBR in terms of subject, geography and project maturity: it addresses the same problem (urban stormwater, flooding, pollution) with the same solution family (catchment-fit NBS/green infrastructure) and has already produced directly reusable governance, stakeholder-engagement and failure-mode material. BBR’s

Working Groups and Joint Action Plans could adopt City Blues' engagement matrix and failure-mode findings largely as-is, adapting mainly for BBR's specific five countries.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

6.17. Key Findings and Recommendations

Key findings:

1. City Blues' NBS Model formalises stakeholder engagement into 5 levels (inform → consult → involve → collaborate → empower) mapped against 6 lifecycle phases (political commitment → financing → planning → design → construction → maintenance) – a ready-made framework BBR could adopt for its own Working Groups.
2. A dedicated study catalogued 36 failure modes of nature-based stormwater solutions and found most failures originate in early planning/design decisions, not construction – strong evidence for BBR's gap and risk analysis.
3. Aarhus and Malmö only fully institutionalised NBS policy after serious flood-damage events, not proactively – a governance/legal lesson relevant to BBR's regulatory-barrier mapping.
4. The five pilot cities (Aarhus, Malmö, Stavanger, Tampere, Tartu) show markedly different starting maturity, yet the same operational model applies to all – evidence the approach transfers across BBR's differing partner regions.
5. Financing responsibility in City Blues is explicitly split between water-utility tariffs/drainage budgets, municipal infrastructure programmes and, secondarily, private investors – a concrete funding-role template.

Key barriers:

1. Decisions made early (catchment- vs. site-level planning) determine whether NBS succeed or fail later; late-stage fixes are far more costly.
2. NBS policy is most often institutionalised reactively, after major flood damage, rather than proactively.
3. Participation typically drops off after construction, risking poor long-term maintenance unless stewardship roles are agreed in advance.

Key opportunities:

1. City Blues' project manager (Anna Vilhula, City of Tampere) is already networking across Interreg BSR water projects via LinkedIn (#CityBlues #MadeWithInterreg) – a low-cost channel for BBR to connect directly.
2. The open NBS Model / self-assessment tool (nbsmodel.tampere.fi) can be used or adapted by BBR partner municipalities without rebuilding a governance framework from scratch.
3. City Blues' closing event ("From City Blues to Blue-Green Futures," Sept 2026) and its exchange with the LIFE LATESTadapt project are venues BBR could join for early dissemination and networking.

Recommendations for BBR:

1. Adopt City Blues' 5-level engagement × 6-phase lifecycle matrix as the starting template for BBR's own stakeholder-mapping and Working Group design, rather than building one from scratch.
2. Request the "36 failure modes" study (City Blues project output, also referenced via IWA Publishing) as direct input to BBR's Gaps and Barriers analysis.
3. Reach out to City Blues' lead partner (City of Tampere) and/or the Berlin Centre of Competence for Water (also a City Blues partner) for a direct knowledge-exchange session, given the close thematic overlap.

Author(s): Klaipeda Science and Technology Park, Karolina Jasaitytė, Audronė Liesytė

7. NOAH – Interreg BSR Project

7.1. Basic information

Full title	NOAH – Protecting the Baltic Sea from untreated sewage spills during floods in urban areas
Author / Lead Organisation	Tallinn University of Technology (TalTech), Estonia – Lead Partner
Period covered / Project duration	01.2019 - 12.2021
Main objectives	Urban flood prevention, stormwater management, prevention of untreated wastewater spillages, climate resilience, holistic spatial planning, monitoring and smart/real-time control of urban drainage systems.
Countries / Regions	Estonia, Finland, Latvia, Poland, Sweden and Denmark. Pilot sites were located in Haapsalu and Rakvere (Estonia), Pori (Finland), Jurmala, Liepaja and Ogre (Latvia), Slupsk (Poland), and Söderhamn (Sweden).
Geographic scope	Municipality / urban catchment; Baltic Sea Region; transnational.
Type	Interreg Baltic Sea Region project, Programme 2014–2020; Priority 2 Natural Resources, Objective 2.1 Clear Waters.
Link	https://interreg-baltic.eu/project/noah/

7.2. Governance Arrangements

The NOAH project operated under a multi-sectoral and transnational governance model within the Interreg Baltic Sea Region programme, bringing together 18 organisations from six countries. The partnership included universities and research institutions, municipalities, water utilities and industry associations, enabling close cooperation between research, public administration and water management practitioners.

A key strength of the governance model was the integration of spatial planning, drainage modelling and Real-Time Control systems, supporting a shift from fragmented stormwater management towards a holistic catchment-based approach. Pilot activities demonstrated the value of direct cooperation between research institutions and utilities, while monitoring tools and AR visualisations supported evidence-based decision-making and stakeholder engagement. The main limitation identified was the dependence of effective implementation on strong cross-departmental and cross-sectoral coordination.

For BBR, NOAH provides a useful governance model for cooperation between municipalities, utilities, research organisations and sectoral networks. Its experience can support BBR Working Groups, regional ecosystem mapping and stakeholder mobilisation, while demonstrating how digital tools, monitoring and structured cooperation can help address governance fragmentation and strengthen integrated stormwater management.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.3. Stakeholder Ecosystem

In NOAH, stakeholder collaboration was central to addressing untreated wastewater overflows and urban flooding across the Baltic Sea Region. The project involved 18 partner organisations from six countries, representing higher education and research institutions, local public authorities, water utilities and infrastructure operators, and waterworks associations. Research institutions provided modelling, monitoring and visualisation expertise, municipalities supported spatial planning and pilot implementation, utilities operated drainage networks and tested Real-Time Control (RTC) systems, while industry associations facilitated knowledge transfer and capacity building.

Stakeholders were engaged throughout planning, decision-making, implementation and monitoring. Municipal planners, utilities and researchers collaborated on catchment-wide planning, digital drainage modelling, AR-based risk visualization, RTC implementation and monitoring of wastewater quality and environmental impacts during storm events.

NOAH provides useful lessons for BBR by demonstrating the value of cooperation between municipalities, utilities, research institutions and sectoral associations. Its multi-actor approach can support BBR stakeholder mapping and Water “Owner” Working Groups, while digital modelling, visualization and monitoring tools can inform BBR’s co-creation activities and facilitate stakeholder involvement in developing NBS and improved stormwater management solutions.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.4. Regional Water Priorities

NOAH identifies climate-driven extreme rainfall, urban flooding, combined sewer overflows, ageing drainage infrastructure and fragmented urban planning as key water-related challenges. In response, the project prioritises holistic catchment-based planning, Real-Time Control of drainage networks, digital modelling and risk visualisation, and continuous monitoring of wastewater discharges and receiving waters.

Stormwater management, climate adaptation and water resilience are central to these priorities. NOAH focuses on improving the capacity of cities to manage increasing stormwater volumes, respond to extreme rainfall and flooding, optimise existing drainage infrastructure and reduce untreated wastewater discharges to surface waters and the Baltic Sea.

These priorities correspond closely to BBR's focus on integrated and climate-resilient stormwater management, improved governance and stakeholder cooperation. In particular, NOAH's catchment-based planning, monitoring and digital decision-support approaches provide relevant input for BBR regional mapping, Water "Owner" Working Groups and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.5. Stormwater Management

NOAH developed and tested digital and non-structural approaches to improve urban stormwater management and reduce untreated wastewater overflows. Key solutions included catchment-wide spatial planning supported by drainage modelling, Real-Time Control (RTC) of drainage networks, Augmented Reality (AR) for flood-risk visualization, and live water-quality monitoring. Together, these tools supported more coordinated planning, active management of stormwater flows during extreme rainfall, assessment of pollutant loads, and better communication of flood risks to decision-makers.

The project also highlighted major challenges, including the high cost of expanding conventional drainage infrastructure, limited capacity of combined sewer systems during extreme rainfall, and institutional fragmentation between municipal planning and utility operations.

For BBR, NOAH provides practical lessons for regional mapping, stakeholder cooperation and Joint Action Plans. Its catchment-wide approach and cooperation between municipalities, utilities and research institutions can support BBR Water "Owner" Working Groups, while RTC and monitoring systems can complement NBS with digital stormwater management. NOAH's visualization tools can also support BBR's co-creation methodology by making flood risks and potential interventions easier for stakeholders to understand and jointly address.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.6. Technologies and Innovations

NOAH developed and tested digital technologies to address untreated wastewater overflows, limited drainage capacity and fragmented urban planning. Key innovations included catchment-wide computerized drainage modelling, Real-Time Control (RTC) of drainage networks, Augmented Reality (AR) for flood-risk visualization, and live water-quality monitoring grids. These solutions enabled real-time flow management, improved assessment of environmental impacts and supported more informed decision-making by municipal planners and utilities.

The technologies were tested in pilot cities and demonstrated high operational readiness. However, their effective implementation requires reliable monitoring infrastructure, sensor maintenance and close coordination between municipalities, utilities and research institutions. NOAH also demonstrated that digital solutions can complement conventional grey infrastructure where large-scale expansion of drainage networks is financially or technically unfeasible.

For BBR, these technologies can complement NBS by providing digital monitoring and control of stormwater flows. Catchment modelling can support regional priority and gap mapping, while RTC and monitoring approaches can provide good practices for Water “Owner” Working Groups. AR and visualization tools can also strengthen BBR’s co-creation methodology and stakeholder engagement, while offering opportunities for SMEs to further develop and scale smart water-management solutions.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.7. Nature-Based Solutions (NBS)

NOAH focused primarily on digital modelling, spatial planning, monitoring and smart drainage systems. NBS were not a central project component, although Söderhamn implemented a rain garden using complementary funding.

Nevertheless, its approaches provide useful complementary lessons for BBR. NOAH’s catchment-wide planning and real-time monitoring can support the integration of NBS

with existing urban drainage infrastructure, while its visualization tools can facilitate stakeholder engagement and co-creation.

The project's cooperation model between research institutions and municipal utilities also provides a useful reference for BBR Working Groups and the planning of integrated stormwater solutions.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.8. Green Infrastructure (GI)

NOAH focused primarily on digital modelling, spatial planning, monitoring and smart drainage systems. NBS were not a central project component, although Söderhamn implemented a rain garden using complementary funding. Its approach integrates hydraulic models into municipal planning and utility operations, supporting catchment-wide stormwater management, reducing sewer overflows and improving climate resilience.

For BBR, NOAH provides complementary tools and planning practices that can support the implementation of GI and NBS. Its catchment-based approach, real-time monitoring and control systems can contribute to hybrid green-grey infrastructure solutions, while risk visualization and cooperation between research institutions, municipalities and utilities offer useful models for stakeholder engagement and BBR Working Groups.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.9. Legal and Regulatory Framework

NOAH did not primarily focus on developing or analysing legal and regulatory frameworks. However, its activities were closely linked to municipal spatial planning, stormwater management and flood-risk management procedures. The project integrated stormwater management with spatial planning and supported municipalities and water utilities in incorporating flood-risk information and climate scenarios into urban planning procedures.

The project demonstrated that effective stormwater management requires coordination between municipal planning authorities and water utilities, as well as the integration of

technical and climate-risk information into local planning and decision-making. For BBR, this provides a useful practical example of how stormwater and flood resilience considerations can be embedded into municipal planning processes, complementing BBR's work on governance, responsibilities and barriers to integrated stormwater management.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.10. Roles and Responsibilities

The following applies only to roles within the NOAH project; the project does not provide information on stakeholder roles outside the project context.

NOAH involved clearly defined roles across several stakeholder groups. Local public authorities were responsible for spatial planning and local urban policies, while research institutions provided hydraulic modelling, extreme-weather simulations and scientific expertise. Water utilities operated and maintained drainage infrastructure and collaborated with researchers on Real-Time Control (RTC) systems and monitoring networks. Waterworks associations supported capacity building, knowledge transfer and regulatory dialogue. Information on financing arrangements in individual cities and regions was not available.

Despite clear project roles, NOAH highlighted important governance challenges, particularly institutional fragmentation between municipal planners and utility operators, plot-by-plot rather than catchment-wide planning, unclear legal and permitting responsibilities, and communication gaps between technical experts and non-technical decision-makers.

These lessons are relevant to BBR's governance mapping and Water "Owner" Working Groups, where municipalities, utilities, regulators and research organisations can jointly address responsibilities, legal and technical barriers. NOAH's use of digital visualization also provides a useful model for BBR's stakeholder co-creation processes, while innovation clusters can help connect municipal needs with relevant SME solutions.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.11. Cooperation Mechanisms

NOAH established a transnational cooperation model connecting research institutions, municipalities, water utilities and industry associations across the Baltic Sea Region. Cooperation was implemented through the formal project partnership, direct research–utility collaboration at pilot sites, digital co-design and risk-visualization activities, and broader knowledge exchange through water-sector associations.

The main enabling factors were a shared need to address urban flooding and wastewater overflows, practical evidence from pilot activities, and the use of digital tools to improve communication between technical and non-technical stakeholders. Key barriers included institutional silos between spatial planning and water management, fragmented planning practices and the technical complexity of drainage modelling.

For BBR, NOAH provides a useful model for strengthening cooperation between municipalities, utilities, research organisations and other water-sector actors. Its experience can support BBR Working Groups, governance mapping and stakeholder co-creation, while demonstrating the importance of combining technical expertise, local knowledge and structured knowledge transfer in integrated stormwater management.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.12. Target groups and their engagement level

The main stakeholder groups involved in NOAH included local public authorities, water utilities, academic and research institutions, water-sector umbrella organisations and consultancy companies. Municipalities and water utilities were directly involved in implementing and testing the project's holistic approach to stormwater management, while academic and research institutions contributed technical and scientific expertise. Water-sector organisations supported knowledge exchange and wider dissemination of the project's approaches.

For BBR, NOAH's stakeholder engagement approach provides a relevant example of cooperation between municipalities, water utilities, research institutions and water-sector organisations in planning and implementing integrated stormwater management solutions.

Table 7.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
	Regional authorities			
	National authorities			
X	Water utilities	X		
	Environmental agencies			
	SMEs and businesses			
	NGOs			
	Citizens / residents			
	Landowners			
X	Researchers / academia	X		
X	Planners and consultants		X	
	Policymakers			
X	Other: water-sector umbrella organisations	X		

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.13. Gaps and Barriers

NOAH identified major financial, infrastructural, technical and institutional barriers to effective stormwater management. Expanding existing underground drainage networks is often financially and technically unfeasible, while conventional grey infrastructure cannot adequately cope with increasingly severe rainfall events. This contributes to combined sewer overflows (CSOs), untreated wastewater discharges and pollution of receiving waters.

The project also highlighted gaps in real-time flow control and monitoring, fragmented plot-by-plot spatial planning, and weak coordination between municipal planners and water utilities. Communication of complex flood-risk information to non-technical decision-makers and citizens was another important challenge. NOAH demonstrated that digital modelling, Real-Time Control (RTC), live monitoring and visualization tools can help optimize existing infrastructure without relying solely on costly physical expansion.

For BBR, these findings underline the need to address fragmented governance, unclear responsibilities and limited capacity for implementing NBS. BBR can build on NOAH by exploring hybrid approaches combining NBS with smart monitoring and RTC, while its

Working Groups and stakeholder activities can strengthen coordination between municipalities, utilities, regulators, research organisations and SMEs.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.14. Opportunities for Coordinated Action

NOAH demonstrates strong opportunities for coordinated action through catchment-wide planning, Real-Time Control of drainage systems, environmental monitoring, digital risk visualization and transnational knowledge exchange. Effective implementation requires cooperation between municipalities, water utilities, research institutions and sectoral organisations, supported by appropriate technical expertise, monitoring tools and cross-sector working mechanisms.

For BBR, these approaches can support integrated regional planning, Water "Owner" Working Groups and stakeholder co-creation. In particular, NOAH's catchment-based perspective, academia–utility cooperation and digital monitoring and visualization tools can complement BBR's focus on NBS and support the development of integrated green-grey stormwater solutions and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.15. Transferability

NOAH offers several transferable approaches for urban stormwater management, including catchment-wide drainage modelling, Real-Time Control, environmental monitoring, digital risk visualization and cooperation between research institutions and water utilities. These solutions can be adapted to different Baltic Sea Region contexts, provided that appropriate institutional cooperation, technical capacity, financing and local hydrological data are available.

For BBR, NOAH's approaches are particularly relevant to regional priority mapping, Water "Owner" Working Groups and stakeholder engagement. Its digital and operational tools can complement BBR's focus on NBS by supporting hybrid green-grey solutions. Transfer to BBR regions would require adaptation to local governance, environmental and regulatory conditions, as well as to mixed urban-rural catchments where relevant.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.16. Relevance for BBR

NOAH is highly relevant to BBR through its focus on integrated stormwater management, catchment-based planning, digital monitoring, Real-Time Control and cooperation between municipalities, utilities and research institutions. Although the project does not directly implement NBS or Green Infrastructure, its planning, monitoring and governance approaches provide complementary knowledge that can support hybrid green-grey solutions, stakeholder cooperation and regional Joint Action Plans. Its transferability depends on local technical capacity, governance structures, financing and adaptation to local catchment conditions.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

7.17. Key Findings and Recommendations

Key findings:

1. Holistic Catchment-Wide Drainage Modelling.
2. Real-Time Operational Control (RTC).
3. Augmented Reality (AR) Risk Visualization.
4. Live Sensor Networks and Monitoring Grids.
5. Transnational Academia-Utility Cooperation.

Key barriers:

1. Infeasibility of Grey Infrastructure Upgrades.
2. Institutional Silos and Fragmented Governance.
3. Technical and Capacity Gaps for Nature-Based Solutions (NBS).

Key opportunities:

1. Smart Hybrid Green-Grey Water Systems.
2. Cross-Regional Water 'Owner' Working Groups.
3. Visual Co-Creation and Local Ecosystem Engagement.

Recommendations for BBR:

1. Institutionalize Direct Academia-Utility Pairings in BBR Working Groups (Activity 1.2).
2. Deploy Smart Real-Time Controls to Regulate BBR's Green Retention Testbeds.
3. Embed AR and Digital Risk Visualizations into the Local Ecosystem Guidebook (Activity 1.3 / Deliverable D1.3).

Author(s): Gdansk-Gdynia-Sopot Metropolitan Area, Grzegorz Walczukiewicz, Karina Rojek

8. Baltic Smart Water Hub – Initiative developed through Interreg BSR Projects

8.1. Basic information

Full title	Baltic Smart Water Hub
Author / Lead Organisation	Union of the Baltic Cities Sustainable Cities Commission (UBC SCC). The platform is hosted and managed by UBC SCC.
Period covered / Project duration	Ongoing – launched within the IWAMA project and further developed through BSR WATER.
Main objectives	To facilitate knowledge exchange and cooperation in the water sector by collecting and disseminating good practices, technical solutions, innovations and tools related to stormwater, wastewater, fresh water and sea water management. The platform supports professionals and decision-makers in identifying tested and transferable water-management solutions across the Baltic Sea Region.
Countries / Regions	Baltic Sea Region, with contributions and solutions from cities, water utilities, authorities, research organisations and other water-sector actors across the region.
Geographic scope	Baltic Sea Region, EU
Type	Online knowledge-sharing platform and initiative developed through Interreg BSR Projects
Link	https://www.balticwaterhub.net/

8.2. Governance Arrangements

Baltic Smart Water Hub was developed through the Interreg Baltic Sea Region projects IWAMA and BSR WATER and is currently hosted and managed by the Union of the Baltic Cities Sustainable Cities Commission. This institutional anchoring ensures continuity beyond individual project funding and supports long-term access to water-related knowledge and solutions.

The Hub operates as an open transnational platform where municipalities, water utilities, researchers and other water-sector actors can share good practices, technical solutions, tools and innovations. Its main governance strengths are long-term institutional continuity, open knowledge exchange and broad cross-sectoral participation. However, detailed information on internal decision-making structures and procedures is not publicly available.

For BBR, the Hub provides a useful model for sustaining and disseminating project results beyond the project lifetime. It could support knowledge exchange between BBR Working Groups and provide an established regional platform for sharing transferable approaches, tools, methodologies and results related to stormwater governance and stakeholder cooperation.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.3. Stakeholder Ecosystem

Baltic Smart Water Hub connects municipalities, water utilities, researchers, technology providers and other water-sector professionals across the Baltic Sea Region. Stakeholders contribute and exchange good practices, technical solutions, tools and innovations through the open digital platform.

BSWH supports knowledge sharing and peer learning, providing a useful mechanism for disseminating practical water-management solutions. At the same time, recurring challenges include fragmented responsibilities in stormwater governance, limited capacity for implementing NBS and difficulties in connecting municipalities with innovative solution providers. For BBR, BSWH can support stakeholder cooperation, knowledge exchange and dissemination of transferable solutions and methodologies.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.4. Regional Water Priorities

BSWH addresses a broad range of regional water priorities covering drinking water, stormwater, surface water and wastewater. Key themes include stormwater and flood management, nutrient reduction, eutrophication, water pollution, resource recovery and climate-related risks.

Stormwater management, climate adaptation and water resilience are strongly represented through solutions related to flood prevention, retention, rain gardens and integrated water management. These priorities align well with BBR's focus on resilient stormwater management, NBS and improved regional water governance.

The Hub can therefore support BBR by providing practical examples and transferable solutions for regional planning, stakeholder cooperation and capacity building.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.5. Stormwater Management

Baltic Smart Water Hub provides a range of practical stormwater management examples, including surface retention systems, flood and overflow mitigation, biofiltration, rain gardens, wetlands and other water-management solutions. The BSWH platform facilitates access to tested practices and tools that can support more sustainable and resilient stormwater management.

For BBR, these resources can provide practical examples for Joint Action Plans, Working Groups and capacity-building activities. The Hub can also support the dissemination and long-term transfer of BBR results, good practices and innovative stormwater solutions across the Baltic Sea Region.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.6. Technologies and Innovations

The Baltic Smart Water Hub provides a broad repository of tools, technical solutions, innovations and good practices covering drinking water, stormwater, surface water and wastewater. Relevant technologies include urban surface retention systems, microplastic monitoring, biofiltration, biochar, wetlands, reed beds, PFAS risk-assessment tools, water reuse solutions, and technologies for wastewater treatment, nutrient removal and energy efficiency.

BSWH includes solutions at different levels of maturity, ranging from field-tested good practices and operational tools to emerging innovations requiring further demonstration. Reported benefits include improved flood and runoff management, reduced nutrient and pollutant loads, prevention of untreated wastewater spills, improved treatment efficiency and better use of resources. However, detailed performance, cost and technical information generally needs to be assessed through individual case studies.

For BBR, BSWH can serve as a source of technologies and good practices for pilot activities, Living Labs, Water “Owner” Working Groups and co-creation processes. Its solutions can support matchmaking between municipalities and SMEs and help identify approaches suitable for adaptation in BBR regions. In turn, successful BBR pilot solutions and tools could be shared through BSWH to support their long-term dissemination and replication across the Baltic Sea Region.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.7. Nature-Based Solutions (NBS)

Baltic Smart Water Hub provides examples of NBS used across the Baltic Sea Region, including rain gardens, wetlands, biofiltration, reed beds and other retention and restoration approaches. These solutions support stormwater retention, flood mitigation, runoff control, water-quality improvement and ecosystem restoration.

The Hub demonstrates the potential of NBS to complement conventional grey infrastructure, while also highlighting the importance of local adaptation, technical capacity and cooperation between municipalities, utilities and other stakeholders. For BBR, the available examples can support the selection and replication of suitable NBS, capacity building and knowledge exchange. The Hub also provides an established platform for disseminating BBR good practices and solutions, supporting their long-term transfer across the Baltic Sea Region.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.8. Green Infrastructure (GI)

BSWH provides examples of Green Infrastructure measures, including rain gardens, wetlands, biofiltration, reed beds, surface retention systems and river restoration. These approaches support stormwater retention, flood mitigation, water-quality improvement and climate resilience while complementing conventional drainage infrastructure.

The Hub facilitates the transfer of GI practices by providing access to good practices, technical solutions, tools and innovations from across the Baltic Sea Region. For BBR, these resources can support the selection and adaptation of GI measures, cross-regional knowledge exchange and the development of integrated stormwater approaches. The Hub can also provide a useful channel for disseminating BBR results and supporting their long-term replication.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.9. Legal and Regulatory Framework

Baltic Smart Water Hub reflects the broader European and Baltic Sea Region policy framework for sustainable water management, including the EU Water Framework Directive, European Green Deal, EU Strategy for the Baltic Sea Region and HELCOM Baltic Sea Action Plan. BSWH also supports policy-related knowledge exchange by providing access to resources and practices developed through regional water cooperation.

Key challenges include fragmented institutional responsibilities, differences in local regulations and permitting procedures, and limited integration of NBS and GI into established planning practices. For BBR, the Hub can support regulatory knowledge exchange, identification of governance and permitting barriers, and sharing of transferable approaches to improve the integration of stormwater management, NBS and GI into local and regional planning.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.10. Roles and Responsibilities

The Baltic Smart Water Hub was developed through the IWAMA and BSR WATER projects, while its long-term management and maintenance are supported by the Union of the Baltic Cities (UBC) Sustainable Cities Commission. Municipal authorities, water utilities, wastewater treatment operators and research organisations contribute practical knowledge, tools, technical solutions and good practices to the platform.

While responsibility for maintaining BSWH is clearly allocated, the broader Baltic Sea Region water sector is characterized by fragmented responsibilities, unclear legal frameworks and institutional silos between municipalities, utilities, regional authorities and environmental regulators. BSWH supports knowledge exchange and cooperation between these actors, although it does not provide detailed information on local responsibility conflicts or operational arrangements.

The governance structure of BSWH differs from that of BBR due to their different purposes and organisational models, and therefore direct comparison of their management structures is not appropriate.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.11. Cooperation Mechanisms

BSWH supports transnational cooperation through an open digital platform developed within the Interreg Baltic Sea Region projects IWAMA and BSR WATER and maintained by the UBC Sustainable Cities Commission. It connects municipalities, water utilities, researchers, technology providers and other water-sector professionals, enabling them to share good practices, technical solutions, tools, innovations and expertise.

Its main strengths are institutional continuity, accessible knowledge exchange and structured sharing of practical water-management experience. For BBR, the Hub provides a useful model for cross-regional cooperation, capacity building and knowledge transfer between Water "Owner" Working Groups. It can also support the dissemination and long-term accessibility of BBR Joint Action Plans, methodologies, tools and other transferable project results.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.12. Target groups and their engagement level

BSWH brings together municipalities, water utilities, research organisations, technology providers and other water-sector professionals. These actors contribute practical knowledge, technical solutions, tools and good practices related to water management and support knowledge exchange across the Baltic Sea Region.

BSWH engages stakeholders at different levels, from information and knowledge exchange to active contribution and implementation. The platform provides access to good practices, tools and technical solutions, while allowing water professionals, utilities, researchers and other actors to share their expertise, solutions and operational experiences.

For BBR, these target groups are particularly relevant for stakeholder mapping, Water "Owner" Working Groups, co-creation activities and Joint Action Plans. BSWH demonstrates the value of combining municipalities, utilities and regulators with research organisations, SMEs and civil society. Its open knowledge-sharing approach can also

support BBR's long-term dissemination and transfer of project results across the Baltic Sea Region.

Table 8.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
X	Regional authorities		X	
X	National authorities	X		
X	Water utilities			X
X	Environmental agencies		X	
X	SMEs and businesses		X	
X	NGOs	X		
X	Citizens / residents	X		
X	Landowners	X		
X	Researchers / academia			X
X	Planners and consultants		X	
X	Policymakers		X	
X	Other: The Union of the Baltic Cities Sustainable Cities Commission			X

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.13. Gaps and Barriers

BSWH highlights several recurring challenges in regional water management, including stormwater overflows, emerging contaminants, operational capacity gaps, fragmented governance and difficulties in transferring practical solutions between regions. Financial constraints and the need to maintain knowledge platforms and cooperation networks beyond project funding also represent important barriers.

For BBR, particularly relevant gaps include fragmented responsibilities and regulatory frameworks, limited capacity for implementing NBS and GI, barriers to transferring innovative solutions into municipal practice, and insufficient stakeholder engagement. BBR can address these challenges through governance mapping, cross-regional Working Groups, capacity building, stakeholder co-creation and structured knowledge exchange. The Baltic Smart Water Hub can additionally support long-term dissemination and transfer of BBR results across the Baltic Sea Region.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.14. Opportunities for Coordinated Action

BSWH provides opportunities for coordinated action through transnational knowledge exchange, sharing of tested water-management solutions and cooperation between municipalities, water utilities, researchers and technology providers. Key areas include stormwater and flood management, NBS and GI, water-quality protection, water reuse and the transfer of innovative tools and practices.

For BBR, the Hub can support cross-regional Working Groups, capacity building and the development of Joint Action Plans by providing practical examples and transferable solutions. Its established digital platform also offers opportunities for wider dissemination and long-term knowledge exchange, supporting the replication of BBR approaches and results across the Baltic Sea Region.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.15. Transferability

BSWH provides a range of water management practices and tools with strong potential for transfer across the Baltic Sea Region. Particularly relevant are surface retention and overflow mitigation, NBS such as rain gardens, wetlands, reed beds and biofiltration, as well as monitoring tools, water reuse approaches and solutions supporting nutrient reduction and circularity.

Successful transfer requires appropriate institutional coordination, regulatory support, financing, technical capacity and adaptation to local environmental and catchment conditions. Solutions should therefore be adjusted to regional differences in climate, urban structure, water quality, land use and existing infrastructure. Stakeholder participation and knowledge exchange are also important for ensuring local acceptance and long-term implementation.

For BBR, BSWH solutions and case studies can support regional priority mapping, Water “Owner” Working Groups, co-creation activities and Joint Action Plans. Relevant approaches can be adapted to the specific conditions of BBR partner regions, while the

BSWH platform can also support the long-term dissemination and replication of BBR results across the Baltic Sea Region.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.16. Relevance for BBR

BSWH is highly relevant to BBR as an established regional platform for sharing practical knowledge, tools, innovations and good practices related to stormwater management, NBS, GI and wider water resilience. The reviewed sections demonstrate its value for cross-regional knowledge exchange, stakeholder cooperation, capacity building and the transfer of tested water management approaches. Its resources can support BBR in identifying suitable solutions, addressing governance and implementation barriers, and strengthening cooperation between municipalities, utilities, researchers and other water-sector stakeholders. BSWH also provides opportunities for the long-term dissemination and transfer of BBR results across the Baltic Sea Region.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

8.17. Key Findings and Recommendations

Key findings:

1. Structured Transnational Repository. Baltic Smart Water Hub provides a structured transnational platform for sharing good practices, technical solutions, tools, innovations and expertise across the Baltic Sea Region.
2. Foundational Projects & Institutional Upkeep. BSWH provides institutional continuity for water-sector knowledge sharing by maintaining and disseminating results and solutions developed through Interreg BSR projects.
3. Stormwater & Flood Overflow Practices. The Hub includes practical approaches relevant to stormwater and flood management, including surface retention, overflow mitigation and integrated water-management solutions.
4. Specialized Risk & Monitoring Tools. BSWH provides access to monitoring, risk-assessment and other technical tools that can support evidence-based water management and decision-making.

5. Decentralized & Nature-Based Solutions. Nature-based and decentralised solutions available through BSWH, including rain gardens, wetlands, biofiltration and reed beds, provide transferable examples for resilient water management.

Key barriers:

1. Extreme Cloudburst Overflows & Untreated Wastewater Spillages. Extreme rainfall and stormwater overflows can increase the risk of flooding and untreated wastewater discharges, highlighting the need for more resilient urban water-management approaches.
2. Operational Capacity Shortfalls & Resource Inefficiencies. Limited operational capacity, financial resources and implementation capacity can hinder the uptake and long-term operation of water-management solutions.
3. Fragmented Governance & Policy Disconnects. Fragmented responsibilities, regulatory differences and institutional silos can hinder coordinated implementation and transfer of water-management solutions between regions.

Key opportunities:

1. Standardized Transnational Crowdsourcing. BSWH provides an established mechanism for transnational knowledge exchange and for sharing tested water-management practices, tools and innovations across the Baltic Sea Region.
2. Replication of Proven Circular & NBS Innovations. Existing stormwater, circular-water and NBS solutions available through BSWH can be assessed and adapted for application in other regional contexts.
3. Post-Project Knowledge Capitalization. BSWH can support long-term knowledge capitalisation by providing an established platform for disseminating project results and transferable practices beyond individual project lifetimes.

Recommendations for BBR:

1. Integrate BSWH Tools into BBR Working Groups Activities. Use relevant Baltic Smart Water Hub tools, case studies and good practices as inputs to BBR Working Groups and Joint Action Plans.
2. Benchmark BSWH Retention and NBS Models in BBR. Assess applicable stormwater retention, NBS and GI examples from BSWH for adaptation to the environmental, institutional and technical conditions of BBR partner regions.
3. Archive BBR Outputs on BSWH for Regional Dissemination. Explore Baltic Smart Water Hub as a channel for the long-term dissemination and transfer of BBR tools, methodologies, good practices and other relevant project results across the Baltic Sea Region.

Author(s): PP4, Gdansk-Gdynia-Sopot Metropolitan Area, Grzegorz Walczukiewicz, Karina Rojek

9. ReCircWater: Innovating Stormwater Management and Reuse – Interreg SB Project

9.1. Basic information

Full title	ReCircWater – Innovating Stormwater Management and Reuse
Author / Lead Organisation	CLEAN – Environmental Cluster Denmark, Denmark
Period covered / Project duration	01.08.2025 – 31.07.2028
Main objectives	Urban stormwater treatment and reuse, reduction of pollutant loads, climate adaptation, water reuse and circular water management, development of cost- and space-efficient treatment methods, capacity building and stakeholder cooperation. The project also addresses stormwater legislation and practices and develops and tests treatment technologies through prototypes and pilots.
Countries / Regions	Denmark, Sweden, Poland and Lithuania
Geographic scope	Municipal / urban; South Baltic area; transnational.
Type	Interreg South Baltic Programme 2021–2027 project; Operation of Strategic Importance (OSI).
Link	https://southbaltic.eu/projects-and-success-stories/recircwater-innovating-stormwater-management-and-reuse/

9.2. Governance Arrangements

ReCircWater uses a structured governance arrangement with a Project Management Committee responsible for strategic decisions and a Work Package Leadership Group responsible for coordination, timing and links between activities. Clean acts as project coordinator and supports both structures through meeting organisation, reporting and preparation of decision-making material. Regular bi-weekly partner meetings provide an additional mechanism for monitoring progress, sharing feedback and agreeing changes. While the ReCircWater application describes the governance structure clearly, there is not yet evidence of its effectiveness in practice. The clear division of responsibilities, regular coordination and cross-partner decision-making could provide useful input for BBR's working groups, stakeholder coordination and development of governance arrangements for regional stormwater management.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.3. Stakeholder Ecosystem

ReCircWater involves a broad stakeholder ecosystem centred on water and wastewater utilities, municipalities and regional authorities, research institutions, SMEs and technology providers, clusters and networks, with NGOs and citizens engaged where

relevant. Utilities and municipalities are core operational actors, while research partners provide technical and regulatory knowledge and SMEs contribute technologies and innovation. Stakeholders are engaged through capacity-building and training workshops, knowledge exchange, cross-border working groups, dissemination activities and matchmaking. This is highly relevant to BBR, which brings together many of the same actors and relies on structured stakeholder engagement, cross-regional cooperation and co-creation. ReCircWater's utility-municipality relationships, working-group format and involvement of research and SMEs could directly inform BBR's stakeholder mapping, working groups and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.4. Regional Water Priorities

ReCircWater identifies polluted urban stormwater, combined sewer overflows, heavy rainfall, drought and emerging water scarcity as major regional water challenges. Priorities include improving stormwater treatment, reducing pollutants and nutrients entering the Baltic Sea, increasing stormwater storage and reuse, strengthening climate adaptation and building municipal and utility capacity. These priorities strongly correspond with BBR's focus on climate-resilient stormwater management, improved water quality and stronger regional capacity and cooperation. ReCircWater could therefore provide BBR with directly relevant knowledge, practices and evidence from the South Baltic region.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.5. Stormwater Management

ReCircWater addresses stormwater through treatment, monitoring, storage and reuse, including pilot testing of combined treatment technologies and novel non-target analysis of pollutants. Pilots are designed to assess water-quality performance, cost, operation, space efficiency and reuse potential. The project also identifies practical challenges such as economic viability, operational serviceability, limited urban space, public acceptance and funding. As the application describes planned rather than completed activities, confirmed implementation results are not yet available. These approaches and evaluation criteria could directly support BBR's technical discussions and Joint Action Plans by

providing practical options, evidence requirements and implementation considerations for regional stormwater management.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.6. Technologies and Innovations

ReCircWater develops and tests technologies for stormwater and combined sewer overflow treatment, monitoring, storage and reuse. Solutions include combinations of filtration, coagulation, disinfection and membrane technologies, integrated into treatment trains, alongside novel non-target analysis for detecting known and unknown pollutants. Prototypes are developed through co-creation and design sprints and will be assessed for pollutant removal, water-quality improvement, cost, operational performance, space requirements and reuse potential. As the pilots are still being implemented, final performance evidence is not yet available. BBR could use the resulting technology reviews, pilot evidence and implementation lessons within technical working groups and Joint Action Plans, while connecting relevant SMEs and utilities to explore transfer and uptake in other regions.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.7. Nature-Based Solutions (NBS)

ReCircWater recognises green infrastructure as a potential approach for reducing urban runoff and filtering pollutants, but the project does not propose, test or implement specific NBS such as wetlands, rain gardens or green roofs. Its activities focus mainly on engineered treatment, monitoring, storage and reuse technologies. The main relevance for BBR is therefore complementary: ReCircWater's knowledge on pollutants, treatment performance, stormwater reuse and implementation constraints could help BBR assess where NBS may be sufficient, where hybrid grey-green solutions may be needed, and which water-quality considerations should be reflected in regional Joint Action Plans.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.8. Green Infrastructure (GI)

ReCircWater identifies green infrastructure as a potential approach for reducing urban runoff and filtering pollutants, but it does not develop, test or integrate specific GI measures into planning processes. Its main focus is on engineered stormwater treatment, monitoring, storage and reuse. ReCircWater could nevertheless support BBR by providing complementary evidence on pollutant loads, treatment requirements and practical implementation constraints. This information could help BBR regions determine where GI measures may be appropriate, where additional treatment may be needed, and how GI could be incorporated into broader stormwater strategies and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.9. Legal and Regulatory Framework

ReCircWater includes a substantial legal and regulatory workstream covering EU and national stormwater legislation in Denmark, Sweden, Poland and Lithuania. It examines how utilities and municipalities implement discharge regulations and standards in practice, including stormwater discharge permitting. Relevant EU frameworks include the Water Framework Directive and Marine Strategy Framework Directive. The project therefore provides both a regulatory overview and practical insight into differences between formal requirements and implementation. These findings could directly support BBR's legal-capacity working groups, comparison of regional regulatory barriers and Joint Action Plans, particularly by clarifying permitting, responsibilities and implementation conditions. However, ReCircWater focuses mainly on stormwater discharge and water quality regulation rather than specific permitting requirements for NBS or GI.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.10. Roles and Responsibilities

ReCircWater allocates clear operational roles across the stormwater ecosystem. Water utilities are central to implementation, operation, monitoring and testing of stormwater solutions, while municipalities and regional authorities influence planning, regulation and wider implementation. Research partners provide technical, water-quality and legislative expertise, SMEs supply technologies, and clusters facilitate innovation and stakeholder cooperation. Project responsibilities are clearly assigned, but the application provides less

detail on long-term financing and does not systematically map overlaps or gaps between municipalities and utilities. These role structures and potential coordination gaps could directly inform BBR's stakeholder mapping, working groups and clarification of responsibilities within Joint Action Plans.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.11. Cooperation Mechanisms

ReCircWater establishes several formal cooperation mechanisms, including a cross-border Stormwater Working Group, capacity-building workshops, expert reference groups, co-creation/design-sprint workshops, an innovation network and an online knowledge-sharing platform. These connect utilities, municipalities, researchers, SMEs, NGOs and other water actors. Regular virtual and physical meetings, shared pilot results and structured knowledge exchange support cooperation, while differing national practices, capacities and levels of stormwater knowledge create coordination challenges. These mechanisms are highly transferable to BBR, particularly for structuring its Working Groups, facilitating peer learning and translating shared priorities into Joint Action Plans.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.12. Target groups and their engagement level

ReCircWater identifies water and wastewater utilities, municipalities and regional authorities, research institutions, SMEs and technology providers, clusters and networks, as well as NGOs and citizens. Engagement ranges from information and training to consultation, co-creation and implementation. Utilities and municipalities participate in capacity building, working groups and pilot activities; researchers and SMEs contribute technical expertise and solution development; and selected actors join reference groups and design-sprint workshops. These practices are highly relevant to BBR, particularly for structuring stakeholder mapping, Working Groups and Joint Action Plans around different levels of engagement and responsibility.

Table 9.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
X	Regional authorities		X	
	National authorities			
X	Water utilities			X
	Environmental agencies			
X	SMEs and businesses			X
X	NGOs		X	
X	Citizens / residents	X		
	Landowners			
X	Researchers / academia			X
	Planners and consultants			
X	Policymakers	X		
	Other:			

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	5/5

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.13. Gaps and Barriers

ReCircWater identifies several barriers to improved stormwater management. These include knowledge gaps concerning pollutants and nutrients, limited competencies among utilities and municipalities, uncertainty around legislation and discharge requirements, and practical barriers to technology uptake such as cost, operational complexity, limited urban space, public acceptance and access to funding. The project does not formally rank these barriers, but knowledge, technical feasibility and implementation capacity are recurring concerns. These findings are highly relevant to BBR and could be used within stakeholder mapping, Working Groups and Joint Action Plans to identify where capacity building, regulatory clarification, financing, coordination or technical support is needed in each region.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	5/5

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.14. Opportunities for Coordinated Action

ReCircWater identifies several opportunities for coordinated action, including cross-border stormwater working groups, joint knowledge exchange, capacity-building workshops,

technology matchmaking, joint project development and the scaling of tested solutions to other regions. These actions bring together municipalities, utilities, researchers, SMEs, NGOs and innovation networks, supported by technical knowledge, pilot results and potential EU, Interreg and national funding. Many of these opportunities could be directly taken forward through BBR Working Groups and Joint Action Plans, particularly joint identification of stormwater priorities, exchange of technical and regulatory practices, SME–utility matchmaking, transfer of solutions between regions and development of follow-up cooperation or investment projects.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.15. Transferability

ReCircWater has a strong focus on replication and scaling, particularly for stormwater treatment technologies, non-target analysis methods, stormwater management guidelines, capacity-building approaches and cross-border working groups. Pilot results are intended to support technology transfer and wider uptake across the South Baltic region. Successful transfer depends on local pollutant profiles, infrastructure and space constraints, national discharge requirements, operational capacity, economic viability, available funding and stakeholder acceptance. These elements could be explored across all BBR partner regions through Working Groups and Joint Action Plans. Technical solutions would need to be adapted to local environmental and infrastructure conditions, while governance and implementation approaches would need to reflect different regulatory frameworks, stakeholder responsibilities and institutional capacities.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.16. Relevance for BBR

ReCircWater is highly relevant to BBR due to its strong focus on stormwater management, water quality, climate resilience, regulatory frameworks and cross-border stakeholder cooperation. Particularly valuable are its approaches to stormwater treatment, monitoring and reuse, cooperation between municipalities, utilities, researchers and SMEs, as well as its work on regulatory barriers, capacity building and transferability of solutions. Although ReCircWater focuses mainly on engineered solutions rather than NBS and GI, it provides

complementary technical, legal and implementation knowledge that can directly support BBR Working Groups and Joint Action Plans.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

9.17. Key Findings and Recommendations

Key findings:

1. Strong overall alignment with BBR: ReCircWater addresses the same core stormwater, water-quality and climate-resilience challenges as BBR, while providing complementary technical and operational knowledge that can strengthen BBR's governance-focused approach.
2. Legal and regulatory findings are particularly valuable: ReCircWater compares EU and national stormwater legislation and examines how discharge requirements are implemented by municipalities and utilities. These findings can directly support BBR's legal Working Groups and Joint Action Plans.
3. Stakeholder and cooperation models are highly transferable: ReCircWater actively involves utilities, municipalities, researchers, SMEs and NGOs through working groups, capacity building, expert reference groups, design sprints and innovation networks. These formats provide useful models for BBR stakeholder engagement and co-creation.
2. Pilot activities can provide practical implementation evidence: ReCircWater will generate evidence on stormwater treatment, monitoring, storage and reuse, including pollutant removal, costs, operational requirements and space constraints. BBR should incorporate these results as they become available, particularly when defining feasible actions in regional Joint Action Plans.
3. BBR should establish structured knowledge exchange with ReCircWater: Regulatory outputs, pilot lessons, technology assessments, barriers and cooperation practices should be systematically transferred into BBR stakeholder mapping, Working Groups, Joint Action Plans and the final replicable methodology. ReCircWater is especially useful as a technical and implementation complement to BBR's stronger focus on governance, GI and NBS.

Key barriers:

1. Knowledge and capacity gaps: Utilities and municipalities may lack sufficient knowledge, competencies and access to data on pollutants, treatment options and modern stormwater management approaches.

2. Implementation and financing barriers: Economic viability, funding availability, operational requirements and limited urban space can restrict the uptake and scaling of stormwater solutions.
3. Regulatory and coordination challenges: Differences in legislation, discharge requirements and how rules are implemented across countries can complicate coordinated stormwater management and cross-border transfer of solutions.

Key opportunities:

1. Transfer of practical stormwater knowledge into BBR planning: ReCircWater's work on treatment, monitoring, storage, reuse and pollutant analysis can provide technical evidence for BBR Working Groups and Joint Action Plans.
2. Cross-border cooperation and stakeholder co-creation: ReCircWater's working groups, design sprints, reference groups and matchmaking activities offer practical formats that BBR can adapt for stakeholder engagement and joint action development.
3. Scaling and follow-up project opportunities: ReCircWater creates opportunities for technology transfer, SME–utility matchmaking, joint funding applications and replication of successful solutions across Baltic regions, which BBR could support through its regional networks and Joint Action Plans.

Recommendations for BBR:

1. Integrate ReCircWater outputs into BBR Working Groups: Use its legal analyses, treatment reviews, pilot lessons and identified implementation barriers as practical inputs for technical, legal and governance discussions.
2. Reflect transferable actions in the Joint Action Plans: Include relevant approaches such as improved monitoring, stormwater treatment and reuse, stronger utility–municipality coordination, and pathways for technology uptake where these fit regional conditions.
3. Establish structured knowledge exchange between the projects: Maintain regular exchange with ReCircWater so that new pilot results, regulatory findings, cooperation practices and scaling opportunities can be incorporated into BBR activities and the final methodology.

Author(s): Clean, Denmark's Water & Environment Cluster, Jack Bruce Reid

10. ENDURANCE: Innovative training to integrate (…) – Erasmus+ Project

10.1. Basic information

Full title	ENDURANCE – Innovative training to integrate European Green Deal's strategies in SMEs and startups by creating a Green Accelerator methodology for EU clusters
Author / Lead Organisation	CAMUEBLA – Cluster of Innovation for Furniture Manufacturers and Related Industries of the Region of Murcia (Spain)
Period covered / Project duration	01.10.2023 – 30.09.2025
Main objectives	Green transition; integration of European Green Deal strategies into SMEs and startups; green growth; eco-innovation; development of green businesses; sustainability knowledge-sharing; upskilling and reskilling; development of a Green Acceleration Methodology for EU clusters.
Countries / Regions	Spain, Denmark, Bulgaria, Finland
Geographic scope	EU / European level. The methodology is intended to be transferable to other European clusters regardless of their sector.
Type	Project / initiative: an Erasmus+ collaborative project co-funded by the European Union.
Link	https://www.endurance-accelerator.eu/

10.2. Governance Arrangements

ENDURANCE uses a structured project governance model based on clear partner roles, central coordination and regular monitoring. AMUEBLA leads project management and financial coordination, the University of Vaasa leads quality assurance and risk management, CLEANTECH Bulgaria leads outreach and impact activities, and Clean and the other partners lead specific technical tasks according to their expertise. Coordination is supported by the PM² methodology, monthly partner meetings, documented actions and deadlines, shared digital workspaces and regular quality reviews. The model provides useful lessons for BBR on role clarity, accountability, meeting structures and continuous monitoring, but it mainly concerns internal consortium management rather than governance of regional stormwater systems or public-sector decision-making.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.3. Stakeholder Ecosystem

ENDURANCE involves a broad stakeholder ecosystem centred on EU clusters, SMEs and startups, entrepreneurs, policymakers, universities, VET providers, regional development agencies, business support organisations, local governments and environmental

organisations. Clusters act as intermediaries between policy, knowledge providers and companies, while SMEs and startups are the main beneficiaries of training and green acceleration support. Stakeholders are engaged through knowledge-exchange sessions, workshops, handbook evaluation, surveys and associated-partner participation. ENDURANCE also uses a Stakeholder Interest/Influence Matrix to prioritise actors according to their power and interest. These approaches could support BBR's stakeholder mapping, Working Groups and co-creation processes, particularly for identifying key actors, structuring engagement levels and involving clusters as intermediaries between public authorities, SMEs and other stakeholders. BBR's description names ENDURANCE as a source of tools and guides for its design-thinking-based methodology; the toolbox canvases and Scenario 1 (design thinking) fit this directly.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.4. Regional Water Priorities

ENDURANCE does not identify specific water-management challenges or regional water priorities. Its focus is the wider green transition, particularly helping clusters, SMEs and startups develop skills and adopt more sustainable and resource-efficient practices. The handbook is built on four scenarios: entrepreneurship and innovation for sustainability, cross-collaboration, digitalisation for the green transition, and circular systemic solutions. Climate risks appear only within toolbox disclosure tools (TCFD, CDP, SASB). However, stormwater management, flooding, runoff, water quality and water resilience are not substantive project priorities. Relevance to BBR is therefore mainly indirect: ENDURANCE's capacity-building and green acceleration approaches could support BBR engagement with clusters and SMEs, particularly around climate adaptation, innovation, skills and implementation of sustainable solutions, but it provides little direct evidence for BBR's regional stormwater priorities.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.5. Stormwater Management

ENDURANCE does not describe or assess specific stormwater management approaches, measures or implementation experiences. Its focus is on green acceleration, sustainability skills and helping clusters support SMEs and startups in adopting greener technologies and

business practices. Climate adaptation and climate-resilient strategies appear as possible training topics, while the project also highlights barriers such as limited skills, resources, knowledge of regulations and awareness of relevant technologies. For BBR, the main transferable lesson is therefore methodological rather than technical: ENDURANCE's workshop, training and acceleration approaches could help structure capacity-building or SME engagement around stormwater solutions, but it provides no direct evidence on stormwater treatment, drainage, runoff management, flooding or operational performance.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.6. Technologies and Innovations

ENDURANCE does not develop or test water or stormwater technologies. Its innovations are mainly methodological and educational, including a green acceleration methodology, thematic acceleration scenarios, practical tools and templates, a sustainability syllabus, video toolkit, facilitator guide and workshop toolkit. These tools are designed to help clusters identify company needs, build green skills and support SMEs and startups in adopting sustainable technologies and business practices. Their main benefit for BBR is therefore in innovation support rather than stormwater technology itself. BBR could adapt the acceleration and workshop methods to engage water SMEs, utilities and municipalities, identify barriers to technology uptake, structure matchmaking and support promising stormwater solutions through Working Groups or Joint Action Plans. Evidence of effectiveness is mainly based on project activities (e.g. the final hybrid workshop in Copenhagen) and stakeholder feedback rather than demonstrated technical performance.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.7. Nature-Based Solutions (NBS)

ENDURANCE does not propose, test or implement specific nature-based solutions. NBS such as wetlands, rain gardens, green roofs or permeable surfaces are not described as project activities, nor does the project provide evidence on their environmental, social, economic or water-management performance. The closest overlap is its broader focus on climate adaptation, climate-resilient strategies, biodiversity and conservation as potential sustainability topics within the green acceleration methodology. For BBR, the relevance is

therefore mainly methodological: ENDURANCE's training, workshop and acceleration tools could potentially be adapted to build SME and cluster capacity around NBS, promote relevant solutions and support stakeholder learning, but it provides no direct NBS implementation lessons or performance evidence.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.8. Green Infrastructure (GI)

ENDURANCE does not describe, test or implement specific green infrastructure measures such as green roofs, rain gardens, wetlands, permeable surfaces or other stormwater-focused GI. Its relevance is indirect through broader sustainability themes including climate adaptation, climate-resilient strategies, biodiversity and conservation. The project instead concentrates on helping clusters and SMEs build knowledge, identify sustainability needs and adopt greener practices through training, acceleration methodologies and workshops. Consequently, ENDURANCE provides no evidence on how GI performs in stormwater management, how it should be integrated into spatial or infrastructure planning, or what implementation barriers arise. For BBR, the main transferable element would be the capacity-building and stakeholder-engagement methodology, which could be adapted to support awareness, SME involvement and discussion of GI options within Working Groups and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**1/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.9. Legal and Regulatory Framework

ENDURANCE addresses regulation mainly in the broader context of the European Green Deal and the green transition rather than water-specific law. The project identifies the EU legal and regulatory environment as a sustainability topic and notes that SMEs and clusters can struggle with limited knowledge of relevant laws, requirements and technological solutions. It also published a policy brief, "European Clusters as Circular Economy Catalysts" (September 2025), with recommendations for policymakers. The brief proposes simplified regulatory procedures, regulatory sandboxes and harmonised cross-border rules (p. 14) and names regulatory and administrative burdens as an SME challenge (p. 6). It also plans a policy paper with recommendations for regional, national and European policymakers on supporting green innovation and environmentally responsible practices.

However, ENDURANCE does not analyse stormwater legislation, discharge permits, NBS or GI permitting, water-quality standards or differences in national implementation. For BBR, the main transferable lesson is the need for capacity building and clearer communication of regulatory requirements, while ENDURANCE's policy-dialogue and recommendation approach could inform BBR legal Working Groups and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.10. Roles and Responsibilities

ENDURANCE clearly allocates responsibilities within the project according to partner expertise. AMUEBLA coordinates project management, financial administration and overall implementation; the University of Vaasa leads quality assurance and risk management; CLEANTECH leads green acceleration methodology development and outreach activities; and CLEAN leads development of the final handbook and the workshop methodology. Associated partners and external stakeholders contribute mainly through feedback, evaluation and participation. Responsibilities are supported by monthly coordination meetings, documented actions, deadlines and risk-management procedures. However, ENDURANCE does not map responsibilities for physical infrastructure planning, financing, operation or maintenance, nor does it identify institutional overlaps in these areas. For BBR, its main value is therefore the clear allocation of lead/support roles, accountability mechanisms and structured coordination practices, which could inform Working Groups and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.11. Cooperation Mechanisms

ENDURANCE uses several structured cooperation mechanisms, including monthly online coordination meetings, transnational knowledge-exchange sessions, workshops, stakeholder feedback and evaluation, shared digital workspaces and continuous communication between partners and associated organisations. Clusters, universities, SMEs, policymakers, VET providers, regional development agencies and other associated partners participate in these exchanges. The final transnational meeting in Copenhagen (10–11 June) included an international hybrid workshop with nearly 50 participants. Cooperation is supported by clear agendas, minutes, assigned actions and deadlines,

shared documentation and regular feedback, while identified risks include partner disputes, delays, resource constraints and insufficient stakeholder engagement. For BBR, these practices could inform Working Groups and Joint Action Plans through regular facilitated meetings, documented responsibilities, hybrid knowledge exchange, stakeholder prioritisation, iterative feedback and active involvement of external actors in validating outputs and identifying barriers.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.12. Target groups and their engagement level

ENDURANCE identifies several target groups relevant to BBR, including innovation clusters, SMEs and startups, policymakers, local governments, regional development agencies, universities and other knowledge organisations, VET providers and environmental organisations. Clusters have the strongest role, acting as intermediaries that connect companies, knowledge providers and policymakers, while SMEs are engaged as beneficiaries and adopters of sustainable solutions. Engagement ranges from information and training to consultation and active participation through knowledge-exchange sessions, workshops, surveys and evaluation of project outputs. Associated partners also contribute during implementation and validation, although external stakeholders generally have a more consultative or co-creation role than formal decision-making authority. For BBR, ENDURANCE demonstrates the value of distinguishing stakeholder influence and interest, using intermediary organisations to mobilise wider ecosystems, and engaging stakeholders repeatedly through workshops, feedback and validation rather than only through dissemination.

Table 10.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities		X	
X	Regional authorities		X	
X	National authorities	X		
	Water utilities			
X	Environmental agencies		X	
X	SMEs and businesses			X
X	NGOs	X		
X	Citizens / residents	X		
	Landowners			
X	Researchers / academia			X
X	Planners and consultants		X	

X	Policymakers		X	
X	Other: Clusters			X

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.13. Gaps and Barriers

ENDURANCE identifies several barriers to the green transition that could also affect BBR implementation. SMEs and startups are described as lacking sufficient skills, resources, time, funding and knowledge to identify and adopt greener technologies and business models or deal with relevant legal requirements. At cluster level, important gaps include limited internal capacity, a shortage of suitable tools and methodologies, insufficient information on regulations and technological solutions, and a lack of standardised approaches for supporting sustainability transitions. Stakeholder engagement and accessibility are also recognised as potential challenges. The policy brief also names governance challenges for cluster orchestrators: aligning members around a shared vision, managing conflicting business strategies, governing without hierarchical authority and building trust (pp. 7–9). The most critical barriers are therefore capacity, knowledge and practical implementation support rather than technology availability alone. For BBR, these findings suggest that Working Groups and Joint Action Plans should examine institutional capacity, skills, regulatory understanding, access to technical knowledge, SME support and the resources needed to move from identified stormwater solutions to implementation.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.14. Opportunities for Coordinated Action

ENDURANCE identifies several opportunities for coordinated action centred on clusters acting as intermediaries between SMEs, knowledge organisations, policymakers and other regional actors. Proposed actions include joint training and capacity building, workshops to identify needs and plan actions, exchange of experiences between regions and clusters, support for SMEs in accessing green technologies, innovation, business solutions and funding, and development of policy recommendations. These activities rely on cluster networks, technical and educational expertise, stakeholder participation and structured knowledge exchange. For BBR, these approaches could be adapted through Working Groups and Joint Action Plans to organise joint capacity-building activities, engage SMEs

and technology providers, identify implementation needs, facilitate solution-provider/public-authority dialogue, exchange practices across regions and develop coordinated recommendations or follow-up actions. The actions are highly transferable as cooperation methods, although ENDURANCE does not propose specific joint stormwater interventions.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.15. Transferability

ENDURANCE is explicitly designed around transferability and replication. Its green acceleration methodology, handbook, accelerator scenarios, training materials and workshop toolkit are intended to be applicable across different EU countries, industrial sectors and regional ecosystems rather than being tied to a single local context. Successful transfer depends on capable intermediary organisations, access to trained facilitators, stakeholder networks, suitable tools and resources, and adaptation to local economic, institutional, regulatory and social conditions. For BBR, the strongest transferable elements are the step-by-step methodology, workshop formats, stakeholder engagement practices, SME-support approach and use of practical tools and templates. These could be applied across all BBR partner regions, particularly through Working Groups, co-creation workshops and Joint Action Plans. However, the ENDURANCE material would need to be substantially adapted from general green acceleration to stormwater governance, water-sector actors, regional legal frameworks and local environmental conditions.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.16. Relevance for BBR

ENDURANCE has limited direct thematic alignment with BBR because it does not address stormwater management, NBS, GI or water-sector governance. Its main value lies instead in transferable approaches for stakeholder engagement, capacity building, SME involvement and structured cooperation. Particularly relevant are the use of clusters as intermediaries between companies, knowledge organisations and public actors; practical workshop and facilitator methodologies; transnational knowledge exchange; stakeholder feedback and validation; policy dialogue; and approaches designed for replication across different regional contexts. These elements could directly support BBR stakeholder

mapping (A1.1), Working Groups and knowledge exchange (A1.2), co-creation of Joint Action Plans (A1.3), and development of the replicable engagement methodology and guidebook (A1.4). BBR should therefore use ENDURANCE primarily as a methodological reference, adapting its workshop, facilitation, SME-engagement and capacity-building approaches specifically to stormwater governance and regional water ecosystems. BBR's own description names ENDURANCE as a source of tools and guides for its engagement methodology.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

10.17. Key Findings and Recommendations

Key findings:

1. ENDURANCE provides a transferable stakeholder-engagement and capacity-building approach, particularly through structured workshops, knowledge exchange, facilitator guides and practical toolkits.
2. Clusters are used as intermediaries between SMEs, knowledge organisations and public actors, which is highly relevant for BBR's engagement of innovation clusters, SMEs and technology providers alongside municipalities and utilities.
3. The project highlights recurring implementation barriers, especially limited skills, time, resources, regulatory knowledge and access to suitable methodologies or technologies among clusters and SMEs.
4. ENDURANCE places strong emphasis on transferability and replication, with methodologies designed to be adapted across different countries, sectors and regional contexts rather than applied as a fixed model.
5. Its relevance to BBR is mainly methodological rather than technical: ENDURANCE offers useful lessons for Working Groups, stakeholder activities and Joint Action Plans, but provides little direct evidence on stormwater management, NBS, GI or water-sector governance.

Key barriers:

1. Limited skills, resources, time and regulatory knowledge among SMEs and startups, making it harder for them to identify and adopt greener technologies and business models.
2. Insufficient internal resources and capacity, tools and methodologies within clusters, limiting their ability to support companies effectively through the green transition.

3. Lack of clear information on relevant regulations and technological solutions, creating uncertainty around implementation and slowing the uptake of sustainable practices.

Key opportunities:

1. Use clusters as intermediaries to connect SMEs, knowledge organisations and public authorities, helping BBR mobilise solution providers and strengthen cross-sector cooperation.
2. Apply structured workshops, knowledge exchange and facilitator methods to BBR Working Groups and Joint Action Plans to turn stakeholder input into concrete, coordinated actions.
3. Strengthen SME capacity and uptake of green solutions through training, matchmaking, access to expertise and support on funding, regulation and technology adoption.

Recommendations for BBR:

1. Adapt ENDURANCE's workshop and facilitation methods for BBR Working Groups, using structured agendas, practical tools and iterative feedback to turn discussion into agreed priorities and actions.
2. Strengthen the role of clusters as intermediaries between municipalities, utilities, SMEs and knowledge organisations, particularly for identifying relevant solutions, mobilising companies and supporting innovation uptake.
3. Include capacity-building actions in the Joint Action Plans, addressing gaps in skills, regulatory understanding, technology awareness and access to funding so stakeholders are better equipped to implement stormwater solutions.

Author(s): Clean, Denmark's Water & Environment Cluster, Jack Bruce Reid

11. Water Framework Directive and Floods Directive Implementation Report (2025)

11.1. Basic information

Full title	Report from the Commission to the Council and the European Parliament on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC): Third River Basin Management Plans, Second Flood Risk Management Plans; Document number: COM(2025) 2 final
Author / Lead Organisation	European Commission
Period covered / Project duration	2022–2027 planning cycle (data mainly 2016–2021); published 4 February 2025
Main objectives	Water management, river basin management, flood risk management, water quality, climate resilience and environmental governance.
Countries / Regions	20 Member States for RBMPs and 21 Member States for FRMPs
Geographic scope	European Union
Type	7th Implementation Report
Link	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0002

The report assesses the implementation of the third **River Basin Management Plans** (RBMPs), prepared under the Water Framework Directive (WFD, 2000/60/EC), and the second **Flood Risk Management Plans** (FRMPs), prepared under the Floods Directive (2007/60/EC), covering the 2022–2027 planning cycle. It is based primarily on monitoring data collected between 2016 and 2021 and includes assessments for 20 Member States for RBMPs and 21 Member States for FRMPs. It provides an EU-level overview, while country-specific assessments and recommendations are provided in the accompanying Commission Staff Working Documents.

The document analyses approximately 97,000 surface-water bodies and 15,000 groundwater bodies, representing around 90% of EU surface waters and a similar share of groundwater bodies.

11.2. Governance Arrangements

Water governance is primarily organised around river basin districts, with Member States designating competent authorities under the Water Framework Directive (WFD) and Floods Directive. Governance involves authorities at EU, national, regional, river basin and local levels, together with environmental agencies, sectoral authorities and stakeholders involved through consultation processes.

Coordination between River Basin Management Plans (RBMPs) and Flood Risk Management Plans (FRMPs) is common, although integration with marine policy, sectoral

policies and subnational governance remains incomplete. The report therefore highlights the need for stronger links between freshwater, coastal and marine management and improving coordination across sectors and administrative levels.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.3. Stakeholder Ecosystem

The stakeholder ecosystem includes EU, national, regional and local authorities, river basin and flood-risk authorities, water utilities, sectoral actors, research organisations, NGOs, landowners, local communities and the general public. Stakeholders are mainly engaged through public consultations and other participation processes related to RBMPs and FRMPs.

Although participation is generally broad, the report identifies limited transparency regarding how stakeholder feedback influences final plans and decisions. It also highlights insufficient coordination between administrative levels and sectoral policies. For BBR, these findings underline the importance of transparent stakeholder engagement, clear feedback mechanisms and stronger cross-sectoral cooperation to build trust and ownership in water and stormwater governance.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.4. Regional Water Priorities

The report identifies key EU water priorities including improving surface and groundwater status, reducing nutrient and hazardous-substance pollution, addressing urban runoff and storm overflows, and strengthening resilience to floods, droughts and water scarcity. It also emphasises natural water retention, ecosystem restoration, improved monitoring and stronger cross-sectoral coordination.

For the Baltic Sea Region, eutrophication remains particularly important. The report also highlights urban runoff, pluvial flooding, climate resilience and Nature-Based Solutions as areas requiring further action, making these priorities directly relevant to integrated and resilient stormwater management. However, urban run-off and storm overflows affect only 8% and 5% of water bodies, against atmospheric deposition (59%),

hydromorphological changes (57%) and agricultural pollution (32%) (Section 5, p. 15). In the Baltic Sea, coastal waters show the highest share affected by nutrients (58%) (Section 6.1.1, p. 17).

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.5. Stormwater Management

Stormwater management is addressed as part of broader urban runoff, storm overflows, pluvial flooding, wastewater management and flood-risk planning. The term "stormwater" itself is not used in the report. The report highlights the need to improve runoff and overflow control, integrate flood-risk management with spatial planning, increase natural water retention and consider future rainfall and flood scenarios. However, it does not provide detailed municipal stormwater governance models or specific implementation and maintenance solutions.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.6. Technologies and Innovations

The report highlights digital and technological tools supporting water and flood management, including improved monitoring, GIS-based flood maps, Earth observation, hydrological modelling, forecasting and early-warning systems. It also refers to water reuse, wastewater-treatment upgrades and satellite-based disaster mapping. However, digitalisation remains uneven across Member States. Overall, the report provides useful references for BBR on monitoring, modelling and decision-support tools, but does not address specific stormwater management technologies in detail.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.7. Nature-Based Solutions (NBS)

Nature-based solutions are recognised as important for water retention, flood-risk reduction, river restoration, biodiversity protection and adaptation to climate change.

Examples of measures discussed in the report (river, floodplain and rural context; urban stormwater use is not described):

- restoring floodplains;
- reconnecting rivers with floodplains;
- restoring riparian areas;
- restoring natural riverbanks;
- removing obsolete barriers;
- improving river continuity;
- restoring wetlands;
- increasing water retention in soils and ecosystems;
- re-naturalising water bodies.

All assessed Member States include NBS in at least some of their FRMPs. However, the report finds no evidence yet of a notable change on the ground (Section 6.3.2, p. 31). Only a few Member States explicitly prioritise NBS over other measures (Austria, Belgium, France, Latvia, Luxembourg, Poland, Romania; Section 6.2.3, p. 25). The Commission recommends substantially wider implementation of NBS, either independently or in combination with traditional infrastructure.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	5/5

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.8. Green Infrastructure (GI)

The term green infrastructure is not used in the report. Nevertheless, many measures discussed can be classified as GI, including:

- restored floodplains;
- wetlands;
- riparian buffers;
- natural river corridors;
- ecological connectivity;
- natural water-retention landscapes;
- soil-based water-storage systems;
- Natura 2000 areas and other protected ecosystems.

The document recognises that spatial planning is relevant to flood-risk management, but only 8 of 21 assessed Member States explicitly referred to legal or policy frameworks linking spatial planning with flood-risk management.

For BBR, this indicates a need to translate broad NBS and ecosystem-restoration principles into concrete GI planning instruments at municipal and regional levels, such as blue-green networks, retention areas and multifunctional public spaces. The document strongly supports solutions that functionally correspond to GI, but it does not use the term green infrastructure or analyse it as a separate approach. The report is a much stronger source for NBS than directly for GI.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.9. Legal and Regulatory Framework

The primary and complementary legal framework consists of:

- Water Framework Directive 2000/60/EC: https://eur-lex.europa.eu/eli/dir/2000/60/oj/eng
- Floods Directive 2007/60/EC: https://eur-lex.europa.eu/eli/dir/2007/60/oj/eng
- Groundwater Directive 2006/118/EC: https://eur-lex.europa.eu/eli/dir/2006/118/oj/eng
- Environmental Quality Standards Directive 2008/105/EC: https://eur-lex.europa.eu/eli/dir/2008/105/oj/eng
- Marine Strategy Framework Directive 2008/56/EC: https://eur-lex.europa.eu/eli/dir/2008/56/oj/eng
- Revised Urban Wastewater Treatment Directive (EU) 2024/3019 (the report notes new rules on storm overflows and urban run-off; Section 6.1.2): https://eur-lex.europa.eu/eli/dir/2024/3019/oj/eng
- Nitrates Directive 91/676/EEC: https://eur-lex.europa.eu/eli/dir/1991/676/oj/eng
- Industrial Emissions Directive 2010/75/EU, as amended by EU Directive 2024/1785: https://eur-lex.europa.eu/eli/dir/2024/1785/oj/eng
- Habitats Directive 92/43/EEC: https://eur-lex.europa.eu/eli/dir/1992/43/oj/eng
- Birds Directive 2009/147/EC: https://eur-lex.europa.eu/eli/dir/2009/147/oj/eng
- Nature Restoration Regulation (EU) 2024/1991: https://eur-lex.europa.eu/eli/reg/2024/1991/oj/eng
- Water Reuse Regulation (EU) 2020/741: https://eur-lex.europa.eu/eli/reg/2020/741/oj/eng
- European Climate Law, Regulation (EU) 2021/1119:

https://eur-lex.europa.eu/eli/reg/2021/1119/oj/eng

- EU Strategy on Adaptation to Climate Change – COM(2021) 82 final, "Forging a climate-resilient Europe": https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021DC0082
- Common Agricultural Policy (CAP) 2023–2027 requirements (Regulation (EU) 2021/2115 on CAP Strategic Plans) (the report refers to the CAP in general): https://eur-lex.europa.eu/eli/reg/2021/2115/oj

The Water Framework Directive requires river basin-based management, programmes of measures, monitoring, economic analysis, cost recovery and achievement of good status. The Floods Directive introduces a cyclical system comprising preliminary flood-risk assessments, flood hazard and risk maps, and FRMPs.

Implementation is weakened by late plan adoption, extensive use of exemptions, inconsistent permit-review cycles, insufficient enforcement and differences in national monitoring and assessment methodologies.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.10. Roles and Responsibilities

Roles and responsibilities are distributed across several governance levels. The European Commission oversees implementation of the WFD and Floods Directive, while Member States designate competent authorities, prepare and implement RBMPs and FRMPs, establish monitoring systems and ensure stakeholder participation, financing and enforcement. River basin and flood-risk authorities coordinate planning and measures at basin level, while regional and local authorities implement actions through spatial planning, infrastructure, urban drainage, flood-risk management and local climate adaptation.

Sectoral actors, including water utilities, agriculture, industry, transport and landowners, are responsible for reducing pressures and complying with environmental requirements. The main challenge is not the absence of assigned responsibilities, but their fragmentation across administrative levels, policy sectors and different management units, which can hinder integrated water and flood-risk management. Roles are described in general terms; no detailed allocation of stormwater responsibilities to municipalities and utilities was found in the report.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.11. Cooperation Mechanisms

The principal cooperation mechanisms include:

- coordination between RBMPs and FRMPs;
- joint public consultations;
- Common Implementation Strategy;
- international river basin organisations;
- international River Basin Management Plans;
- bilateral and multilateral agreements;
- joint monitoring and research;
- hydrological and environmental data sharing;
- dedicated flood-risk working groups;
- coordination with the Marine Strategy Framework Directive;
- Union Civil Protection Mechanism;
- European Flood Awareness System;
- exchanges of good practices between Member States.

In transboundary basins, cooperation generally has a stable institutional basis. It often includes joint monitoring, status assessment, indicators and data sharing. However, consistency between national measures is not always achieved, especially between upstream and downstream regions. Cooperation regarding transboundary groundwater, drought and water scarcity is particularly limited.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.12. Target groups and their engagement level

The report identifies a broad multi-level stakeholder ecosystem including EU, national, regional and local authorities, river-basin organisations, utilities, environmental agencies, businesses, researchers, NGOs, landowners and citizens. Engagement takes place mainly through formal planning, public consultation, implementation and monitoring, although the report provides limited evidence on how stakeholder input influences final decisions.

Table 11.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities		X	
X	Regional authorities		X	
X	National authorities			X
X	Water utilities	X		
X	Environmental agencies			X
X	SMEs and businesses	X		
X	NGOs	X		
X	Citizens / residents	X		
X	Landowners	X		
X	Researchers / academia	X		
X	Planners and consultants	X		
X	Policymakers			X
X	Other: River basin authorities and transboundary river basin organisations			X
X	Other: Sectoral authorities, particularly agriculture, energy and transport		X	

The report does a good job identifying the multi-level setup of actors and public consultations, but it does not provide a systematic mapping of target groups or a comparable assessment of each group's level of engagement. The Low/Medium/High levels in the table are the reviewer's qualitative estimates; the report itself gives no such assessment.

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	4/5

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.13. Gaps and Barriers

Governance barriers:

- fragmented responsibilities across sectors and administrative levels;
- insufficient coordination between WFD, Floods Directive and marine-policy implementation;
- weak integration with agriculture, energy, transport and spatial planning;
- insufficient administrative capacity;
- unclear communication concerning stakeholder input.

Financial barriers:

- insufficient or unsecured funding;
- absence of long-term investment schedules;
- weak application of cost recovery and polluter-pays principles;
- insufficient use of cost-effectiveness and cost-benefit analysis;
- estimated EU financing gap of approximately EUR 25 billion annually, largely based on water supply and sanitation needs (Section 7, p. 33).

Data and monitoring barriers:

- inconsistent monitoring methods;
- incomplete electronic reporting;
- insufficient comparability;
- gaps in geographical and chemical monitoring;
- reliance on expert judgement and extrapolation;
- limited monitoring of urban runoff and other diffuse pressures, reviewed document states that expert judgement or extrapolation is often used.

Implementation barriers:

- delays in implementing programmes of measures;
- insufficient linkage between pressures and measures;
- missing quantitative gap assessments;
- lack of measurable targets and progress indicators;
- slow implementation of NBS;
- land-acquisition difficulties;
- weak enforcement and infrequent permit reviews.

Stormwater-related barriers:

- urban runoff and storm overflows are insufficiently integrated into broader water planning;
- weak coordination between drainage, wastewater, flood-risk, spatial-planning and environmental authorities;
- limited incorporation of pluvial flooding;
- lack of evidence of broad implementation of NBS at an operational scale.

The report is especially valuable for BBR because it not only identifies problems but also shows their systemic nature. It points out the main reasons why measures announced in the second RBMPs were not implemented, including insufficient funding (86%), delays (81%), lack of appropriate national mechanisms (70%), and governance issues (57%). It also highlights insufficient coordination between administrative levels and sectoral policies.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.14. Opportunities for Coordinated Action

The report highlights opportunities for coordinated action through stronger integration of water, flood-risk, climate and spatial planning, improved monitoring and data sharing, and joint action on urban runoff and pollution. It also supports wider implementation of NBS and improved cooperation across governance levels and regions.

For BBR, these approaches can help connect local solutions and pilots with broader regional planning, governance and financing frameworks.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.15. Transferability

The report has high strategic transferability due to its common EU framework and recurring governance and implementation challenges. Transferable approaches include integrated river basin and flood-risk planning, joint monitoring, GIS-based risk assessment, NBS integration and cross-sectoral cooperation. However, their application requires adaptation to local legal, institutional, environmental and financial conditions.

For BBR, the report provides useful strategic guidance for exchanging and adapting good practices rather than transferring specific technical solutions.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.16. Relevance for BBR

The report is highly relevant to BBR as an EU-level strategic and policy reference for integrated stormwater and flood-risk management. It provides valuable insights into regional water priorities, urban runoff, pluvial flooding, climate resilience, NBS, governance, legal and regulatory frameworks, stakeholder cooperation, and key implementation barriers.

Particularly relevant are its findings on fragmented responsibilities, insufficient coordination across governance levels and sectors, and the need to better integrate water management, flood-risk planning, climate adaptation and spatial planning. The report also

supports wider implementation of natural water retention and NBS, improved monitoring and data sharing, and stronger cross-sectoral and transboundary cooperation.

Overall, the report provides BBR with a strong policy and governance framework for understanding regional challenges and developing more integrated and climate-resilient stormwater management approaches. Its value is primarily strategic, while its relevance for specific stormwater technologies and operational solutions is more limited.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

11.17. Key Findings and Recommendations

Key findings:

1. Water and flood management across the EU is increasingly integrated, but coordination between water management, flood risk, spatial planning, climate adaptation and other sectoral policies remains insufficient.
2. Urban runoff, storm overflows and pluvial flooding are recognised pressures (affecting 8% and 5% of surface water bodies requiring stronger integration into water and flood risk management.
3. Nature-based solutions and natural water retention measures are increasingly included in planning, but their large-scale implementation remains limited.
4. Responsibilities are distributed across multiple administrative levels and sectors, creating challenges for coherent planning and implementation.
5. Effective management requires improved monitoring, comparable data, stakeholder involvement and stronger transboundary and upstream-downstream cooperation.

Key barriers:

1. Fragmented governance and insufficient coordination between authorities, sectors and administrative levels.
2. Gaps in monitoring, data comparability and assessment of urban runoff, pluvial flooding and implementation progress.
3. Limited financial and administrative capacity, combined with slow implementation of measures, particularly NBS and integrated solutions.

Key opportunities:

1. Better integration of stormwater management with river basin, flood risk, spatial planning and climate adaptation processes.
2. Wider implementation of NBS and natural water retention measures for pollution reduction and flood resilience.

3. Stronger cross-sectoral and transboundary cooperation supported by harmonised monitoring, data sharing and common approaches.

Recommendations for BBR:

1. Develop a coordinated BBR approach linking stormwater management with water quality, flood risk, climate adaptation and spatial planning across governance levels.
2. Strengthen cooperation and clarify roles and responsibilities among municipalities, water authorities, utilities, spatial planners and other relevant stakeholders.
3. Support the testing and transfer of NBS, GI, shared knowledge and transferable implementation models.

Author(s): Savonia UAS, Monika Wojciechowska

12. European Water Resilience Strategy (2025)

12.1. Basic information

Full title	European Water Resilience Strategy, COM(2025) 280 final
Author / Lead Organisation	European Commission
Period covered / Project duration	Adopted 4 June 2025; strategic framework towards 2030 and beyond, contributing to the EU vision of a water-resilient Europe by 2050. Individual flagship actions have specific implementation timelines, mainly from 2025 onwards
Main objectives	The Strategy aims to restore and protect the water cycle, build a water-smart economy, and ensure clean and affordable water and sanitation for all, climate and flood resilience, natural water retention, NBS and "sponge cities", water-smart spatial planning, pollution prevention, water efficiency and reuse, digitalisation, innovation, improved governance, investment, stakeholder cooperation and cross-border cooperation
Countries / Regions	EU Member States, with implementation involving national, regional and local authorities. The Strategy also addresses cross-border river basins and cooperation between regions and cities.
Geographic scope	European Union, with relevance across national, regional, river-basin and municipal/local levels.
Type	EU Commission Communication (strategy with flagship actions and timelines in Annex I)
Link	https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52025DC0280

12.2. Governance Arrangements

The European Water Resilience Strategy promotes a multi-level, cross-sectoral governance approach in which Member States and regional and local authorities retain key responsibilities, while the European Commission provides strategic direction and supports implementation, funding and cooperation. It emphasises stronger coordination between authorities, cities, river and sea basin organisations, businesses, research actors and civil society, as well as better integration of water resilience into spatial planning and other sectoral policies. Key challenges include implementation and funding gaps, limited administrative capacity, and insufficient cross-border and cross-sectoral coordination.

For BBR, the most relevant elements are stronger cooperation between municipalities, water authorities and other stakeholders, peer-to-peer knowledge exchange, and integration of stormwater management with spatial planning and wider climate-resilience policies.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.3. Stakeholder Ecosystem

The Strategy promotes a multi-level and whole-of-society approach involving national, regional and local authorities, cities, water authorities, businesses, research organisations, financial actors, civil society and citizens. Stakeholders contribute through water planning and implementation, innovation, investment, knowledge exchange, consultation and public participation.

For BBR, particularly relevant is the emphasis on cooperation between different governance levels and sectors, including municipalities, water authorities, businesses and solution providers. The Strategy supports peer learning, exchange of good practices and cross-border cooperation, while highlighting implementation and funding gaps and insufficient coordination across policy sectors and levels as key barriers to effective water resilience.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.4. Regional Water Priorities

The European Water Resilience Strategy identifies key priorities including restoring the natural water cycle, improving water retention, strengthening resilience to floods and droughts, promoting NBS and “sponge cities”, and integrating water resilience into spatial and urban planning. It also emphasises pollution prevention, water reuse and efficiency, digitalisation, monitoring, innovation and stronger cooperation across governance levels. Nutrient pollution is placed at the centre of restoring water quality, including nutrients from urban settlements, with an Assistance Toolbox for Member States on nutrient reduction (Section 2.1). The Strategy does not mention stormwater management and the closest content is natural water retention, “sponge cities” (one sentence, Section 2.1), flood-risk preparedness and NBS. “Water-smart spatial planning” in the Strategy concerns the siting of water-intensive business operations (Section 3.1).

These priorities closely align with BBR’s focus on integrated and climate-resilient stormwater management, green-blue infrastructure, stakeholder cooperation and the transfer of solutions between regions.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.5. Stormwater Management

The Strategy does not address stormwater management as a separate policy area and the term “stormwater” is not used. It supports natural water retention, NBS, “sponge cities” and restoration of wetlands and floodplains (Section 2.1). “Water-smart spatial planning” refers to the siting of water-intensive business operations (Section 3.1). It promotes combining natural and engineered solutions, improving cooperation between cities, regions and water authorities, and linking urban water management with wider catchment and source-to-sea approaches.

For BBR, the Strategy supports restoring natural water retention on land and in cities, which is relevant to climate-resilient stormwater management (neither conventional drainage nor stormwater is mentioned in the Strategy). However, it provides strategic guidance rather than detailed technical solutions or operational stormwater management models.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.6. Technologies and Innovations

The Strategy emphasises digitalisation, AI, Earth Observation, modelling and improved data management as important tools for water resilience. It also promotes smart monitoring, climate-risk assessment and innovative NBS approaches such as “sponge cities” and natural water retention.

For BBR, these approaches can support monitoring, flood-risk assessment, evidence-based planning and the transfer of innovative water-management solutions between regions. However, the Strategy provides strategic direction rather than detailed technical descriptions or performance evidence for specific stormwater technologies.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.7. Nature-Based Solutions (NBS)

The European Water Resilience Strategy 2025 places Nature-Based Solutions at the centre of restoring the natural water cycle and strengthening resilience to floods and droughts. It promotes the natural "sponge" function of landscapes by using soils, forests, wetlands, floodplains and other ecosystems to retain, purify and gradually release water. The proposed "Sponge Facility" aims to support and scale up measures that increase water retention across landscapes.

In urban areas, the Strategy promotes the concept of "sponge cities", built with NBS to absorb and release water in a controlled way. Relevant measures include restoring wetlands and floodplains, improving the natural water-retention capacity of soils and landscapes, restoring rivers and coastal ecosystems, developing green-blue corridors, and combining NBS with conventional infrastructure where hybrid solutions are more appropriate.

These approaches can provide multiple benefits, including improved water retention, reduced flood and drought risks, groundwater replenishment, better water quality, biodiversity protection, ecosystem restoration and increased climate resilience. However, their wider implementation requires significant investment, scaling-up and stronger integration into planning, governance and financing frameworks.

For BBR, the Strategy supports a shift from rapidly draining stormwater towards retaining and managing rainwater within urban and regional landscapes. Concepts such as sponge cities, restored wetlands and floodplains, natural retention and integrated green-blue systems are directly relevant to BBR's work on climate-resilient stormwater management, NBS and regional planning. The Strategy's support for NBS, sponge cities and Green and Blue Corridors also provides strong policy support for transferring and scaling suitable solutions across BBR partner regions.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.8. Green Infrastructure (GI)

The Strategy does not use the term green infrastructure; it supports measures that functionally correspond to GI, such as sponge cities, natural water retention and Green and Blue Corridors. It promotes restoration of the natural water-retention capacity of landscapes and the use of soils, wetlands, floodplains and other ecosystems to store, purify

and gradually release water. In urban areas, the Strategy explicitly promotes "sponge cities" based on Nature-Based Solutions, designed to absorb and release water in a controlled manner.

Key GI-related approaches include:

- "Sponge cities" and sponge landscapes, integrating natural water retention into urban and spatial planning to improve resilience to heavy rainfall and flooding.
- Restoration and protection of wetlands, floodplains, soils and other ecosystems that provide natural water-storage and retention functions.
- Green and Blue Corridors, planned as an EU initiative supporting restoration of ecological infrastructure, including rivers, wetlands and coastal areas, within a source-to-sea approach.
- Combination of NBS and conventional infrastructure, with priority given to nature-based approaches where appropriate.

For BBR, these approaches provide a useful strategic basis for incorporating GI into regional and municipal Joint Action Plans, particularly for increasing stormwater retention, reducing flood risks, strengthening climate resilience and creating multifunctional urban spaces. The concepts of sponge cities and green-blue corridors are particularly transferable to integrated stormwater planning. However, the Strategy does not provide detailed GI design standards, performance indicators or specific implementation guidance for individual GI measures.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.9. Legal and Regulatory Framework

The Strategy builds on the existing EU water and environmental acquis, rather than creating a new stormwater-specific regulatory framework. The most relevant legal instruments for BBR include:

- Water Framework Directive (WFD), providing the overarching framework for protection and restoration of surface water and groundwater and achievement of good water status.
- Floods Directive, establishing the framework for flood risk assessment and management and supporting climate-resilient water planning.
- Nature Restoration Regulation, which supports restoration of ecosystems and water retention and explicitly creates opportunities for using NBS to strengthen resilience to both floods and droughts.

- Urban Wastewater Treatment Directive (EU) 2024/3019, particularly relevant to BBR because cities above 100,000 inhabitants will be required by 2033 to establish integrated urban wastewater management plans prioritising Nature-Based Solutions and green/blue infrastructure. (This obligation is not stated in the Strategy, which mentions the Directive only for extended producer responsibility, Section 3.1, and public information, Section 2.3).
- Marine Strategy Framework Directive, supporting stronger integration between freshwater and marine water management and the source-to-sea approach. (The Commission will revise it in 2027 to improve coherence with the freshwater acquis; Section 2.1, Annex I)
- Other relevant frameworks include the Water Reuse Regulation, Industrial Emissions Directive, Drinking Water Directive, CAP Strategic Plans and EU biodiversity and climate policies.

The Strategy identifies the main challenge not as the absence of EU regulation, but as insufficient implementation, enforcement, funding and coordination of existing legislation. It therefore calls for stronger implementation of the EU water acquis, better integration with other sectoral policies and closer cooperation between administrative levels. Structured Dialogues with Member States are planned to strengthen implementation and enforcement.

For BBR, particularly relevant is the stepped-up enforcement of the existing water acquis, the Nature Restoration Regulation's support for NBS, the planned revision of the Marine Strategy Framework Directive, and better coordination between water, flood-risk, environmental and planning policies. These provisions can support BBR stakeholders in aligning Joint Action Plans and regional recommendations with emerging EU policy and regulatory requirements.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.10. Roles and Responsibilities

The Strategy describes roles across EU, national, regional and local levels in general terms. The European Commission provides strategic direction, guidance, funding and support for innovation, while Member States are responsible for implementing EU water legislation and planning measures. Regional and local authorities, cities and water authorities play a key role in spatial planning, infrastructure investment and the implementation of NBS and

water-resilience measures, supported by businesses, technology providers, investors and civil society.

For BBR, the key message is the need for stronger cooperation across governance levels and sectors. The Strategy states that Member States organise water management differently (public, private or mixed ownership) and that one size does not fit all (Section 1). However, the Strategy does not define detailed responsibilities for the ownership, operation and maintenance of municipal stormwater systems, NBS or GI, which remain dependent on national and local governance arrangements.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.11. Cooperation Mechanisms

The Strategy places strong emphasis on multi-level, cross-sectoral and cross-border cooperation as a prerequisite for water resilience. The main cooperation mechanisms include:

- Structured Dialogues between the European Commission and Member States to strengthen implementation of the EU water governance, including the Water Framework Directive and Floods Directive.
- Regular exchanges between regions, cities and water authorities through the Cohesion for Transitions Community of Practice, including exchange of good practices on “sponge landscapes” and transboundary water cooperation identified under Interreg.
- Peer-to-peer cooperation between river- and sea-basin organisations, regions and cities, supported through EU programmes and initiatives such as Horizon Europe, the Urban Agenda for the EU thematic partnership on Water Sensitive City and the Cohesion for Transitions Community of Practice; regional and local involvement is shown by Interreg initiatives (Section 3.1).
- Cross-border and upstream-downstream cooperation in international river basins, including harmonisation of water-status assessments, coordination of measures and improved water quantity management.
- Water Resilience Forum, bringing together stakeholders from government, business and civil society to review progress and monitor implementation of the Strategy.
- Knowledge and best-practice exchange, including cooperation on water retention, sponge landscapes, water efficiency, monitoring, innovation and climate resilience.

The Strategy also identifies barriers to cooperation, particularly fragmentation across administrative levels and policy sectors, insufficient consistency between upstream and downstream measures, implementation gaps and the need for stronger coordination between water management and spatial planning, agriculture, industry, energy and other policies.

For BBR, these mechanisms are highly relevant. In particular, regular cooperation between regions, cities and water authorities, peer-to-peer exchange, Interreg-based transnational cooperation and exchange of practices on sponge landscapes could be directly reflected in BBR Working Groups and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.12. Target groups and their engagement level

The Strategy applies a whole-of-society approach, explicitly calling for cooperation between citizens, businesses, civil society, nature representatives and public administrations working across policy sectors and governance levels. It also foresees regular exchanges between regions, cities and water authorities and structured dialogue with Member States.

Table 12.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
X	Regional authorities			X
X	National authorities			X
X	Water utilities			X
X	Environmental agencies		X	
X	SMEs and businesses		X	
X	NGOs		X	
X	Citizens / residents		X	
X	Landowners	X		
X	Researchers / academia		X	
X	Planners and consultants		X	
X	Policymakers			X
X	Other: River and sea basin organisations			X
X	Other: Nature representative groups		X	

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.13. Gaps and Barriers

The European Water Resilience Strategy 2025 identifies several interconnected barriers that limit effective water resilience and integrated water management across the EU.

Governance and institutional barriers:

- Persistent implementation gaps in existing EU water legislation and insufficient integration of water objectives across sectors and governance levels.
- Legal and organisational barriers and insufficient administrative capacity constrain implementation and access to available funding.
- Cross-border and cross-sectoral coordination needs further strengthening, particularly between water management and spatial planning, agriculture, industry, energy and other sectors.

Financial barriers:

- Insufficient investment remains a major obstacle to implementing water-resilience measures. The Strategy estimates current annual capital investment at around EUR 55 billion and an annual investment gap of around EUR 23 billion.
- Some Member States have difficulties using available EU funds because of administrative, legal and organisational constraints.
- Additional public and private investment is needed for water infrastructure, NBS, water retention and innovative solutions.

Technical and digital barriers:

- Uptake of digital water-management solutions remains slow and uneven.
- Water data are fragmented across different repositories, while ageing and analogue systems limit effective use of information.
- Digital tools, Earth Observation and AI have considerable potential, but their practical deployment needs to be accelerated.

Knowledge and capacity barriers:

- Public authorities and the private sector face an ageing workforce and skills gaps, particularly in technical water-management and digital skills.
- Knowledge gaps remain concerning water availability, climate impacts and interactions within the water-energy-food ecosystems nexus.

– EU research and innovation activities remain fragmented, reducing the effective transfer of knowledge and technologies into implementation.

For BBR, the most relevant gaps are the fragmentation of governance and responsibilities, insufficient integration of water resilience into spatial and urban planning, limited implementation capacity, gaps in data and digitalisation, and the need to scale up NBS and water-retention approaches. BBR could address these challenges through its Working Groups and Joint Action Plans by strengthening cross-sectoral cooperation, improving knowledge and data sharing, supporting capacity building, and developing transferable approaches for integrating stormwater management, NBS and climate resilience into regional and municipal planning.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.14. Opportunities for Coordinated Action

The Strategy highlights opportunities for coordinated action through cooperation between regions, cities, water authorities, businesses and other stakeholders. Key areas include joint development of NBS and natural water-retention approaches, exchange of good practices, transboundary and source-to-sea cooperation, and testing and scaling innovative water solutions. Funding and pilot routes: the Water Resilience Investment Accelerator (20 pilots for natural water retention and water efficiency, 2026–2027), the Cohesion policy water-resilience package (up to 100% EU financing) and the EIB Water Programme (over EUR 15 billion, 2025–2027) (Section 3.2).

For BBR, these approaches can support Working Groups and Joint Action Plans by strengthening peer learning, connecting regional water challenges with suitable solutions and implementation actors, and promoting coordinated development and transfer of sponge-city and natural-retention approaches across partner regions.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.15. Transferability

The European Water Resilience Strategy has high transferability potential for BBR, particularly through “sponge-city” and “sponge-landscape” approaches, NBS and green-

blue infrastructure, integrated spatial planning, improved monitoring and data sharing, and cross-regional knowledge exchange.

The Strategy emphasises that solutions should be adapted to local conditions rather than directly replicated. For BBR, successful transfer therefore requires consideration of local governance, climate conditions, existing infrastructure, regulatory frameworks, financing, technical capacity and stakeholder arrangements. These approaches can be transferred through BBR Working Groups, Joint Action Plans and regional planning processes.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.16. Relevance for BBR

The European Water Resilience Strategy has high overall relevance for BBR, particularly in the areas of governance and cooperation, legal and regulatory framework, NBS and GI, stakeholder involvement, and opportunities for coordinated action. It provides strong strategic support for integrated and climate-resilient water management through approaches such as sponge cities and landscapes, natural water retention, water-smart spatial planning, source-to-sea management and stronger cooperation between regions, cities and water authorities. These findings can directly support BBR water "owner" working groups and the five joint actions by providing an EU-level strategic framework for coordinated, multi-level and cross-sectoral action.

Its relevance is somewhat lower for stormwater-specific management and technologies, as the Strategy does not provide detailed stormwater governance models, technical design guidance or performance evidence for individual stormwater solutions. Therefore, BBR should primarily use the Strategy to align its governance approaches, Joint Action Plans, NBS/GI measures, stakeholder cooperation and recommendations with the emerging EU water-resilience framework, while using more stormwater-specific sources for detailed technical and implementation guidance. The Strategy explicitly promotes sponge cities based on NBS, exchanges between regions, cities and water authorities on sponge landscapes, and coordinated investment in natural water retention and Green and Blue Corridors.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

12.17. Key Findings and Recommendations

Key findings:

1. Integrated water resilience requires stronger coordination across governance levels, sectors and policy areas.
2. Nature-Based Solutions, natural water retention and "sponge city" approaches are important measures for increasing resilience to floods, droughts and climate change.
3. Water resilience should be systematically integrated into spatial and urban planning rather than addressed only through conventional water infrastructure.
4. Cooperation between regions, cities and water authorities, including exchange of good practices on "sponge landscapes", is essential for effective implementation.
5. Digitalisation, monitoring, modelling and Earth Observation provide important opportunities for more informed and adaptive water management.

Key barriers:

1. Fragmentation across governance levels, policy sectors and administrative responsibilities.
2. Insufficient implementation, enforcement, funding and administrative capacity for existing water policies and measures.
3. Uneven uptake of innovative, digital and nature-based solutions and difficulties in scaling successful approaches.

Key opportunities:

1. Wider integration of NBS, sponge-city approaches and Green and Blue Corridors into urban and spatial planning.
2. Stronger cooperation and exchange of practices between cities, regions, water authorities and other stakeholders, including through transnational initiatives.
3. Joint testing, financing and scaling of innovative water-retention and resilience solutions through mechanisms such as the Water Resilience Investment Accelerator.

Recommendations for BBR:

1. Integrate stormwater management with climate adaptation, spatial planning, NBS/GI and broader water-resilience objectives in BBR Joint Action Plans.
2. Use BBR Working Groups to strengthen cooperation between municipalities, water authorities, planners, research organisations and solution providers and to exchange transferable practices on sponge landscapes and integrated water management.
3. Align BBR recommendations and Joint Action Plans with the European Union water-resilience direction, while using stormwater-specific sources to complement the Strategy with detailed technical and operational guidance.

Author(s): Savonia UAS, Monika Wojciechowska

13. HELCOM Baltic Sea Action Plan 2021 Update

13.1. Basic information

Full title	HELCOM Baltic Sea Action Plan, 2021 Update (BSAP)
Author / Lead Organisation	HELCOM, Baltic Marine Environment Protection Commission (Helsinki Commission). The plan was adopted by the HELCOM Contracting Parties.
Period covered / Project duration	Adopted on 20 October 2021. Most actions and commitments are to be implemented by 2030 at the latest. Implementation is monitored through HELCOM mechanisms, including reporting and regular assessments. The HELCOM Explorer tracks actions: first reporting 2025, second 2029 (pp. 6-7).
Main objectives	Achieving good environmental status of the Baltic Sea and strengthening the resilience of the Baltic Sea ecosystem. The four main goals concern: biodiversity; eutrophication; hazardous substances and litter; and environmentally sustainable sea-based activities. Cross-cutting priorities include climate change, monitoring, maritime spatial planning, economic and social analysis, knowledge exchange, awareness raising, hot spots and financing. Particularly relevant to BBR are reducing land-based pollution and nutrient inputs, climate adaptation and resilience, ecosystem-based management, regional cooperation, monitoring and coordinated implementation.
Countries / Regions	Baltic Sea Region. The Plan was adopted by the HELCOM Contracting Parties, comprising the Baltic Sea countries and the European Union.
Geographic scope	Baltic Sea Region, with actions implemented through regional, national and other relevant governance levels. The Plan explicitly addresses pressures originating from both land-based and sea-based human activities.
Type	Regional strategy / action plan / programme of measures and actions. HELCOM formally describes the BSAP as its “strategic programme of measures and actions”.
Link	https://helcom.fi/wp-content/uploads/2021/10/Baltic-Sea-Action-Plan-2021-update.pdf

13.2. Governance Arrangements

The HELCOM Baltic Sea Action Plan (BSAP) is based on a regional and multi-level governance model, with common objectives and measures coordinated through HELCOM and implemented by the Contracting Parties at national level. The approach emphasises cross-sectoral cooperation, stakeholder participation, coordinated monitoring and adaptive management, while maintaining alignment with EU and other regional frameworks.

A key challenge is the gap between regional commitments and their effective national implementation, including financing, monitoring and enforcement. For BBR, the most relevant elements are shared regional objectives, cross-sectoral cooperation, stakeholder involvement and coordinated monitoring, which can support BBR water "owner" Working Groups and the development and follow-up of Joint Actions.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.3. Stakeholder Ecosystem

The HELCOM Baltic Sea Action Plan involves a broad transnational and cross-sectoral stakeholder ecosystem, including HELCOM Contracting Parties, national and local authorities, environmental and water authorities, research organisations, businesses, NGOs and financing institutions. Cooperation focuses on implementation, monitoring, knowledge exchange, environmental protection and progress towards shared Baltic Sea objectives.

For BBR, the key lesson is the importance of connecting authorities, municipalities, researchers, businesses and civil society within a common regional framework. This approach can support BBR water "owner" Working Groups and Joint Actions, particularly where stormwater management requires cooperation across water management, spatial planning, climate adaptation and environmental protection. However, the BSAP provides limited guidance on stakeholder engagement at the municipal stormwater-management level.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.4. Regional Water Priorities

The HELCOM Baltic Sea Action Plan (BSAP) identifies several water-related priorities relevant to BBR, with the overall objective of achieving good environmental status of the Baltic Sea. Key priorities include reducing nutrient inputs and eutrophication, limiting hazardous substances and litter, protecting biodiversity and ecosystem resilience, strengthening climate adaptation, and improving monitoring, knowledge exchange and regional cooperation. Eutrophication is the major threat: over 96% of the sea area is below

good status, and diffuse run-off provides almost 35% of riverine nutrient input with no significant reduction in two decades (pp. 20-21).

The BSAP also reflects a source-to-sea perspective by linking land-based pressures with their impacts on coastal and marine waters. This is particularly relevant to BBR because urban stormwater can transport nutrients, hazardous substances and other pollutants from urban catchments into receiving waters and ultimately the Baltic Sea. Improved stormwater management can therefore contribute to broader objectives related to water quality, pollution reduction and ecosystem protection.

Stormwater management is not addressed as a separate priority in the BSAP, but it is closely connected to several of its objectives, particularly eutrophication reduction, control of land-based pollution, climate resilience and biodiversity protection. The BSAP should therefore be considered an important regional environmental and policy framework supporting improved stormwater management rather than a detailed framework for stormwater measures.

For BBR, the main value of the BSAP is its connection between local water-management actions and wider Baltic Sea environmental objectives. BBR can demonstrate how improved management of urban runoff, including NBS and other retention measures, contributes to reducing pollutant loads, increasing climate resilience, protecting aquatic ecosystems and improving the environmental status of the Baltic Sea.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.5. Stormwater Management

The HELCOM Baltic Sea Action Plan mentions stormwater only in its description of the current state of hazardous substances and litter: urban storm water is named as a contributor to hazardous substances, and untreated or insufficiently treated storm waters and snowmelt run-off as release routes for microlitter (pp. 30-31). No BSAP action addresses stormwater.

For BBR, the key value is the source-to-sea perspective, which links stormwater management with the quality of receiving waters and the wider Baltic Sea ecosystem. However, the BSAP provides limited operational guidance on municipal stormwater management, technologies or implementation, which are addressed more directly in

HELCOM Recommendation 23/5-Rev.1. (Recommendation 23/5-Rev.1 is not mentioned in the BSAP and was not provided.)

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.6. Technologies and Innovations

The Baltic Sea Action Plan refers to a range of technologies, technical practices and innovative approaches, but most of them address broader environmental and water-management challenges rather than urban stormwater management specifically.

Relevant examples include:

- Innovative water-management measures, such as sediment traps, controlled drainage and lime filter ditches, as well as nature-based measures including two-level ditches and constructed wetlands. These are primarily proposed for agricultural drainage and nutrient-loss reduction rather than urban stormwater management.
- Precision fertilisation and Best Available Technologies (BAT) to reduce nutrient losses and emissions from agriculture. These contribute indirectly to improving water quality but have limited direct relevance to BBR stormwater activities.
- Best available treatment techniques for wastewater treatment, supported by knowledge exchange through regional digital platforms. Again, these primarily concern wastewater rather than stormwater.
- Digital platforms and knowledge-sharing tools for exchanging information on available technologies and environmental practices across the Baltic Sea Region.
- Other technological innovations, including digitalisation, alternative fuels, onshore power and pollution-response technologies, are included in the BSAP but relate mainly to shipping and marine pollution and therefore have little relevance to BBR stormwater management.

For BBR, the most useful technological lessons concern retention and treatment approaches, constructed wetlands, sediment management, controlled drainage and the regional exchange of information on available solutions. However, the BSAP provides limited information on specific urban stormwater technologies, monitoring systems, sensors, smart drainage, treatment performance or implementation readiness. It also does not provide detailed evidence comparing the effectiveness of stormwater technologies.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.7. Nature-Based Solutions (NBS)

The Baltic Sea Action Plan explicitly includes NBS, although their use is mainly described in relation to agricultural drainage, nutrient reduction, habitat restoration and ecosystem resilience, rather than specifically urban stormwater management. NBS appear in a single action, E19 (agricultural drainage: "two-level ditches and constructed wetlands"), pp. 24-25.

Relevant NBS and ecosystem-based approaches include:

- Constructed wetlands and two-level ditches for water retention and reduction of nutrient losses, particularly when upgrading agricultural drainage systems.
- Restoration of habitats and ecosystems, including active and passive restoration measures supported through regional restoration programmes and best-practice tools.
- Restoration of rivers and migration habitats, including removal of barriers and restoration of spawning habitats.
- Ecosystem-based and adaptive management, linking restoration and pressure reduction with wider biodiversity and resilience objectives.
- Mapping and protection of ecosystem services, supporting better integration of ecosystem functions into planning and management.

The main benefits identified are improved nutrient retention, water quality, ecosystem functioning, biodiversity and climate resilience. However, the BSAP provides limited information about the performance, costs or practical implementation of NBS specifically for urban stormwater runoff and pluvial flood management.

For BBR, the most transferable lesson is the integration of water retention, pollution reduction, ecosystem restoration and biodiversity objectives when selecting NBS. Constructed wetlands and other retention-oriented measures could be relevant to BBR, but their applicability would need to be adapted from predominantly agricultural/ecosystem contexts to urban and peri-urban stormwater conditions.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.8. Green Infrastructure (GI)

The HELCOM Baltic Sea Action Plan 2021 Update does not address Green Infrastructure as a separate or systematically developed concept. However, it includes several measures that have GI functions, particularly for runoff management, nutrient retention, erosion control and ecosystem protection.

Relevant approaches include:

- site-specific buffer zones on agricultural land, along ditches, surface-water inlets and areas affected by surface runoff and erosion, intended to reduce nutrient losses to receiving waters;
- constructed wetlands as nature-based water-management measures that can retain water and reduce pollutant and nutrient transport;
- two-level ditches supporting more sustainable drainage and water retention;
- integration of NBS with measures such as sediment traps and controlled drainage when drainage systems are upgraded or renovated.

These measures contribute to objectives relevant to BBR by reducing surface runoff and nutrient transport, improving water retention and supporting more ecosystem-based management of drainage and receiving waters. The BSAP therefore provides useful regional principles for incorporating green and nature-based elements into water-management systems.

However, most examples concern agricultural drainage and catchment management rather than urban stormwater management. The document does not provide detailed approaches for urban GI such as rain gardens, green roofs, permeable surfaces, urban retention areas or blue-green networks. It also provides limited guidance on how GI should be integrated into municipal spatial planning or stormwater infrastructure.

For BBR, the most relevant lesson is the use of buffer zones, constructed wetlands, two-level ditches and other nature-based retention measures to intercept runoff before pollutants reach receiving waters. These principles can inform Joint Action Plans, particularly where urban and peri-urban catchments interact with downstream water bodies and the Baltic Sea.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.9. Legal and Regulatory Framework

The Baltic Sea Action Plan operates within a broad international, EU, regional and national regulatory framework. Its legal basis is the Helsinki Convention, while implementation is supported by EU environmental legislation, national legislation and HELCOM Recommendations. The BSAP explicitly seeks synergies between these different regulatory levels.

The main EU frameworks relevant to water management identified in the BSAP include:

- Marine Strategy Framework Directive (MSFD), identified as a key supporting instrument for achieving good environmental status and regional cooperation;
- Water Framework Directive (WFD);
- Urban Wastewater Treatment Directive (UWWTD);
- Nitrates Directive;
- Industrial Emissions Directive;
- Birds and Habitats Directives;
- Maritime Spatial Planning Directive;
- Waste Framework Directive;
- Common Agricultural Policy, together with broader EU policies such as the European Green Deal, Zero Pollution Action Plan and EU Biodiversity Strategy.

Of particular relevance to BBR, the BSAP recognises urban stormwater as a pathway for hazardous substances and litter into the Baltic Sea, noting that untreated or insufficiently treated storm waters and snowmelt run-off are release routes for microlitter, and that urban storm water contributes to hazardous substances (pp. 30-31).

The main regulatory lesson is that the Baltic Sea Region already has an extensive policy and regulatory framework, but effective implementation depends on alignment between international commitments, EU legislation, HELCOM Recommendations and national regulations. The BSAP calls for reviewing national regulations and voluntary measures for agricultural nutrient losses (action E16, pp. 24-25) and for coordinating its work with other political instruments (Preamble, pp. 4-5).

For BBR, this provides a useful basis for assessing whether regional and municipal stormwater governance is sufficiently aligned with wider Baltic Sea protection objectives, particularly regarding urban runoff pollution, water quality, NBS/GI, spatial planning and source-to-sea management. However, the BSAP itself does not provide detailed stormwater permitting requirements, municipal stormwater standards or specific regulatory models.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.10. Roles and Responsibilities

The Baltic Sea Action Plan establishes responsibilities primarily at the regional and national levels. The HELCOM Contracting Parties are responsible for implementing agreed BSAP actions and commitments, while HELCOM provides the common regional framework, coordinates monitoring and assessments, and follows progress towards agreed targets.

Key roles include:

- HELCOM: coordinates regional objectives, actions, monitoring, assessment and follow-up, and facilitates harmonisation and cooperation across the Baltic Sea Region.
- Contracting Parties / national authorities: implement BSAP commitments through national legislation, policies, programmes and sectoral measures and provide monitoring and implementation data.
- Competent environmental and water authorities: implement sector-specific measures, monitoring and regulatory requirements and contribute to coordinated management and assessment.
- Municipalities and other local actors: not assigned a role in the BSAP; municipalities appear only in a wastewater action on smaller municipalities (E25, p. 25) and as municipal facilities among hot spots (p. 54).
- EU and public financing institutions: provide funding mechanisms supporting implementation. The BSAP explicitly refers to EU funds, Interreg and the Baltic Sea Action Plan Fund, among others.
- Private sector, financial institutions and non-profit organisations: are invited to join the efforts and contribute funding (Financing, p. 56).
- Research and scientific organisations: provide knowledge, monitoring methods and scientific evidence supporting implementation and adaptive management.

The allocation of responsibilities is clear at the strategic regional level, particularly between HELCOM coordination and implementation by Contracting Parties. However, the BSAP provides limited detail concerning local operational responsibilities, including ownership, operation and maintenance of stormwater systems, NBS or GI.

For BBR, the most relevant lesson is the combination of shared regional objectives with decentralised national and local implementation, supported by harmonised monitoring, financing mechanisms and cross-sectoral cooperation. At the same time, BBR can address

the gap left by the BSAP by clarifying responsibilities among municipalities, water authorities, infrastructure operators, planners and other actors specifically involved in stormwater management.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.11. Cooperation Mechanisms

The HELCOM Baltic Sea Action Plan places regional and cross-sectoral cooperation at the core of its implementation. Cooperation with river basin management authorities of non-HELCOM countries (E4), the private sector and other relevant organisations, supporting coordinated action towards common environmental objectives for the Baltic Sea.

Key mechanisms include coordinated monitoring and data exchange, cooperation between river basin and environmental authorities, knowledge sharing and exchange of good practices, and coordination with wider EU frameworks such as the WFD, Marine Strategy Framework Directive and EUSBSR. Public participation, awareness raising and access to science-based knowledge also support stakeholder involvement and implementation.

For BBR, particularly relevant elements include cross-sectoral cooperation (the BSAP does not describe working groups), cooperation between water and environmental authorities, structured knowledge and data sharing, and exchange of good practices across regions. The BSAP also demonstrates the importance of linking local and regional actions with common Baltic Sea objectives. This approach can inform BBR joint actions by encouraging coordinated measures across sectors, governance levels and catchments rather than isolated local actions.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.12. Target groups and their engagement level

The BSAP identifies a broad range of BBR-relevant target groups and promotes regional and cross-sectoral cooperation, stakeholder participation, knowledge exchange, awareness raising and citizen science. Particularly relevant to BBR is the involvement of national and local authorities, environmental authorities, research organisations, NGOs

and the private sector. However, the BSAP provides limited detail on engagement methods specifically for municipal stormwater planning and does not systematically define the engagement level of each target group.

Table 13.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities		X	
X	Regional authorities		X	
X	National authorities			X
X	Water utilities	X		
X	Environmental agencies			X
X	SMEs and businesses		X	
X	NGOs		X	
X	Citizens / residents	X		
X	Landowners	X		
X	Researchers / academia		X	
X	Planners and consultants	X		
X	Policymakers			X
X	Other: HELCOM / Contracting Parties			X
X	Other: Financial institutions		X	

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.13. Gaps and Barriers

The HELCOM Baltic Sea Action Plan identifies several gaps and barriers relevant to BBR, although most are presented at the broader Baltic Sea environmental-management level rather than specifically for urban stormwater.

Key gaps and barriers include:

- Implementation gap: despite progress under the original BSAP, its environmental objectives were not achieved by 2021, demonstrating that agreed regional commitments do not automatically translate into sufficient national and local implementation.
- Diffuse pollution remains difficult to control: while substantial reductions have been achieved for point sources, diffuse nutrient inputs remain a major challenge. Diffuse run-off contributes almost 35 percent of riverine nutrient input, with no significant reduction in the last two decades; point sources contribute only a few percent (p.

21). This illustrates the difficulty of managing dispersed land-based runoff and is relevant to BBR's focus on runoff pathways and source control.

- Insufficient knowledge and monitoring: the BSAP identifies the need for harmonised monitoring, improved data, common indicators and continued development of assessment methods. This can hinder comparison of conditions and evaluation of measures across the BSR.
- Need for stronger cross-sectoral and transboundary coordination: effective implementation requires coordination between numerous authorities, sectors and governance levels, including cooperation with river basin authorities of non-HELCOM countries (E4) and with the EUSBSR (E26).
- Financing and investment needs: the BSAP states that increased public and private investment is necessary and stresses the need to better connect priorities across sectors, mobilise different funding sources and use available resources efficiently.
- Climate change creates additional implementation challenges, requiring adaptation of policies, measures and management approaches as environmental conditions change.

For BBR, particularly important are the barriers related to fragmented implementation, cross-sectoral coordination, diffuse pollution, monitoring and knowledge gaps, financing and the need to adapt management approaches to climate change. BBR water "owner" Working Groups and Joint Actions could address these issues by improving cooperation between municipalities, water and environmental authorities, planners and other actors, strengthening data and knowledge exchange, and linking stormwater measures more clearly with Baltic Sea environmental objectives.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.14. Opportunities for Coordinated Action

The HELCOM Baltic Sea Action Plan 2021 Update identifies strong opportunities for coordinated action at Baltic Sea Region, national, catchment and local levels. Its implementation relies on cooperation between Contracting Parties, environmental and river basin authorities, municipalities, research organisations, NGOs, private-sector actors and financial institutions.

The most relevant opportunities for BBR include:

- Coordinated reduction of land-based pollution and runoff, linking measures in individual catchments with Baltic-wide objectives for nutrients, hazardous

substances, litter and microplastics. The BSAP specifically recognises urban stormwater and insufficiently treated stormwater as pathways of pollution to the Baltic Sea.
- Joint monitoring, harmonised methods and data exchange to assess pollution loads, environmental pressures and the effectiveness of implemented measures.
- Cross-sectoral and transboundary cooperation, including cooperation with river basin authorities of non-HELCOM countries (E4) and with EUSBSR policy areas (E26).
- Exchange and replication of good practices, with the BSAP explicitly calling for sharing experiences and best practices on measures that have already been implemented.
- Joint knowledge exchange and stakeholder engagement, involving authorities, decision-makers, research organisations, civil society, private actors and citizens.
- Coordinated mobilisation of funding, linking priorities across sectors and using regional, national, EU and private financing to implement environmental measures. The BSAP explicitly notes that Interreg Baltic Sea Region projects can support its implementation. Named sources: European Structural and Investment Funds 2021-2027, the Baltic Sea Action Plan Fund (hosted by NIB/NEFCO), and external funding from the World Bank, KfW and the Nordic Investment Bank (pp. 56-57).

For BBR, these opportunities could realistically be translated into water “owner” Working Groups and joint actions focusing on common stormwater priorities, harmonised assessment approaches, exchange of practices and solutions, coordinated monitoring, source-to-sea pollution reduction and stronger cooperation between municipalities, water/environmental authorities, researchers and other stakeholders.

A particularly relevant lesson is that BBR activities should connect local stormwater measures with regional Baltic Sea objectives, demonstrating how improved stormwater management contributes to reducing pollutants, nutrients, litter and other pressures reaching receiving waters and ultimately the Baltic Sea.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.15. Transferability

The HELCOM Baltic Sea Action Plan has high transferability across the Baltic Sea Region, promoting exchange of good practices, coordinated monitoring, cross-sectoral cooperation and source-to-sea approaches. Particularly transferable are catchment-based

planning, pollution-reduction measures, NBS and cooperation between science, policy and other stakeholders.

The BSAP does not discuss adapting measures to local conditions; it calls for sharing experiences and best practices on implemented measures (HT28, p. 55). For BBR, these principles can support water "owner" Working Groups, joint actions and the exchange of stormwater practices between partner regions while contributing to shared Baltic Sea objectives for water quality and climate resilience.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.16. Relevance for BBR

The HELCOM Baltic Sea Action Plan 2021 has high overall relevance for BBR as it provides the main regional strategic framework linking water quality, land-based pollution, climate resilience, biodiversity and coordinated environmental action across the Baltic Sea Region. Its strongest relevance to BBR lies in regional water priorities, governance and cooperation, the legal and policy framework, coordinated implementation, and the identification of environmental pressures and implementation gaps. It also provides relevant approaches related to NBS, monitoring, knowledge exchange and stakeholder cooperation.

The relevance is lower for stormwater-specific technologies, operational responsibilities and detailed municipal implementation. Although the BSAP explicitly recognises urban stormwater and insufficiently treated stormwater as pathways for hazardous substances, litter and other pollutants to the Baltic Sea, it does not provide a comprehensive urban stormwater management model or detailed technical guidance. Technologies and innovations are addressed, but many relate to agriculture, wastewater or maritime activities rather than urban stormwater.

For BBR, the BSAP is therefore particularly useful as a regional strategic and policy reference. BBR Working Groups and Joint Action Plans can use it to demonstrate how improved stormwater management contributes to wider Baltic Sea objectives, especially reducing land-based pollution and nutrient inputs, limiting hazardous substances and litter, strengthening climate resilience and biodiversity, and improving cooperation between sectors and governance levels. The BSAP also stresses strong regional and cross-sectoral cooperation and recognises knowledge exchange, monitoring and financing as cross-cutting elements of implementation.

Specific action for BBR: BBR should explicitly link the measures proposed in its Joint Action Plans to relevant BSAP objectives and actions, demonstrating how coordinated stormwater management at municipal and regional level can contribute to achieving Baltic-wide environmental targets. More detailed stormwater-specific governance, technical and implementation guidance should, however, be drawn from complementary sources such as HELCOM Recommendation 23/5-Rev.1.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

13.17. Key Findings and Recommendations

Key findings:

1. The Baltic Sea remains under significant pressure from eutrophication, hazardous substances, litter and other human activities, requiring coordinated regional action and ecosystem-based management.
2. Urban stormwater and insufficiently treated stormwater are recognised as pathways transporting hazardous substances, litter and microplastics to the Baltic Sea.
3. Effective management requires strong regional, cross-sectoral and transboundary cooperation, supported by harmonised monitoring, knowledge exchange and stakeholder participation.
4. Nature-based and runoff-management measures, including constructed wetlands, buffer zones and other retention approaches, can contribute to reducing land-based pollution reaching receiving waters.
5. Measures should follow an adaptive, locally tailored approach rather than a one-size-fits-all model, while contributing to shared Baltic Sea environmental objectives.

Key barriers:

1. Persistent land-based pollution and runoff continue to transport nutrients, hazardous substances, litter and microplastics to the Baltic Sea.
2. Implementation requires sufficient financing, coordinated monitoring, knowledge exchange and effective cross-sectoral cooperation.

Key opportunities:

1. Strengthen source-to-sea cooperation by linking local and regional stormwater management with Baltic Sea water-quality and ecosystem objectives.

2. Expand exchange and transfer of good practices, harmonised monitoring approaches and locally adapted nature-based runoff-management solutions across the Baltic Sea Region.
3. Use regional cooperation and funding mechanisms, including Interreg, to support coordinated implementation of measures contributing to BSAP objectives.

Recommendations for BBR:

1. Integrate a source-to-sea perspective into BBR Working Groups and Joint Action Plans, linking stormwater quantity and quality management with impacts on downstream and Baltic Sea ecosystems.
2. Promote coordinated monitoring, data and knowledge exchange between partner regions to assess stormwater pressures and the effectiveness of implemented measures.
3. Facilitate transfer of NBS, runoff-pollution reduction measures and governance practices between BBR regions, while adapting them to local environmental, institutional and regulatory conditions.

Author(s): Savonia UAS, Monika Wojciechowska

14. HELCOM Recommendation 23/5-Rev.1

14.1. Basic information

Full title	HELCOM Recommendation 23/5-Rev.1: Reduction of Discharges from Urban Areas by the Proper Management of Storm Water Systems
Author / Lead Organisation	Baltic Marine Environment Protection Commission, HELCOM (Helsinki Commission). The Recommendation is addressed to the governments of the Contracting Parties to the Helsinki Convention.
Period covered / Project duration	Originally adopted 6 March 2002; amended 4 June 2021. Implementation is to be assessed regularly, with reporting every six years starting in 2033 using data from 2030. The Recommendation is scheduled to be reconsidered in 2035. The reporting format is to be specified by 2025 (p. 3).
Main objectives	Improve integrated urban stormwater management (ISWM) and reduce harmful stormwater discharges to the Baltic Sea. Key objectives include stormwater quality protection, flood-risk reduction, climate adaptation, catchment-based planning, pollution prevention, source control, retention and detention, reduction of sewer overflows, management of high-risk stormwater, integration of stormwater into urban planning, use of NBS/green infrastructure, biodiversity and ecosystem services, and development of municipal stormwater policies/plans.
Countries / Regions	HELCOM Contracting Parties / Baltic Sea Region. Implementation is directed particularly towards national governments and municipalities (or other respective authorities), which should develop storm water policies and/or plans.
Geographic scope	Baltic Sea Region, with implementation particularly relevant at municipal, urban and catchment levels, while being embedded in the regional HELCOM framework.
Type	Regional policy recommendation / guidance
Link	https://helcom.fi/wp-content/uploads/2021/06/Rec-23-5-Rev.1.pdf

14.2. Governance Arrangements

HELCOM Recommendation 23/5-Rev.1 promotes an integrated stormwater governance approach based on municipal stormwater policies, catchment-based planning and integration with urban and spatial development. It emphasises consideration of water quality, flood risks, Green Infrastructure and future climate conditions throughout planning, construction, operation and maintenance.

For BBR, particularly relevant are municipal stormwater plans, early integration of stormwater into spatial planning, catchment-based management and systematic

monitoring of implementation. However, the Recommendation provides limited guidance on the detailed division of responsibilities between municipalities, utilities and other authorities, leaving these arrangements to national and local governance systems.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.3. Stakeholder Ecosystem

HELCOM Recommendation 23/5-Rev.1 is addressed to the governments of the Contracting Parties and names municipalities (or other respective authorities) as the body to develop storm water policies and/or plans (A8, p. 2). It does not define stakeholders or a stakeholder ecosystem; ISWM is to be applied from planning and construction to operation and maintenance (A2, p. 2). It promotes cross-sectoral cooperation throughout planning, construction, operation and maintenance, linking stormwater management with spatial planning, environmental protection and climate adaptation.

For BBR, the key lesson is the need to involve relevant authorities and infrastructure actors throughout the entire stormwater management process. This provides a useful basis for structuring BBR Working Groups, although the Recommendation offers limited guidance on wider engagement of citizens, NGOs and businesses.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.4. Regional Water Priorities

HELCOM Recommendation 23/5-Rev.1 prioritises integrated and catchment-based stormwater management, linking water-quality protection, flood-risk reduction, climate adaptation and urban planning. Key priorities include pollution prevention, source control and retention, adaptation to future rainfall, and increased use of sustainable approaches such as Green Infrastructure.

These priorities are closely aligned with BBR's focus on integrated stormwater governance, climate resilience, pollution reduction, NBS/GI and better integration of stormwater management into spatial planning.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.5. Stormwater Management

HELCOM Recommendation 23/5-Rev.1 provides a comprehensive framework for Integrated Storm Water Management (ISWM), covering urban planning, construction, operation and maintenance. It promotes catchment-based planning that considers runoff pathways, land use, receiving waters, groundwater conditions and current and future stormwater risks.

A key principle is the prioritisation of stormwater management at source. Stormwater should first be treated and utilised at the source, then conveyed with a system that retains and detains it, before conveyance to retention areas, direct discharge or a combined sewer (B10, p. 2). The Recommendation promotes approaches such as Low Impact Development (LID), Water Sensitive Urban Design (WSUD), Sustainable Urban Drainage Systems (SuDS) and Green Infrastructure, including infiltration, detention, rainwater harvesting and temporary storage in suitable areas. It also addresses combined sewer overflows, polluted runoff from high-risk areas, stormwater quality management and climate-resilient system design.

Stormwater management should be integrated into spatial planning and urban regeneration from an early stage. Catchment-level assessments mapping of flood-risk areas and regular assessment of implementation (reporting to HELCOM) are also recommended (B13, B14, p. 3); the Recommendation does not require monitoring of stormwater impacts or of the effectiveness of measures. Also recommended: preventing street-cleaning snow from being dumped directly into water bodies and managing the meltwater as urban storm water (B16, p. 3); limiting water released through secondary runoff paths to preferably 30% of the estimated annual stormwater volume (A6, p. 2).

For BBR, the most relevant lesson is the hierarchy that prioritises source control and retention before conventional sewer conveyance and direct discharge. The Recommendation also supports treating stormwater as a resource and integrating water-quality protection, flood mitigation, climate adaptation, biodiversity and urban-development objectives. However, individual solutions need to be adapted to local climatic, technical and environmental conditions, which is particularly relevant to BBR's work on transferability across different partner regions.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.6. Technologies and Innovations

HELCOM Recommendation 23/5-Rev.1 provides practical approaches for integrated stormwater management, including LID, WSUD, SuDS, infiltration, retention and detention systems, source-control measures, secondary runoff pathways and the Green Area Factor. These solutions support runoff reduction, water-quality improvement, flood mitigation and greater resilience to extreme rainfall. The techniques are described in general terms in Annex 1 (IV); the Annex states that an extensive library of suitable techniques for Nordic conditions does not yet exist and points to the CIRIA SuDS manual, the Baltic Sea Challenge handbook (waterprotectiontools.net) and Swedish examples (godaexempel.dagvattenguiden.se) (p. 5).

The Recommendation promotes a shift from conventional drainage towards multifunctional and green stormwater systems. For BBR, these approaches provide useful examples for testing and transferring stormwater solutions between regions. However, their implementation requires adaptation to local climate, catchment characteristics, existing infrastructure, pollution risks and planning frameworks.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.7. Nature-Based Solutions (NBS)

The HELCOM Recommendation 23/5-Rev.1 strongly promotes nature-based and green approaches as integral elements of sustainable urban stormwater management. Although the term NBS is not used systematically throughout the document, the recommended approaches clearly follow NBS principles by retaining, infiltrating and managing stormwater close to its source and by giving priority to green infrastructure (GI) over conventional grey infrastructure.

Key NBS-related approaches include:

- Low Impact Development (LID) and Water Sensitive Urban Design (WSUD), which aim to minimise the hydrological impacts of urban development and integrate water management with urban design.

- Sustainable Drainage Systems (SuDS) using infiltration, detention, conveyance and rainwater harvesting to replicate natural pre-development drainage processes.
- Local infiltration and retention/detention prioritised before direct conveyance of stormwater to receiving waters.
- Temporary retention areas and suitable low-lying areas that can safely store excess stormwater during high-intensity rainfall events.
- Green Infrastructure and public greening, integrated into urban development and regeneration of roads, streets, squares and other urban spaces. The Recommendation explicitly states that sustainable stormwater drainage should prioritise green infrastructure over grey infrastructure.
- Green Area Factor, proposed as a practical planning tool for ensuring sufficient GI and runoff-management solutions in dense urban areas.
- Ecosystem services approach, under which stormwater is treated as a resource contributing to biodiversity, urban environmental quality and the condition of surface water and groundwater.

The identified benefits include reduced flood risk, reduced runoff volumes and peak flows, improved stormwater quality, pollutant filtration, increased infiltration, biodiversity support, ecosystem services and improved quality of the urban environment.

An important limitation is transferability to local climatic conditions. The Recommendation notes that SuDS guidance developed elsewhere cannot always be directly applied in the Baltic Sea Region and may require adaptation to local and Nordic conditions.

For BBR, this is particularly relevant because it supports not only the use of individual NBS, but their systematic integration into municipal stormwater planning and urban development. The hierarchy of source control, infiltration and retention could directly inform BBR Joint Action Plans and recommendations.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.8. Green Infrastructure (GI)

The HELCOM Recommendation 23/5-Rev.1 gives green infrastructure a direct role in sustainable urban stormwater management. It explicitly promotes a transition from conventional drainage towards sustainable systems where GI is prioritised over grey infrastructure.

Key GI-related approaches include:

- GI integrated into urban planning and regeneration, including roads, streets, squares and public green spaces.
- Green Area Factor as a practical planning tool to ensure sufficient GI in dense urban areas. The tool can be integrated into zoning regulations or construction-permit processes and includes different green elements and runoff-management solutions. Annex 1 (III) describes it as an Excel-based tool for new lots in dense urban areas: the ratio of scored green area to lot area, reached by choosing from 39 green elements (pp. 4-5).
- Low Impact Development (LID), Water Sensitive Urban Design (WSUD) and Sustainable Drainage Systems (SuDS) as approaches supporting greener and more multifunctional stormwater systems.
- Infiltration, retention and detention measures to reduce runoff volumes and peak flows, improve water quality and limit direct discharge to receiving waters.
- Temporary retention areas and low-lying urban spaces that can accommodate excess stormwater during high-intensity rainfall events.
- Ecosystem-services-based planning, treating stormwater as a resource that can contribute to biodiversity, surface and groundwater quality, and the quality of the urban environment.

The Recommendation therefore links GI not only with stormwater quantity and flood management, but also with water quality, climate adaptation, biodiversity and improved urban environments. Importantly for BBR, GI is intended to be considered from the early urban planning stage, rather than added only as a technical measure after development decisions have already been made.

A key implementation lesson is that GI and SuDS solutions need to be adapted to local conditions. The Recommendation notes that guidance developed elsewhere cannot always be transferred directly to the Baltic Sea Region and that suitable solutions may require adjustment to Nordic climatic conditions.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.9. Legal and Regulatory Framework

HELCOM Recommendation 23/5-Rev.1 provides a directly stormwater-specific regional policy and regional policy recommendation and implementation benchmark for the Baltic Sea Region. It is adopted under the Helsinki Convention and recommends that Contracting

Parties use legislative, administrative and other measures to reduce pollution from urban stormwater systems.

Key regulatory and planning aspects relevant to BBR include:

- Municipal stormwater policies and/or plans: municipalities or other responsible authorities should develop dedicated stormwater policies or plans to ensure systematic management.
- Integration into urban planning: Integrated Storm Water Management (ISWM) should be incorporated throughout urban development, from planning and construction to operation and maintenance.
- Catchment-based planning: stormwater planning should consider natural runoff pathways and catchment-level impacts rather than only individual infrastructure elements.
- Climate-proof planning requirements: stormwater infrastructure should be planned and dimensioned using future climate scenarios, including changes in precipitation intensity, volumes and receiving-water levels.
- Green Infrastructure in planning regulation: the Recommendation presents the Green Area Factor as a tool that may be incorporated into zoning regulations or used in construction-permit processes to ensure sufficient GI and runoff-management solutions.
- Priority hierarchy for stormwater management: source treatment and utilisation should be prioritised, followed by retention and detention, while direct discharge to receiving waters or combined sewers represents a lower-priority option.
- Pollution-control requirements: high-risk stormwater from industrial or heavily polluted areas should be separately treated, and contaminated runoff should not be connected to stormwater systems or discharged to receiving waters without effective pollution-control measures.
- Monitoring and reporting: Contracting Parties are expected to assess implementation regularly and report to HELCOM, providing a mechanism for regional follow-up.

An important enabling factor for BBR is that the Recommendation provides a regional basis for integrating stormwater, GI, climate adaptation and spatial planning into municipal regulatory and planning processes. Particularly useful is the possibility of embedding tools such as Green Area Factor into zoning and permitting.

A limitation is that the Recommendation does not establish a harmonised binding permitting system or detailed legal requirements applicable uniformly across Baltic Sea Region countries. Implementation therefore depends on how individual Contracting

Parties translate the recommendations into their national and municipal regulatory frameworks.

Relevance score (0-5)	
To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**5/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

14.10. Roles and Responsibilities

The HELCOM Recommendation 23/5-Rev.1 provides a clear overall allocation of responsibility for stormwater management, particularly by placing municipalities and other responsible authorities at the centre of systematic stormwater planning. It also stresses that Integrated Storm Water Management (ISWM) must cover the full lifecycle, from planning and construction to operation and maintenance.

Key roles and responsibilities include:

- HELCOM Contracting Parties / national governments: responsible for implementing the Recommendation through appropriate legislative, administrative and other measures, assessing its implementation and reporting progress to HELCOM.
- Municipalities or other responsible authorities: should develop dedicated stormwater policies and/or plans and ensure systematic management of stormwater issues.
- Urban and spatial planning authorities: should integrate stormwater considerations at early planning stages, consider natural runoff pathways, apply tools such as the Green Area Factor and ensure that stormwater management is incorporated into urban development and regeneration (implicit: the Recommendation does not name planning authorities).
- Infrastructure planning, construction and operational actors: are implicitly responsible throughout the full stormwater-system lifecycle, as ISWM should cover planning, construction, infrastructure operation and maintenance.
- Environmental/water-management authorities: have relevant roles in catchment assessment, receiving-water protection, flood-risk mapping and assessment of contamination risks from chemicals, oil, litter and microlitter (implicit: B13 and B14 are not assigned to a named body, p. 3).
- Operators of industrial and other high-risk sites: should ensure that contaminated runoff is effectively controlled and treated before connection to stormwater systems or discharge to receiving waters.

A major strength for BBR is that the Recommendation establishes stormwater management as a shared, cross-sectoral responsibility extending across planning,

construction, environmental management and infrastructure operation, rather than only a technical drainage function.

However, the document does not precisely allocate responsibilities between individual municipal departments, water utilities, road authorities, landowners, private developers and other infrastructure operators. It also does not specify detailed financing responsibilities. This leaves an important governance issue to national and local institutional arrangements.

For BBR, this gap is particularly relevant. Partner regions could use the Recommendation as a common baseline and then identify who is responsible for planning, financing, implementation, ownership, operation and maintenance of stormwater solutions in each region.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.11. Cooperation Mechanisms

HELCOM Recommendation 23/5-Rev.1 does not establish a separate formal cooperation structure for stormwater management, but Integrated Storm Water Management (ISWM) requires coordination between multiple municipal and sectoral actors throughout planning, construction, operation and maintenance.

Key cooperation principles include integration of ISWM across planning, construction, operation and maintenance (A2, p. 2); the sectors and authorities listed here are the reviewer's interpretation. The Recommendation also promotes catchment-based cooperation that considers natural runoff pathways, receiving waters, land use and upstream-downstream impacts rather than focusing on individual sites. Coordination across the full lifecycle of stormwater systems is important to ensure continuity between planning decisions and subsequent operation and maintenance. Reporting to HELCOM every six years from 2033 supports regional follow-up (p. 3); the Recommendation does not mention monitoring, knowledge exchange or learning between countries.

A key gap is that the Recommendation does not define how such cooperation should be organised institutionally, for example through permanent working groups, coordination bodies, data-sharing platforms or formal agreements. These arrangements therefore depend on national and local governance structures.

For BBR, this provides a strong basis for Water "Owner" Working Groups that bring together municipalities, water and environmental authorities, planners, utilities and other relevant actors. These groups could translate the Recommendation into practice by jointly identifying catchment-level stormwater challenges, clarifying responsibilities, coordinating planning and discussing implementation needs and barriers.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.12. Target groups and their engagement level

The Recommendation primarily targets governments, municipalities and public authorities responsible for stormwater management. Planners, infrastructure operators, environmental and water authorities and experts are not named in the Recommendation; ISWM applies from planning and construction to operation and maintenance (A2, p. 2). Citizens are mainly recognised as beneficiaries of improved urban environments, while SMEs, NGOs and businesses are not given a role (industrial and similar plants appear only as sources of contaminated water, C18, p. 3).

Table 14.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
X	Regional authorities		X	
X	National authorities			X
X	Water utilities		X	
X	Environmental agencies			X
	SMEs and businesses			
	NGOs			
X	Citizens / residents	X		
	Landowners			
X	Researchers / academia		X	
X	Planners and consultants			X
X	Policymakers		X	
X	Other: infrastructure operators / urban development actors			X

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	**3/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.13. Gaps and Barriers

HELCOM Recommendation 23/5-Rev.1 identifies several important technical, planning, knowledge and implementation gaps directly relevant to stormwater management in BBR. Although barriers are not presented in a dedicated section, they can be clearly identified from the recommended corrective actions and supporting information. The preamble also states problems: a considerable part of oil pollution of the sea comes from oil-contaminated waters discharged via storm water systems, present sewerage systems need development, and unsuitable sewerage systems cause pollution (pp. 1-2); it recalls Recommendation 36/1, action RL4, on storm water management to prevent litter, including microlitter (p. 1).

Key gaps and barriers include:

- Insufficient integration of stormwater into urban planning. The Recommendation stresses that Integrated Storm Water Management (ISWM) should be embedded throughout urban development, from planning and construction to operation and maintenance, indicating a need to move beyond fragmented or drainage-focused approaches.
- Inadequate adaptation to climate change and extreme rainfall. Existing systems may not have sufficient capacity for future precipitation conditions, requiring climate-based dimensioning, secondary runoff pathways and temporary retention areas.
- Pollution and water-quality risks remain insufficiently controlled, particularly from combined sewer overflows, traffic-related microparticles, construction sites, industrial areas, oil, chemicals, litter and microlitter.
- Need for better catchment-level knowledge and assessment. The Recommendation calls for assessment of stormwater quantity, quality, sources, flood risks, contaminant loads, land use and receiving-water conditions to support decision-making and prioritisation of measures.
- Limited transferability of existing technical guidance. SuDS guidance developed for other climatic contexts cannot always be applied directly in the Baltic Sea Region and may require adaptation to Nordic conditions. The Recommendation specifically notes the lack of an extensive library of suitable techniques for these conditions.
- Implementation and monitoring gaps. The Recommendation recommends that Contracting Parties assess implementation regularly, with the reporting format to be specified by 2025 (Annex 2 is provisional; p. 3).

For BBR, particularly important gaps to explore are fragmented stormwater planning, adaptation of solutions to regional climatic conditions, insufficient catchment-based assessment, management of polluted runoff, integration of GI/NBS into planning, and

monitoring of implementation. These issues could be directly addressed through BBR Working Groups and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.14. Opportunities for Coordinated Action

The HELCOM Recommendation 23/5-Rev.1 provides several directly applicable opportunities for coordinated action in BBR. They are particularly relevant because the document promotes Integrated Storm Water Management (ISWM) across urban planning, construction, operation and maintenance, rather than treating stormwater as the responsibility of a single sector.

Key opportunities include:

- Joint development or revision of municipal stormwater policies and plans, using common ISWM principles while adapting them to local conditions. This could be directly supported through BBR Working Groups and Joint Action Plans.
- Coordinated catchment-based stormwater planning, bringing together municipalities, planners, environmental and water authorities, infrastructure actors and other relevant stakeholders to assess runoff pathways, flood risks, pollutant loads and impacts on receiving waters.
- Joint integration of stormwater into spatial planning and urban regeneration, including application of tools such as the Green Area Factor and coordinated implementation of Green Infrastructure, Low Impact Development (LID), Water Sensitive Urban Design (WSUD) and Sustainable Drainage Systems (SuDS).
- Regional exchange and adaptation of stormwater solutions, particularly because the Recommendation notes that existing SuDS guidance cannot always be transferred directly to Baltic/Nordic conditions. BBR could compare partner experiences and identify which approaches are transferable and what adaptations are required.
- Coordinated assessment and monitoring, using common questions and indicators concerning catchment-based planning, ISWM implementation, stormwater plans, climate adaptation, combined sewer overflows and local stormwater impacts. The Recommendation already contains a reporting structure that could inform BBR monitoring and benchmarking.

For BBR, a particularly strong opportunity is to use the Recommendation as a common regional reference framework and compare how its principles are currently implemented

across partner regions. Identified differences and gaps could then directly inform BBR Working Groups and Joint Action Plans.

Relevance score (0-5)	
To what extent could the identified opportunities support the objectives and activities of the BBR project?	**5/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

14.15. Transferability

HELCOM Recommendation 23/5-Rev.1 has high transferability across BBR partner regions, providing common principles for integrated and catchment-based stormwater management, source control, retention, LID, WSUD, SuDS, green infrastructure and climate-resilient planning.

The Recommendation emphasises that solutions should be adapted to local circumstances (B10, p. 2) and, for SuDS manuals, Baltic Sea Region and Nordic conditions (Annex 1, IV, p. 5) rather than directly replicated. For BBR, it can provide a common framework for comparing stormwater approaches, exchanging good practices and identifying adaptations needed for their transfer between partner regions and integration into Joint Action Plans.

Relevance score (0-5)	
To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

14.16. Relevance for BBR

HELCOM Recommendation 23/5-Rev.1 is one of the most relevant sources for BBR because it directly addresses urban stormwater management in the Baltic Sea Region and provides practical principles covering governance, planning, water quality, flood mitigation, climate adaptation, NBS/GI and sustainable drainage. Its strongest relevance lies in Integrated Storm Water Management (ISWM), catchment-based planning, source control, retention and detention, Low Impact Development (LID), Water Sensitive Urban Design (WSUD), Sustainable Drainage Systems (SuDS), green infrastructure, climate-resilient design and management of polluted stormwater.

The Recommendation is particularly useful for BBR Working Groups and Joint Action Plans because it links stormwater management with urban planning, construction, operation and maintenance and recommends that municipalities or other responsible authorities develop dedicated stormwater policies and/or plans. It also provides practical planning and assessment elements, including the Green Area Factor, catchment-level stormwater

impact assessment, flood-risk mapping and a regional implementation reporting framework.

The source also has very high transferability across BBR partner regions because it establishes common regional principles while recognising the need for local adaptation. In particular, the Recommendation notes that sustainable drainage approaches developed elsewhere may require adjustment to Baltic and Nordic climatic and local conditions. This creates a direct role for BBR in comparing implementation approaches, identifying regional gaps and developing transferable solutions adapted to different partner regions.

BBR should therefore use the Recommendation as a key regional benchmark for assessing existing stormwater governance and practices across partner regions and for developing Joint Action Plans. Partner regions should compare their current approaches against its main principles, identify implementation gaps and define coordinated actions related to ISWM, catchment-based planning, source control, NBS/GI, climate adaptation, stormwater quality and clarification of institutional responsibilities.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

14.17. Key Findings and Recommendations

Key findings:

1. Integrated Storm Water Management (ISWM) should be embedded across the entire urban development process, from planning and construction to operation and maintenance.
2. Stormwater management should follow a source-to-recipient hierarchy, prioritising treatment and use at source, followed by retention and detention before direct discharge to receiving waters or combined sewers.
3. Catchment-based planning should consider natural runoff pathways, flood risks, pollutant loads, land use and impacts on receiving waters.
4. Green Infrastructure and sustainable drainage approaches, including LID, WSUD and SuDS, should be integrated into urban planning, with preference for green over conventional grey infrastructure where appropriate.
5. Stormwater planning and infrastructure should systematically account for future climate scenarios, including increasing rainfall intensity and the need for secondary runoff pathways and temporary retention areas.

Key barriers:

1. Fragmented stormwater management and insufficient integration between urban planning, water management, construction, infrastructure operation and maintenance.
2. Existing stormwater systems may be insufficiently adapted to future extreme rainfall and climate conditions, while polluted runoff and combined sewer overflows remain important water-quality risks.
3. Sustainable drainage solutions developed elsewhere cannot always be transferred directly to the Baltic Sea Region, highlighting the need for adjustment to Baltic Sea Region and Nordic conditions (Annex 1, IV, p. 5).

Key opportunities:

1. Integrate ISWM, NBS/GI and sustainable drainage systematically into municipal stormwater policies, spatial planning and urban regeneration.
2. Apply common approaches to catchment assessment, flood-risk mapping, stormwater-quality assessment and implementation monitoring across BBR regions.
3. Exchange and adapt successful stormwater solutions across Baltic Sea regions, identifying which approaches are transferable and which require modification for local conditions.

Recommendations for BBR:

1. Use HELCOM Recommendation 23/5-Rev.1 as a common regional benchmark to assess current stormwater governance, planning and practices in BBR partner regions and identify implementation gaps.
2. Through BBR Working Groups and Joint Action Plans, promote catchment-based ISWM integrating source control, NBS/GI, climate adaptation, water-quality protection and urban/spatial planning.
3. Develop a transferability approach for Baltic/Nordic conditions, comparing partner-region experience and identifying technical, regulatory and organisational adaptations needed to replicate successful stormwater solutions.

Author(s): Savonia UAS, Monika Wojciechowska

15. Overview of the (Smart) Stormwater Management around the Baltic Sea – article

15.1. Basic information

Full title	Overview of the (Smart) Stormwater Management around the Baltic Sea
Author / Lead Organisation	Kristjan Suits, Ivar Annus, Nils Kändler, Tobias Karlsson, Antonius Van Maris, Antti Kaseva, Nika Kotoviča and Gunaratna Kuttuva Rajarao. Affiliations: Tallinn University of Technology, KTH Royal Institute of Technology, Turku University of Applied Sciences and Riga City Municipality. Lead/corresponding author: Kristjan Suits, Tallinn University of Technology.
Period covered / Project duration	Published 21 April 2023. As a review article, it has no project duration. The review synthesises 178 scientific papers, including research/review articles and reports, to assess the current state of stormwater management.
Main objectives	To review the current state of urban stormwater management in the Baltic Sea Region, with particular focus on stormwater quality, management practices, standards and legislation, Green Infrastructure and Nature-Based Solutions, digitalisation, e-monitoring, real-time control and smart stormwater management. The study also examines key regional gaps and barriers and proposes a decision-support matrix to support the development of smarter and more resilient stormwater infrastructure.
Countries / Regions	Baltic Sea Region, with comparative analysis of stormwater management practices and regulatory approaches across Baltic Sea countries. Examples and data include Estonia, Finland, Sweden, Latvia, Lithuania, Denmark, Poland and Germany.
Geographic scope	Baltic Sea Region
Type	Scientific review article / study
Link	https://doi.org/10.3390/w15081623

15.2. Governance Arrangements

The article identifies fragmented and insufficiently harmonised stormwater governance across the Baltic Sea Region. Regulatory requirements, water-quality standards and management practices differ between countries and municipalities, while stormwater management often remains separated from other technical services.

A key challenge is the lack of common approaches for assessing stormwater quality and the effectiveness of management measures and technologies. The article therefore notes that several stakeholders must work together to develop technological solutions and monitoring systems Harmonised monitoring, improved data quality and shared e-

monitoring approaches could support more evidence-based planning, regulation, operation and maintenance.

The article also identifies gaps in frameworks supporting large-scale implementation, particularly regarding governance, cost-benefit assessment, procurement, standardisation and interoperability of technologies and monitoring systems. These gaps can limit the transition from individual solutions towards integrated and smart stormwater management.

For BBR, the findings support stronger coordination between municipalities, planners, utilities, engineers and other relevant actors, together with more harmonised monitoring and assessment approaches. Shared data and common frameworks for evaluating smart, NBS-based and hybrid stormwater solutions could help BBR address governance fragmentation and support more consistent implementation across partner regions.

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.3. Stakeholder Ecosystem

The article highlights a multi-actor stakeholder ecosystem involving municipalities, urban planners, engineers, stormwater system operators, decision-makers, researchers and technology providers. Effective stormwater management requires cooperation between these actors, particularly in planning, monitoring, technology implementation, data sharing and evaluation of stormwater solutions.

For BBR, this stakeholder structure is highly relevant to Working Groups and Joint Action Plans, supporting cooperation between problem owners, technical experts, researchers and solution providers. However, the article provides limited guidance on broader participation of citizens, NGOs and community groups.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.4. Regional Water Priorities

The article identifies stormwater quality and quantity, climate-driven flooding and pollutant transport as key water-management challenges in the Baltic Sea Region. It

emphasises improved stormwater monitoring, harmonised management approaches, pollution reduction and the transition towards resilient systems combining grey infrastructure with NBS and Green Infrastructure.

These priorities closely align with BBR's focus on climate-resilient stormwater management, water-quality protection, improved monitoring and evidence-based planning across the Baltic Sea Region.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.5. Stormwater Management

The article focuses on urban stormwater management in the Baltic Sea Region, addressing both water quality and quantity and the transition from conventional drainage towards smarter, climate-resilient and data-driven systems. Urban runoff is identified as an important pathway for nutrients, heavy metals, oils, PFAS, microplastics and other pollutants, while increasing rainfall intensity creates additional pressure on drainage systems and receiving waters. About 60% of Baltic cities have both separate and combined sewers, 28% only separate and 12% only combined; Tallinn Water Utility observed a 30% increase in precipitation intensity (Section 1). Road salt in snowmelt raises conductivity and can affect soils and receiving waters.

The article promotes a transition towards hybrid stormwater systems combining conventional grey infrastructure with green infrastructure and nature-based solutions (NBS). Approaches such as SuDS, WSUD, LID and "sponge-city" concepts can support runoff retention, infiltration, treatment and flood mitigation. These measures can be complemented by sensors, continuous monitoring, real-time control, forecasting and other digital tools to improve management of stormwater flows and water quality.

A major challenge is the lack of harmonised stormwater-quality standards and monitoring approaches across the Baltic Sea Region. Other gaps include insufficient long-term monitoring data, limited evidence on the performance of green and hybrid infrastructure, and difficulties in scaling smart stormwater technologies from pilots to full-scale implementation. The proposed decision-support approach can help municipalities, planners and engineers identify suitable combinations of monitoring, digital and infrastructure solutions.

For BBR, the article provides useful input for Joint Action Plans and regional recommendations, particularly regarding harmonised monitoring, integrated green-grey infrastructure, smart stormwater management and climate adaptation. It also highlights the value of combining NBS with monitoring and digital technologies to improve both stormwater quality and flood resilience across BBR partner regions.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.6. Technologies and Innovations

The article reviews smart stormwater technologies, including continuous monitoring, water-quality and hydraulic sensors, Real-Time Control, digital modelling, forecasting and decision-support tools. Particular attention is given to integrating digital technologies with NBS and Green Infrastructure to create adaptive hybrid green-grey stormwater systems. Section 5 describes four control tiers: rule-based control (Tier 1), water-quality-based real-time control (Tier 2), forecast-based predictive control (Tier 3) and network control (Tier 4); robust surrogate parameters are EC, turbidity, pH, temperature and dissolved oxygen (Section 3.2.2). The Interreg Central Baltic CleanStormWater project (Estonia, Finland, Latvia, Sweden) built e-monitoring pilots (Section 4.2.6).

For BBR, these approaches are highly relevant for monitoring, predictive management, technology assessment and evidence-based planning. However, wider implementation remains limited by insufficient long-term performance data, lack of standardisation, interoperability challenges and difficulties in scaling solutions from pilot to full-scale application.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.7. Nature-Based Solutions (NBS)

The article reviews key NBS for stormwater management, including rain gardens, constructed wetlands, green roofs, permeable pavements, swales, infiltration systems and stormwater ponds. These solutions can reduce runoff and peak flows, improve water quality and support climate resilience, although their performance depends on local climate, design, maintenance and hydrological conditions. Reported figures: rain gardens remove TSS 85% and TN and TP 74% and cut runoff up to 96%, but perform worse in heavy

rain (4.2.1); wetlands TSS 25-93%, TP 6-77%, TN 5-52% across two studies (4.2.2); in cold climates permeable pavement peak outflow was on average 91% lower than asphalt runoff (4.2.5); dynamic control raised stormwater-pond TSS removal from 46% to 70-90% (4.2.3).

Particularly relevant for BBR is the integration of NBS with sensors, monitoring, forecasting and Real-Time Control to create smart hybrid green-grey systems. The article also highlights gaps in long-term performance data and smart monitoring of NBS, providing useful guidance for selecting, adapting and monitoring solutions across BBR regions.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.8. Green Infrastructure (GI)

The article highlights Green Infrastructure as a key component of modern stormwater management, including rain gardens, stormwater ponds, green roofs, permeable pavements, swales and infiltration systems. These measures support runoff retention, flood mitigation, water-quality improvement and climate resilience, particularly when integrated with conventional drainage infrastructure. Caveats: green roofs are ineffective at retaining solutes and particulate matter and may release heavy metals in heavy rain (4.2.4); permeable pavements clog and long-term performance is uncertain where winters require sanding and salting (4.2.5).

For BBR, particularly relevant is the concept of smart hybrid green-grey infrastructure, where GI is combined with sensors, monitoring, forecasting and Real-Time Control. The findings can support the selection, adaptation, monitoring and maintenance of GI across BBR regions, while highlighting challenges related to long-term performance, maintenance, standardisation and local conditions.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.9. Legal and Regulatory Framework

The article highlights significant differences in stormwater regulation across the Baltic Sea Region. Although stormwater management is influenced by EU water legislation and HELCOM recommendations, there are no harmonised stormwater-quality thresholds across the region. National approaches differ in permitting, monitoring requirements and

the use of receiving-water quality standards, making comparison and harmonisation difficult. Denmark, Lithuania and Estonia manage stormwater quality through integrated environmental permits with site-specific or national threshold limits; Finland, parts of Sweden, Latvia, Poland and Germany set requirements by the environmental status of the receiving water body (Section 3.1, Table 1). No EU policies exist to encourage digital stormwater solutions (Section 5).

Key regulatory frameworks identified include:

- Water Framework Directive (2000/60/EC);
- Floods Directive (2007/60/EC);
- Groundwater Directive (2006/118/EC);
- Urban Wastewater Treatment Directive (91/271/EEC);
- Environmental Quality Standards Directive (2008/105/EC);
- Bathing Water Quality Directive (2006/7/EC);
- regional HELCOM stormwater recommendations supporting improved stormwater management, flood-risk management and pollution prevention.

Key regulatory and implementation gaps:

- Lack of harmonised stormwater-quality thresholds across the Baltic Sea Region.
- No common baseline for evaluating stormwater-management measures and NBS.
- Differences in national and local permitting, monitoring and assessment requirements.
- Limited standardisation and regulatory support for wider implementation of smart and hybrid stormwater solutions.

For BBR, these findings are particularly relevant for comparing regulatory approaches across partner regions, identifying common legal and implementation barriers, and supporting the development of recommendations and Joint Action Plans for more consistent stormwater monitoring and management.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.10. Roles and Responsibilities

The article does not describe roles and responsibilities. It notes that stormwater management mostly occurs in silos, separated from other technical services (Section 4.1), that local governments and industries must demonstrate outlet water quality, usually by

periodic grab samples (3.2.2), and that system managers often overlook the maintenance of green infrastructure.

A particular governance challenge concerns diffuse pollution, where responsibility and costs cannot easily be assigned to a single actor. Differences in regulatory approaches and stormwater-quality requirements across countries further complicate coordinated management.

For BBR, the main lesson is the need to clarify responsibilities across the full stormwater management chain, from planning and financing to implementation, monitoring, operation and maintenance. Stronger cooperation between municipalities, utilities, environmental authorities, planners, researchers and technology providers is therefore essential for overcoming fragmentation and supporting integrated stormwater management.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**2/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.11. Cooperation Mechanisms

The article emphasises the need for cross-sectoral cooperation between municipalities, water utilities, environmental authorities, planners, researchers, engineers and technology providers. Effective stormwater management requires shared knowledge, comparable data and stronger links between research, policy and practice.

Key cooperation mechanisms include harmonised monitoring and assessment, shared data and e-monitoring, transdisciplinary cooperation in smart and green-grey infrastructure, and common decision-support tools. Major barriers include fragmented responsibilities, differing regulatory and monitoring approaches, limited long-term performance data and siloed practices.

For BBR, these findings support multi-stakeholder Working Groups focused on knowledge exchange, common monitoring approaches, data sharing and comparison of stormwater solutions. They can also inform Joint Action Plans by strengthening cooperation between problem owners, researchers and solution providers.

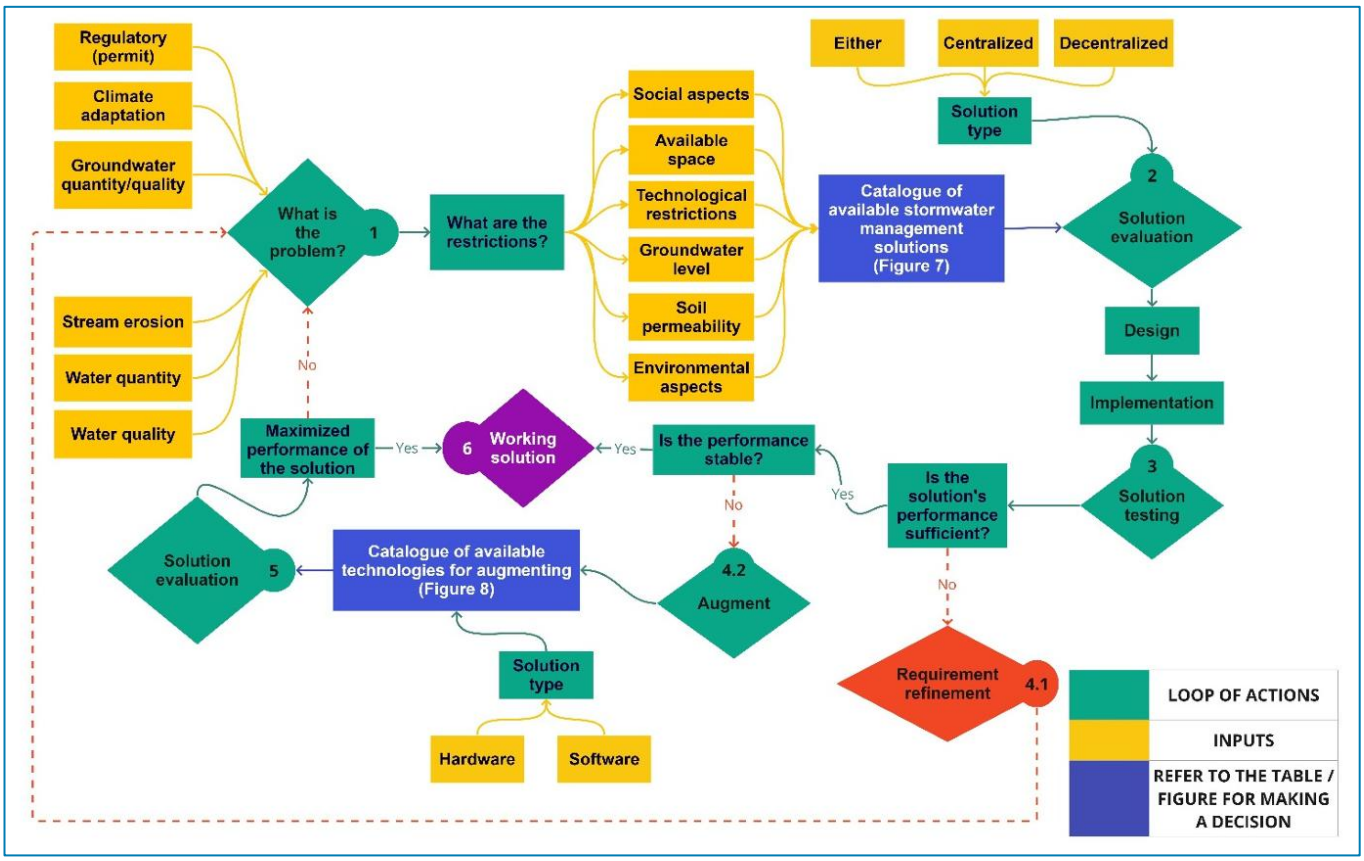


Figure 15.1. Decision-support matrix for developing a smart stormwater system. The framework supports the selection and enhancement of stormwater solutions based on local challenges, environmental conditions, infrastructure characteristics and monitoring requirements. Source: Suits et al.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.12. Target groups and their engagement level

The dominant engagement model is therefore technical and professional rather than participatory. The article focuses on the interaction between municipalities, engineers, planners, researchers, policymakers and system managers in decision-making, technology selection, monitoring, implementation, operation and maintenance. It provides little evidence of structured citizen participation, NGOs or community-level co-creation.

For BBR, the strongest lesson is to involve municipalities, planners, engineers, researchers, water utilities/system operators and policymakers jointly when assessing stormwater challenges and selecting smart, green or hybrid solutions. BBR could complement this technically oriented stakeholder ecosystem by introducing broader stakeholder engagement and co-creation where appropriate.

Table 15.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
	Regional authorities			
	National authorities			
X	Water utilities		X	
	Environmental agencies			
	SMEs and businesses			
	NGOs			
X	Citizens / residents	X		
	Landowners			
X	Researchers / academia			X
X	Planners and consultants			X
X	Policymakers			X
X	Other: engineers / stormwater system managers			X

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	3/5
0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source	

15.13. Gaps and Barriers

The article identifies a broad range of technical, financial, regulatory, organisational and knowledge-related barriers that currently limit the transition towards smart and sustainable stormwater management in the Baltic Sea Region.

Key gaps and barriers include:

- Regulatory fragmentation and lack of harmonisation. Baltic Sea countries apply different stormwater quality requirements, while EU water legislation does not establish explicit common stormwater-quality thresholds. There is also no common baseline for assessing the effectiveness and environmental impact of stormwater measures and technical solutions.
- Insufficient monitoring and performance data. Long-term hydraulic and water-quality data for Green Infrastructure, NBS and hybrid systems remain limited, restricting reliable assessment, comparison and optimisation of solutions.
- Technical and implementation barriers to smart stormwater systems, including technological maturity, computational requirements, lack of standardisation, limited interoperability and the need to move from modelling and pilot applications towards validated full-scale systems.

- Poor integration of green and grey infrastructure. The article indicates that insufficient integration can substantially reduce overall system performance, while Baltic Sea cities still make limited use of state-of-the-art approaches for monitoring and controlling NBS.
- Lack of strategic guidance and integrated frameworks. A high-level strategic vision for selecting and implementing available smart and hybrid stormwater approaches is lacking, together with frameworks integrating technical, environmental, social, economic, legal and institutional considerations.
- Organisational fragmentation and silo approaches remain barriers to more integrated stormwater management. The article also identifies decision-maker and public trust as challenges affecting the uptake of smart stormwater systems.
- Financial constraints. Conventional infrastructure renewal is expensive, and municipalities may face chronic underfunding. The article stresses the need for greater investment while also highlighting the importance of cost-effective alternatives to continuous enlargement and replacement of conventional drainage infrastructure. The article cites an Organisation for Economic Co-operation and Development (OECD) estimate that countries must raise spending by at least 20% to meet EU water standards, and a combined funding gap of EUR 289 billion by 2030.

For BBR, the most important issues to address are regulatory and monitoring harmonisation, improved cross-sectoral integration, common performance assessment approaches, long-term monitoring of NBS/GI, integration of green-grey-smart infrastructure, and development of practical pathways from pilot solutions to wider implementation. These gaps provide a strong evidence base for BBR Working Groups and Joint Action Plans.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.14. Opportunities for Coordinated Action

The article identifies several opportunities for coordinated action across the Baltic Sea Region, particularly around harmonisation of stormwater monitoring, shared assessment approaches, implementation of smart technologies and integration of green and grey infrastructure. However, it does not propose a formal regional cooperation mechanism.

Key opportunities include:

- Harmonising stormwater monitoring and assessment approaches across the BSR. A standardised real-time monitoring approach could provide comparable data on

pollutant concentrations, loads and effectiveness of stormwater measures, including NBS.
- Joint testing and validation of smart stormwater technologies, including robust and cost-effective e-monitoring devices, real-time control and predictive systems. The article specifically identifies the need to move from modelling and pilot applications towards validation under real-world conditions.
- Coordinated development and evaluation of hybrid green-grey stormwater systems, including making the combination of separate sewer systems with appropriate Green Infrastructure more common and standardising deployment and maintenance of enhanced systems.
- Development of common implementation frameworks covering policy, governance, cost-benefit assessment, tendering, QA/QC and maintenance to facilitate wider deployment of enhanced stormwater technologies.
- Use of a common decision-support approach. The article's decision-support matrix could provide a shared methodology for municipalities, planners, engineers and other stakeholders to define stormwater problems, assess local conditions, select suitable green/grey solutions, determine the appropriate level of smart control, and evaluate performance.

For BBR, these opportunities could realistically be translated into Working Group activities and Joint Action Plans, especially through comparative assessment of partner regions, joint development of monitoring principles, exchange of performance data, identification of suitable GI/NBS and smart technologies, and testing their applicability under different Baltic Sea Region conditions. The article's decision-support matrix could serve as a practical starting framework.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.15. Transferability

The review demonstrates high transferability potential across the Baltic Sea Region, since it compares stormwater management practices, regulatory approaches and technological solutions across several BSR countries and specifically aims to support decision-makers in developing smarter and more resilient stormwater systems. The proposed decision-support approach is intended to help end-users select solutions for improving existing grey and green-blue infrastructure.

The approaches with particularly strong replication potential for BBR include:

- e-monitoring and continuous/real-time monitoring of stormwater quantity and quality;
- sensor-based real-time control and predictive analysis;
- hybrid systems combining grey infrastructure with NBS and green-blue infrastructure;
- solutions such as bioretention, green roofs, permeable pavements, LID, WSUD and other stormwater control measures;
- early-warning approaches for stormwater quality and flood risks;
- use of surrogate water-quality parameters to facilitate more practical continuous monitoring;
- common decision-support tools/matrices to support selection of appropriate smart stormwater solutions.

However, the article clearly shows that direct replication is constrained by differences in national and local regulatory frameworks, stormwater-quality standards, environmental conditions, existing infrastructure and monitoring practices. Baltic Sea countries currently lack a harmonised approach to stormwater-quality management and there is no common baseline for evaluating the effectiveness of different stormwater measures.

Successful transfer also requires sufficient long-term performance data, technological maturity, investment capacity, appropriate operation and maintenance arrangements, interdisciplinary cooperation and trust among decision-makers and the public. Solutions therefore need to be adapted to local catchment characteristics, climatic conditions, receiving-water sensitivity, existing drainage systems and institutional responsibilities. Surrogate-parameter relationships are event- and location-specific and must be validated locally.

For BBR, this creates a particularly relevant opportunity to use partner regions as a transnational learning and replication environment. Working Groups and Joint Action Plans could support comparison of monitoring methods, common indicators, exchange of performance data, assessment of NBS and smart technologies, and development of more harmonised approaches for transferring solutions between BSR municipalities and regions.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.16. Relevance for BBR

The article is highly relevant to BBR because it directly addresses stormwater management in the Baltic Sea Region and combines governance, roles and stakeholders are treated only briefly. It highlights the need to manage stormwater quality and quantity together, expand NBS and hybrid green-grey infrastructure, strengthen monitoring and digitalisation, and improve cooperation between municipalities, utilities, researchers, planners and technology providers.

Particularly valuable for BBR are the identified regional gaps, including fragmented responsibilities, differences in regulatory and monitoring approaches, lack of harmonised stormwater-quality criteria, insufficient long-term performance data and difficulties in scaling solutions beyond pilot level. These findings can support BBR Working Groups, Joint Action Plans and regional recommendations by providing a basis for comparing approaches, identifying common priorities and transferring smart stormwater solutions between partner regions.

Overall, the article provides a strong evidence base for developing more harmonised, data-driven and climate-resilient stormwater management approaches adapted to different Baltic Sea Region conditions.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

15.17. Key Findings and Recommendations

Key findings:

1. Stormwater management in the Baltic Sea Region requires better harmonisation of water-quality monitoring, standards and assessment methods, as current approaches differ considerably between countries.
2. Smart stormwater management, including e-monitoring, sensors, real-time control, modelling and predictive approaches, can improve both stormwater quality and quantity management and support evidence-based decision-making.
3. Hybrid green-grey infrastructure combining conventional drainage with NBS/GI provides opportunities to increase flood resilience, retain and treat runoff and improve overall system performance.
4. NBS/GI such as bioretention, wetlands, stormwater ponds, green roofs, permeable pavements, swales and infiltration systems can provide significant water-quality and

runoff-management benefits, but their performance depends strongly on design, local conditions and maintenance.
5. Long-term monitoring and performance data are essential for moving from modelling and pilot applications towards reliable full-scale implementation of smart and green stormwater solutions.

Key barriers:

1. Fragmented regulation and lack of harmonised stormwater-quality standards, monitoring methods and performance criteria across the Baltic Sea Region.
2. Insufficient long-term monitoring and performance data, particularly for NBS/GI and integrated green-grey systems, limiting evidence-based selection, optimisation and scaling of solutions.
3. Silo-based management and implementation barriers, including technological maturity, limited standardisation, maintenance requirements, financial constraints and the lack of an integrated policy/governance framework for large-scale deployment.

Key opportunities:

1. Develop more harmonised stormwater monitoring and assessment approaches across Baltic Sea Region municipalities and regions.
2. Combine GI/NBS with sensors, e-monitoring, forecasting and real-time control to improve performance, maintenance and climate resilience of stormwater systems.
3. Use common decision-support approaches and regional knowledge exchange to compare, select, test and scale appropriate smart and hybrid stormwater solutions.

Recommendations for BBR:

1. Promote harmonisation of stormwater monitoring and assessment through BBR Working Groups, including identification of common parameters, indicators and approaches for evaluating stormwater quality and solution performance.
2. Use Joint Action Plans to promote integrated green-grey-smart stormwater systems, combining NBS/GI with monitoring and digital technologies and adapting solutions to local climatic and catchment conditions.
3. Facilitate cross-regional testing, data sharing and transfer of good practices, using the article's decision-support approach to identify suitable solutions, implementation gaps and priorities for scaling smart stormwater management across BBR partner regions.

Author(s): Savonia UAS, Monika Wojciechowska

16. Mainstreaming stormwater NBS: A study in transition governance – article

16.1. Basic information

Full title	Mainstreaming stormwater NBS: A study in transition governance
Author / Lead Organisation	Sigrid Damman, Raül Glotzbach, Carla Gomes, Bård Torvetjønn Haugland and Rachelle Collette. Journal: Water Policy 27(6): 639-656. Project: B-WaterSmart (Horizon 2020, grant agreement No. 869171).
Period covered / Project duration	Published 16 May 2025. The empirical work included stakeholder workshops conducted between February 2022 and June 2024, supplemented by 11 stakeholder interviews, desk research and participant observation. The study was conducted within a 4-year European project focused on accelerating the transition towards water-smart societies.
Main objectives	To investigate the governance challenges, tensions and trade-offs affecting the mainstreaming of Nature-Based Solutions (NBS) for stormwater management and to identify the governance changes needed to support a transition towards more sustainable stormwater management. Particular attention is given to cross-sectoral coordination, stakeholder collaboration, adaptive and context-sensitive governance, financing, learning and integration of NBS into municipal planning and implementation.
Countries / Regions	Belgium: Flanders, with demonstration activities in Mechelen / Hombeek; Norway: Bodø.
Geographic scope	Municipality / regional / European comparative case study. The empirical analysis focuses on two European cases, Flanders and Bodø.
Type	Scientific research article / comparative case study
Link	https://doi.org/10.2166/wp.2025.238 https://iwaponline.com/wp/article/27/6/639/108207/Mainstreaming-stormwater-NBS-A-study-in-transition

16.2. Governance Arrangements

The article analyses governance arrangements for mainstreaming stormwater nature-based solutions (NBS) in Flanders and Bodø, showing that municipalities play a central role in implementation, infrastructure planning and integration of climate adaptation and NBS into spatial planning. At the same time, effective implementation requires multi-level cooperation with regional and national authorities, water utilities and other relevant organisations. In Flanders the regional level (Flemish Environment Agency, provinces) is more active; in Bodø local coordination challenges are more prominent and the municipality manages water cycle services internally.

A key finding is the importance of interdepartmental and cross-sectoral coordination. In Bodø, an interdepartmental committee on surface water provides a practical mechanism for connecting municipal responsibilities, while the wider study highlights the value of

Living Labs (LLs) and Communities of Practice (CoPs) for collaboration, experimentation, learning and knowledge exchange between municipalities, utilities, technology providers and research organisations.

The main governance barriers include institutional silos, fragmented responsibilities, insufficient capacity and incentives for interdisciplinary cooperation, late involvement of relevant actors, and tensions between short-term operational priorities and the long-term benefits of NBS. The article also shows that supportive NBS policies do not always translate into clear implementation targets and practical instruments at municipal level.

For BBR, particularly useful lessons include establishing interdepartmental coordination, strengthening multi-level and cross-sectoral cooperation, using LLs and CoPs, and involving relevant stakeholders early in planning. The comparison between Flanders and Bodø also demonstrates that governance arrangements for NBS should be adapted to local institutional, environmental and organisational conditions rather than transferred uniformly between regions.

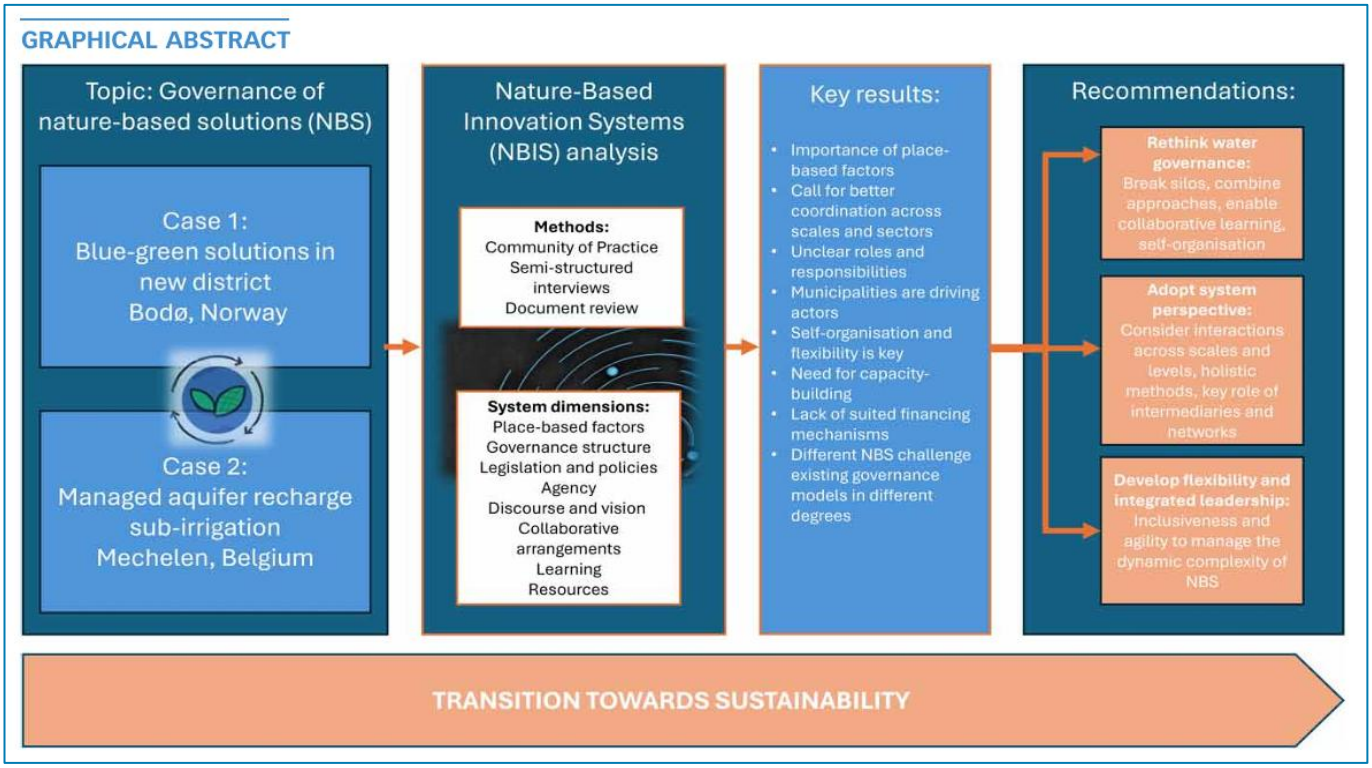


Figure 16.1. Transition governance for mainstreaming stormwater NBS. Source: Damman et al. (2025).

Relevance score (0-5)

To what extent could the identified governance arrangements support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.3. Stakeholder Ecosystem

The article identifies a diverse stakeholder ecosystem involved in planning, implementing and mainstreaming stormwater NBS. Key actors include municipalities and municipal departments, regional and national authorities, water and wastewater utilities, property developers, consultants, research and knowledge organisations, technology providers, farmers, citizens and local communities. Municipalities play a central role in planning, decision-making and implementation, while other actors contribute regulatory guidance, technical expertise, infrastructure management, innovation and local knowledge.

LLs and CoPs are particularly important mechanisms for stakeholder engagement. They bring together public authorities, utilities, researchers, businesses, experts and end-users to exchange knowledge, discuss practical challenges and co-develop solutions. The study shows that such structured cooperation can contribute to practical governance outcomes, including municipal planning and implementation of new regulatory requirements.

However, effective engagement can be limited by institutional silos, late involvement of relevant actors, weak NBS networks, limited organisational capacity and dependence on individual champions. Early and continuous involvement of different municipal departments and implementation actors is therefore important for successful NBS mainstreaming.

For BBR, transferable approaches include multi-stakeholder Working Groups, CoPs, LLs, public-private cooperation and the use of knowledge intermediaries. These mechanisms could support the co-creation of Joint Action Plans and strengthen cooperation between municipalities, utilities, planners, researchers, businesses and local stakeholders.

Relevance score (0-5)

To what extent could the identified stakeholder ecosystem and engagement approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.4. Regional Water Priorities

The article does not set out regional priorities. It describes local drivers in two cases outside the Baltic Sea Region: in Flanders flood risk, water scarcity and reuse of stormwater, in Bodø increased precipitation and flooding, limited infiltration and a new city district It also highlights stormwater retention and reuse, integrated multifunctional water management, biodiversity protection and stronger cross-sectoral cooperation.

For BBR, particularly relevant is the need to integrate stormwater management with climate adaptation, spatial planning, water retention and reuse, and NBS. The case studies also demonstrate that priorities and solutions should be adapted to local climatic, hydrological, institutional and socio-economic conditions rather than applied uniformly across regions.

Relevance score (0-5)

To what extent could the identified regional water priorities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.5. Stormwater Management

The article examines the transition from conventional stormwater management towards integrated approaches incorporating NBS, using cases from Flanders and Bodø. It highlights integrated stormwater planning as an important tool for addressing flooding, water pollution and climate-change impacts while linking green-blue infrastructure, stormwater reuse and spatial planning.

The cases demonstrate different practical approaches. In Flanders, stormwater retention can combine flood mitigation with water reuse and managed aquifer recharge, showing the potential to treat stormwater as a resource. In Norway, a three-tiered approach promotes local infiltration for small rainfall events, detention for medium events and safe flood pathways for extreme events. The Bodø case also illustrates the benefits of integrating NBS and green-blue infrastructure early in urban development and land-use planning.

The study emphasizes that stormwater solutions must be adapted to local conditions. Climate, soil and infiltration capacity, available urban space, existing infrastructure, water scarcity, snow and ice conditions, and maintenance requirements can strongly influence the suitability and performance of NBS. Key implementation barriers include fragmented responsibilities, institutional silos, insufficient early coordination, limited municipal capacity, financing and maintenance challenges, and gaps in practical NBS guidance.

For BBR, the main lessons are to integrate NBS into stormwater and spatial planning from an early stage, combine flood management with retention and beneficial stormwater reuse, strengthen cooperation between municipalities and water utilities, and adapt solutions to local conditions. The comparison between Flanders and Bodø also confirms that there is no single stormwater or NBS model suitable for all BBR regions.

Relevance score (0-5)

To what extent could the identified stormwater management approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.6. Technologies and Innovations

The article addresses innovation mainly through NBS, blue-green infrastructure and water-smart urban development, combining technical, planning and governance approaches. In Flanders, managed aquifer recharge combined with stormwater storage and reuse demonstrates how one system can support both flood mitigation and water-scarcity management. In Bodø, blue-green infrastructure, including green corridors, infiltration, detention and safe floodways, is integrated into urban development.

The article also highlights the blue-green factor as a planning tool for integrating surface-water management and nature conservation into early urban planning. Living Labs and pilot demonstrations provide practical environments for testing and evaluating NBS while bringing together municipalities, utilities, technology providers, researchers and other stakeholders. The Nature-Based Innovation Systems (NBIS) framework further supports understanding how governance, knowledge, finance and local conditions influence NBS development and uptake.

Key limitations include fragmented pilot activities, insufficient monitoring and evaluation, limited practical experience among decision-makers and the need for more experimental data. These challenges can limit confidence in NBS and hinder their wider replication and upscaling.

For BBR, the main lessons are to test NBS and blue-green solutions in real-life settings, integrate appropriate planning tools, explore combined stormwater retention and reuse, and systematically monitor and document performance and implementation experience. This can strengthen the evidence base for transferring and scaling successful solutions across BBR partner regions.

Relevance score (0-5)

To what extent could the identified technologies and innovations support the objectives and activities of the BBR project?	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.7. Nature-Based Solutions (NBS)

The study focuses directly on mainstreaming NBS for urban stormwater management and analyses their implementation through two European Living Lab cases in Flanders,

Belgium, and Bodø, Norway. NBS are presented as multifunctional stormwater solutions capable of addressing flooding, water scarcity, runoff pollution, biodiversity, urban liveability and climate adaptation. The paper also stresses that NBS should be integrated with other stormwater solutions rather than viewed as isolated measures.

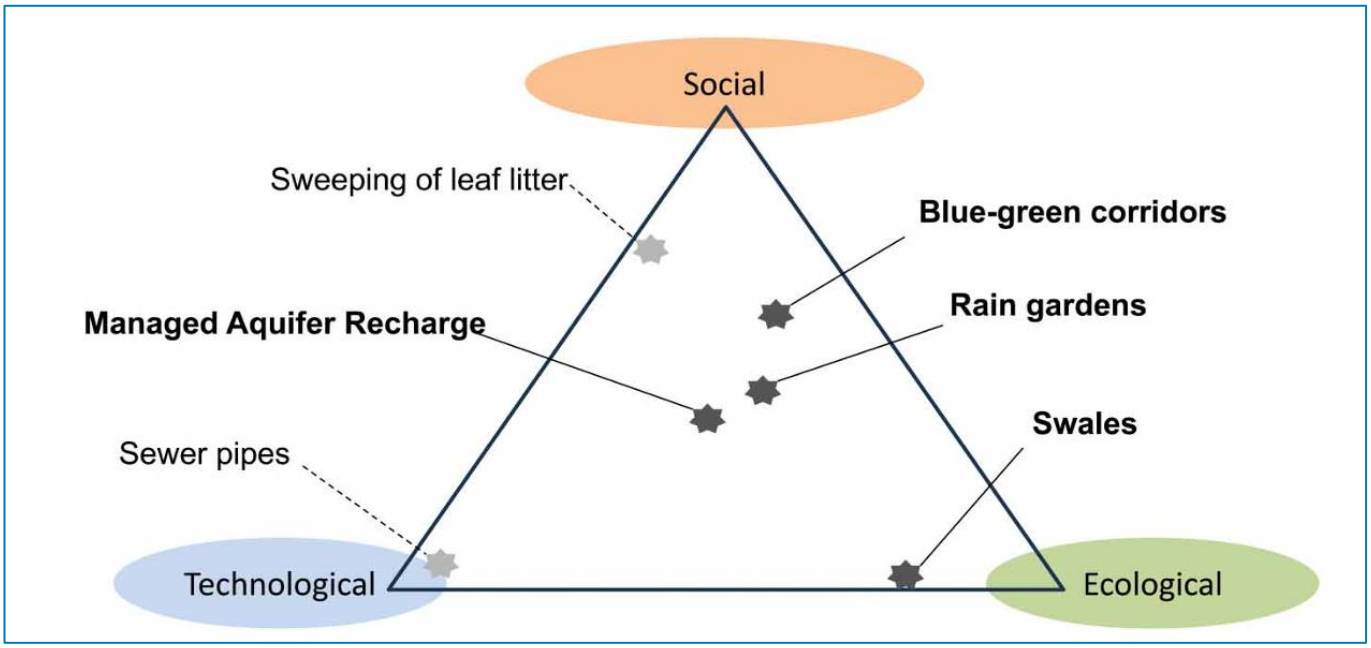


Figure 16.2. Stormwater solution space ranging from conventional infrastructure to nature-based stormwater solutions, illustrating the integration of technological, ecological and social dimensions. Source: Damman et al. (2025), modified from Remme et al. (2024).

The NBS approaches discussed include:

- blue-green corridors for stormwater retention and safe conveyance of excess water;
- rain gardens and swales;
- managed aquifer recharge, demonstrated in Flanders through a 1,400 m³ buffer basin that stores stormwater, manages flooding and provides water for agricultural reuse through sub-irrigation;
- green-blue structures and safe floodways, incorporated into early planning of the new urban district in Bodø;
- broader integration of NBS into municipal stormwater plans, urban development and climate adaptation.

The study also identifies important barriers, including fragmented governance, limited space and municipal capacity, financing difficulties, maintenance requirements and uncertainty about long-term performance. For BBR, a key lesson is that NBS should be adapted to local climatic, hydrological and institutional conditions and supported by early stakeholder involvement, cross-sectoral cooperation, monitoring and flexible governance.

Relevance score (0-5)

To what extent could the identified NBS support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.8. Green Infrastructure (GI)

The article does not analyse green infrastructure separately; GI appears only as a concept overlapping with NBS. Its findings on green-blue NBS indicate that they should be integrated into municipal stormwater, land-use and urban planning rather than implemented as isolated measures. In Flanders, municipal stormwater plans can incorporate green-blue infrastructure and retrofitting measures, while the Bodø case demonstrates opportunities to integrate GI from the early stages of urban development.

Relevant approaches include blue-green corridors, rain gardens, swales, local infiltration and retention, and safe floodways. The article also highlights the blue-green factor as a planning tool for integrating surface-water management and nature conservation into development and construction processes. These measures can support stormwater retention, flood-risk reduction, climate adaptation, biodiversity and urban liveability.

However, GI design and performance depend strongly on local conditions. Limited urban space, soil and infiltration capacity, harsh climate, existing infrastructure, maintenance requirements and insufficient monitoring can constrain implementation. Institutional fragmentation and isolated pilot activities can also limit wider uptake.

For BBR, the main lessons are to integrate GI early into urban and stormwater planning, use appropriate planning instruments, and adapt solutions to local climatic, hydrological and spatial conditions. Piloting, monitoring and collaborative learning should support the selection of suitable measures and their subsequent replication and upscaling across BBR partner regions.

Relevance score (0-5)

To what extent could the identified green infrastructure approaches support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.9. Legal and Regulatory Framework

The article provides a detailed comparison of the legal and regulatory conditions influencing stormwater management and NBS implementation in Flanders and Norway, showing that regulation can act both as an important enabler and as a barrier to mainstreaming NBS.

Key legal and regulatory aspects include:

- Flanders: water management is implemented within the framework of the EU Water Framework Directive and Floods Directive, principally through the Decree on Integrated Water Policy (2003). Its implementation is overseen by the Coordination Committee on Integrated Water Policy, chaired by the Flemish Environment Agency.
- A regional urban development ordinance (2023) in Flanders requires rainwater retention, reuse and infiltration, providing a regulatory driver for integrating sustainable stormwater measures into development.
- Municipalities in Flanders are required to develop stormwater management plans, which can incorporate green-blue infrastructure, stakeholder participation and retrofitting of existing infrastructure for water reuse.
- Norway applies a three-tier stormwater approach: small rainfall events should be infiltrated locally, medium events detained locally as far as possible, and large events managed through safe flood pathways.
- Norwegian national guidance requires municipalities to integrate climate adaptation into planning, while since 2018 non-selection of NBS must be justified. National building requirements also support local stormwater management, and the blue-green factor is increasingly used to integrate surface-water management and nature conservation into early development planning. Norway is not an EU member but has adopted most relevant EU policies; the Plan and Building Act, Pollution Act and Water Act were revised in 2022 to clarify NBS definitions and responsibilities, and a National Plan for Climate Adaptation Planning followed in 2023.

The article identifies important regulatory barriers to NBS implementation, including changing or unclear rules, inconsistent runoff classifications, unclear responsibilities and conflicts between NBS objectives and existing planning standards. It also highlights insufficient practical guidance and implementation requirements at municipal level.

For BBR, a key lesson is that policy support for NBS needs to be accompanied by clear responsibilities, consistent regulations and practical planning instruments. Integrated stormwater plans and tools such as the blue-green factor can help municipalities translate broader NBS objectives into local implementation.

Relevance score (0-5)

To what extent could the identified legal and regulatory aspects support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.10.

16.11. Roles and Responsibilities

The article identifies municipalities as central actors in stormwater management and NBS implementation, supported by regional and national authorities, water utilities, environmental agencies and private stakeholders. Responsibilities include planning, implementation, financing, infrastructure management and integration of stormwater and climate adaptation into spatial planning. Examples: in Flanders the Flemish Environment Agency monitors water quality and sets guidelines, provinces implement regional water plans, and water and wastewater companies develop and operate infrastructure; in Norway the Water Resources and Energy Directorate is responsible for stormwater, the Ministry of Climate and Environment coordinates across sectors and county governors give guidance.

Key challenges include fragmented responsibilities, institutional silos, insufficient interdepartmental cooperation and unclear arrangements for long-term financing, operation and maintenance of NBS. For BBR, the findings highlight the importance of clearly mapping responsibilities across the full lifecycle of stormwater solutions and strengthening coordination between municipalities, utilities and other relevant authorities.

Relevance score (0-5)

To what extent could the identified roles and responsibilities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.12. Cooperation Mechanisms

The study identifies cross-sectoral, multi-level and collaborative governance as essential for mainstreaming stormwater NBS.

The most relevant cooperation mechanisms include:

- Living Labs (LLs) as platforms for testing, demonstrating and jointly developing innovative water and NBS solutions in real-life settings.
- Communities of Practice (CoPs) connecting experts, local actors, end-users and other stakeholders to exchange knowledge, share good practices and co-develop solutions.
- Formal and informal multi-stakeholder networks, which enable pooling of knowledge, expertise, financial resources and implementation capacity.
- Interdepartmental municipal cooperation. In Bodø, an interdepartmental committee on surface water supported coordination, while CoP activities

contributed to development of the municipal Surface Water Plan and implementation of new legislation.
- Municipality - utility cooperation, identified particularly in Flanders as important for integrating stormwater planning with infrastructure development and operation.
- Public-private and knowledge partnerships, including intermediaries that connect municipalities with local stakeholder groups and support experimentation and innovative financing or management models.
- Early stakeholder involvement and co-development, allowing different interests, knowledge systems and local needs to be incorporated before key planning decisions are fixed.

EU-funded LLs were a key enabler: one Flemish interviewee said the municipality could not have built the Hombeek solution or engaged stakeholders as widely without the LL; in Norway the long-term public-private partnership Klima 2050 acted as a co-creation centre. Important barriers include institutional silos, unclear responsibilities, limited administrative capacity and late stakeholder involvement. For BBR, the main lesson is to establish continuous multi-stakeholder cooperation rather than rely on ad hoc consultation. BBR Working Groups can provide such a structure by connecting municipalities, utilities, authorities, researchers and solution providers to exchange knowledge, assess NBS and jointly develop actions.

Relevance score (0-5)

To what extent could the identified cooperation mechanisms support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.13. Target groups and their engagement level

The article does not define engagement levels. It describes awareness and capacity-building initiatives, workshops and interviews with public and private participants, Communities of Practice, citizens' assemblies in Mechelen and a public dialogue meeting in Bodø. LLs and CoPs are particularly relevant, enabling experts, local actors and end-users to exchange knowledge and jointly develop solutions.

For BBR, these approaches provide a useful model for Working Groups and Joint Action Plans, supporting early and continuous engagement of municipalities, water utilities, researchers, private actors and other relevant stakeholders.

Table 16.1. Target groups and their level of engagement.

	Target groups identified:	Engagement level of target groups:		
		Low	Medium	High
X	Municipal authorities			X
X	Regional authorities		X	
X	National authorities		X	
X	Water utilities			X
X	Environmental agencies		X	
X	SMEs and businesses		X	
X	NGOs	X		
X	Citizens / residents		X	
X	Landowners		X	
X	Researchers / academia			X
X	Planners and consultants		X	
X	Policymakers		X	
X	Other: technology providers		X	

Relevance score (0-5)

To what extent could the identified target groups and engagement practices support the objectives and activities of the BBR project?	5/5

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.14. Gaps and Barriers

The study identifies a broad set of structural, governance, financial, regulatory, knowledge and implementation barriers that constrain the mainstreaming of stormwater NBS. Importantly, the authors conclude that the strongest barriers are structural, because NBS challenge established sectoral boundaries, institutional responsibilities and the traditional engineering-oriented or “hydraulic” logic of urban water management.

Key gaps and barriers include:

- Organisational and governance fragmentation: institutional silos, insufficient coordination across municipal departments, sectors and governance levels, unclear allocation of roles and responsibilities, and stakeholder involvement occurring too late in planning processes.
- Legal and policy barriers: inconsistencies between policies promoting NBS and existing stormwater, groundwater, land-use and infrastructure regulations; unclear guidelines and insufficient practical implementation requirements at national level.
- Financial barriers: lack of sustainable financing models covering not only initial investments but also long-term operation and maintenance. The study points to the need to explore public-private partnerships and innovative financing mechanisms, while considering affordability and distributional justice. Examples named: green

bonds, land-value capture, community infrastructure levies and neighbourhood committees / collective management (Flanders); a proposed stormwater management fee with fixed and variable parts, still debated (Norway).

- Knowledge and capacity gaps: insufficient practical experience among decision-makers, lack of capacity in smaller municipalities, need for training and knowledge intermediaries, and insufficient integration between research and practice.
- Monitoring and evidence gaps: limited monitoring and evaluation of implemented NBS, insufficient experimental and long-term performance data, and uncertainty regarding long-term functionality. These uncertainties can increase risk aversion and favour established grey infrastructure.
- Technical and environmental constraints: limited space, existing infrastructure and local climatic or geological conditions can restrict NBS implementation. In Bodø, for example, cold climate, snow and ice, dense clay and rock, and limited infiltration create specific implementation and maintenance challenges.
- Social and institutional resistance: risk aversion, dependence on individual champions, competing municipal priorities, limited public awareness and tensions between long-term NBS benefits and more immediate local priorities can hinder mainstreaming.

For BBR, key barriers include fragmented governance, weak cross-sectoral coordination, limited implementation tools, financing and maintenance challenges, insufficient NBS monitoring, and limited transfer of pilot results into mainstream planning. BBR Working Groups and Joint Action Plans could address these barriers through clearer responsibilities, early stakeholder involvement, capacity building, joint monitoring and exchange of tested implementation and financing models.

Relevance score (0-5)

To what extent could the identified gaps and barriers provide useful insights for the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.15. Opportunities for Coordinated Action

The article identifies several concrete opportunities for coordinated action to mainstream stormwater NBS, with collaboration across sectors and governance levels presented as a central enabling condition. Particularly important are mechanisms that combine municipal leadership with utilities, private actors, knowledge organisations and local stakeholders.

Key opportunities include:

- Establish cross-sectoral and multi-level cooperation structures. The study calls for stronger collaboration between municipalities, water utilities, regional/national

authorities, developers, knowledge partners and local stakeholders. Integrated stormwater management plans can provide a common framework for such coordinated action.

- Use Living Labs (LLs) and Communities of Practice (CoPs) for co-creation and learning. The cases demonstrate that these mechanisms can pool expertise and resources, strengthen stakeholder relationships and support practical implementation. In Bodø, CoP activities contributed to development of the municipal Surface Water Plan and implementation of new legislation.
- Strengthen public-private and collective implementation models. The article highlights public-private partnerships and collective arrangements involving municipalities, farmers, industries and neighbourhood groups as opportunities for implementation and long-term management of NBS.
- Jointly develop and test place-specific NBS. Rather than applying one governance or technical model everywhere, municipalities and stakeholders should use collaborative learning, experimentation and local capabilities to identify solutions appropriate to specific climatic, institutional and socio-economic conditions.
- Explore coordinated financing models. The study identifies a need for mechanisms that distribute NBS costs and benefits among stakeholders and highlights the potential of public-private financing and other innovative approaches, while also stressing procedural and distributional fairness.

For BBR, these findings could be translated directly into Working Groups and Joint Action Plans. Working Groups could function similarly to CoPs, bringing together municipalities, utilities, planners, environmental authorities, researchers, businesses and other relevant stakeholders to identify shared challenges, exchange knowledge, co-develop context-specific solutions and clarify implementation and financing responsibilities.

Relevance score (0-5)

To what extent could the identified opportunities support the objectives and activities of the BBR project?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.16. Transferability

The study does not assess transferability; its two cases (Flanders and Bodø) are narrow in scale and time (Section 5), and it concludes that stormwater NBS cannot be replicated through a “one-size-fits-all” approach. The comparison of Flanders and Bodø shows that successful implementation depends on local climatic, physical, institutional, regulatory and socio-economic conditions.

Transferable approaches include integrated stormwater management plans, early integration of NBS into urban planning, LLs and CoPs, cross-sectoral cooperation, and practical planning tools such as the blue-green factor and requirements for infiltration, retention and safe floodways. Piloting, monitoring and learning are also important before solutions are implemented at a larger scale.

Successful transfer requires adaptation to local climate, soil and infiltration capacity, available space, existing infrastructure, governance and regulatory frameworks, financing, municipal capacity and maintenance requirements. The Bodø case is particularly relevant for Nordic regions because it highlights challenges related to snow, ice, harsh climate and limited infiltration.

For BBR, the main lesson is to transfer principles, governance models and planning practices rather than identical NBS solutions. Working Groups and Joint Action Plans could support a common framework for assessing suitable approaches, followed by adaptation to the specific conditions of each BBR partner region.

Relevance score (0-5)

To what extent could the identified approaches, solutions or practices be transferred to other BBR partner regions?	**5/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.17. Relevance for BBR

The article is highly relevant to BBR because it provides practical insights into mainstreaming NBS through governance, stakeholder cooperation, spatial planning, regulation and financing. It highlights the importance of cross-sectoral coordination, LLs, CoPs, early stakeholder involvement and context-sensitive implementation.

Particularly valuable for BBR are the identified barriers, including fragmented responsibilities, institutional silos, regulatory inconsistencies, limited capacity, financing challenges and insufficient monitoring. The findings can support BBR Working Groups and Joint Action Plans by helping partner regions identify locally adapted pathways for NBS implementation while following common principles for integrated and climate-resilient stormwater management. Both cases are outside the Baltic Sea Region (Belgium, Norway); the study is a governance analysis of two cities and does not compare BSR countries.

Overall relevance score (0-5)

The Overall relevance score is calculated as the arithmetic mean of the relevance scores assigned to the 14 previous criteria (X.2-X.15), rounded to the nearest whole number.	**4/5**

0 = Not addressed, 1 = Very limited relevance, 2 = Limited relevance, 3 = Moderate relevance, 4 = High relevance, 5 = Very high relevance / key source

16.18. Key Findings and Recommendations

Key findings:

1. Mainstreaming stormwater NBS requires adaptive and context-sensitive governance, as there is no single governance model suitable for all NBS types and local conditions.
2. Municipalities are key actors, but effective implementation requires stronger cross-sectoral and multi-level cooperation with water utilities, regional/national authorities, developers, knowledge partners and local stakeholders.
3. Integrated stormwater management plans and early integration of NBS/GI into urban planning are important instruments for moving NBS from fragmented pilots towards mainstream implementation.
4. LLs and CoPs provide effective mechanisms for co-creation, learning and stakeholder cooperation. In Bodø, CoP activities supported development of the municipal Surface Water Plan and implementation of new legislation.
5. NBS can provide multiple benefits beyond flood management, including water retention and reuse, climate adaptation, biodiversity, liveability and water resilience, but solutions must reflect local climatic, spatial, institutional and socio-economic conditions.

Key barriers:

1. Institutional and organisational fragmentation, including sectoral silos, unclear or varying responsibilities, late cooperation between departments and dependence on individual champions.
2. Regulatory and knowledge gaps, including unclear or conflicting rules, insufficient practical guidance, limited monitoring/evaluation and lack of experimental evidence supporting wider NBS implementation.
3. Financing and long-term management challenges, particularly unclear cost distribution, limited resources for operation and maintenance and difficulties financing retrofitting and upscaling.

Key opportunities:

1. Establish cross-sectoral Communities of Practice / Living Lab approaches bringing together municipalities, utilities, authorities, researchers, developers, businesses and local stakeholders.
2. Mainstream NBS through integrated stormwater plans, blue-green planning tools and early integration into spatial planning and development processes.
3. Develop collaborative implementation and financing models, including public-private partnerships, collective management and knowledge-sharing arrangements suited to local contexts.

Recommendations for BBR:

1. Structure BBR Working Groups as cross-sectoral CoPs, enabling municipalities, utilities, planners, environmental authorities, researchers, businesses and other stakeholders to jointly identify barriers and co-develop stormwater NBS solutions.
2. Use Joint Action Plans to establish context-specific pathways for mainstreaming NBS, covering governance, responsibilities, regulation, financing, planning, implementation, operation and maintenance.
3. Promote transfer through common principles rather than one-size-fits-all solutions, using pilot experience, collaborative learning and comparison between BBR partner regions to adapt NBS to different climatic, hydrological, spatial and institutional conditions.

Author(s): Savonia UAS, Monika Wojciechowska

IV. Summary

The desk research shows that resilient stormwater management across the Baltic Sea Region requires an integrated approach combining effective governance, cross-sector stakeholder cooperation, catchment-based planning, nature-based solutions and green infrastructure, and appropriate technical and digital tools. Across the reviewed sources, recurring challenges include fragmented responsibilities, insufficient coordination between organisations and governance levels, regulatory and implementation barriers, limited long-term resources and capacity, and difficulties in moving from individual pilot solutions to systematic regional implementation. At the same time, the reviewed projects and policy frameworks provide substantial transferable knowledge, practical tools and tested cooperation models. For BBR, the strongest opportunities lie in strengthening multi-stakeholder and cross-regional cooperation, integrating NBS and blue-green infrastructure into spatial and stormwater planning, improving knowledge and data exchange, building institutional capacity, and using existing good practices to support regional Working Groups and Joint Action Plans.

Top 5 Key Findings:

1. Integrated and catchment-based stormwater management is essential for effective climate resilience, replacing fragmented or site-by-site approaches with coordinated planning across the wider water system.
2. Nature-based solutions and green infrastructures are key measures for stormwater retention, flood-risk reduction, water-quality improvement and climate adaptation, particularly when integrated into broader urban and spatial planning.
3. Effective water governance depends on strong cooperation between municipalities, water utilities, public authorities, researchers, businesses and other relevant stakeholders, with clearly defined roles and responsibilities.
4. Monitoring, data sharing, modelling and digital decision-support tools can significantly improve stormwater planning and management, but technological solutions need to be combined with appropriate governance and stakeholder cooperation.
5. Many existing approaches, tools and good practices are transferable across Baltic Sea Region municipalities, but successful replication requires adaptation to local environmental, institutional, legal and organisational conditions.

Top 5 Key Barriers:

1. Fragmented governance and unclear responsibilities between municipalities, utilities, authorities and other actors involved in stormwater management.
2. Insufficient cross-sector and multi-level coordination, including weak information and knowledge exchange between organisations and governance levels.

3. Legal, regulatory and permitting barriers, including inconsistent frameworks and insufficient integration of stormwater management, NBS and water reuse into existing planning systems.
4. Limited financial, technical and institutional capacity, particularly for long-term implementation, operation, maintenance and scaling of solutions beyond individual pilots.
5. Insufficient stakeholder engagement and long-term commitment, particularly the limited involvement of citizens, NGOs, businesses and other actors outside the core institutional or project partnerships.

Top 5 Key Opportunities:

1. Strengthening cross-sector and cross-regional cooperation through Working Groups, stakeholder networks, peer learning and structured knowledge exchange.
2. Scaling up NBS and blue-green infrastructure and embedding them more systematically into stormwater, climate adaptation and spatial planning.
3. Transferring and adapting existing good practices, tools and methodologies instead of developing new approaches from scratch.
4. Improving monitoring, data sharing and evidence-based decision-making, including the complementary use of digital tools, modelling and real-time monitoring.
5. Building stakeholder and institutional capacity through training, mentoring, workshops, co-creation and exchange of practical implementation experience across regions.

Top 5 Recommendations for BBR:

1. Establish strong multi-stakeholder Working Groups involving municipalities, utilities, authorities, researchers, businesses, NGOs and other relevant actors, with clearly defined roles and responsibilities, possibly utilizing Living Lab (LL) and Communities of Practice (CoP) approaches.
2. Use an integrated, catchment-based approach in Joint Action Plans, linking stormwater management with spatial planning, climate adaptation, NBS and Green Infrastructure.
3. Build on existing projects, tools and proven practices, systematically assessing which solutions can be transferred and adapted to individual BBR partner regions.
4. Address governance, legal, financial and operational barriers already during action planning, including responsibility for financing, implementation, monitoring and long-term maintenance.
5. Strengthen continuous knowledge exchange and capacity building across BBR regions, using workshops, peer learning, stakeholder co-creation, shared data and practical examples to support implementation beyond the project lifetime.

Author: Savonia UAS, Monika Wojciechowska

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