Freshwater & Urban

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Policy brief

Resilient Urban Waters

A Roadmap Approach for Urban Freshwater Restoration in National Restoration Plans

Key NRR Articles

- **4: Terrestrial, Coastal and Freshwater Ecosystems**
- **8: Urban Ecosystems**
- **9: River Connectivity**
- **14: Preparation of NRPs**
- **15: Content of NRPs**
- **20: Monitoring**
- **21: Reporting**

Key Messages

- Combined sewer systems can be overloaded by stormwater runoff; **targeted Nature-based Solutions (NbS) can help reduce sewer overflows in high-risk catchments**, see **recommendation 1**.
- Fragmented water governance can limit NbS implementation in urban and peri-urban areas. **Integrated planning and cross-departmental coordination can support more effective urban water restoration**, see **recommendation 2**.
- Urban water and NbS projects do not automatically support biodiversity. **To support urban biodiversity objectives, national authorities could promote habitat-diverse design in urban water and NbS projects**, see **recommendation 3**.
- Small-scale urban and peri-urban freshwaters are critical local biodiversity pools; **integrated monitoring approaches can help cities track ecological condition and strengthen long-term freshwater restoration over time**, see **recommendation 4**.
- Neither grey infrastructure nor green solutions alone can resolve climate extremes – **long-term urban water resilience requires integrated green-grey infrastructure approaches combining NbS with existing drainage systems**, see **recommendation 5**.

Introduction: How can this brief help you?

Small-scale urban and peri-urban freshwaters are critical local biodiversity pools. However, healthy urban freshwater systems cannot be recovered if cities continue to treat water management purely as a technical drainage question isolated from the wider urban and peri-urban ecosystems. Across many European cities, aging drainage infrastructure, increased runoff, and combined sewer overflows are placing growing pressure on freshwater ecosystems. To address this, the **Nature Restoration Regulation (NRR)** strengthens requirements for more integrated, cross-sectoral planning under **Articles 14** and **15**, encouraging Member States to better align urban greening, freshwater restoration, and wider catchment management within **National Restoration Plans (NRPs)**.

This brief provides recommendations for national authorities, environmental ministry officials, and municipalities to support NRP preparation and implementation. It forms part of a series of four implementation briefs covering forest, freshwater, marine and coastal, and urban ecosystems. The recommendations are organised as a phased roadmap covering: i) NRP preparation, publication, and early implementation; ii) implementation of objectives towards 2030; and iii) longer-term monitoring, reporting, and adaptive implementation beyond 2030.

By synthesising evidence from **NICHES** and **BiNatUr**, this brief identifies practical implementation pathways for urban catchment screening, cross-departmental coordination and financing, site-level aquatic habitat design, and integrated biological monitoring under **Article 4** (Terrestrial, Coastal and Freshwater Ecosystems), **Article 8** (Urban Ecosystems), and **Article 9** (River Connectivity).

Recommendations: A Roadmap Approach for NRP Preparation and Implementation

As illustrated in **Figure 1**, the recommendations are structured as a phased roadmap approach to support NRP preparation, implementation, and the delivery of restoration targets over time. The following recommendations are organised according to these implementation phases.

Figure 1 - Recommendations for the NRP Preparation, Review and Early Implementation phase

NRP Preparation, Review and Early Implementation (0-2 years / 2026 – 2028)

Recommendation 1: Screen Urban Catchments for High-Frequency Sewer Overflows

Under NRR Article 14 and **Article 15,** NRPs must identify priority areas for restoration and implementation actions linked to the Regulation's 2030 targets. These milestones include restoring at least 30% of degraded freshwater-related habitats under **Article 4** and preventing net loss of urban green space under **Article 8.**

Implementing authorities could use digital catchment screening during the planning phase to identify high-risk overflow hotspots and prioritise areas where NbS can deliver the greatest stormwater mitigation benefits.

Recommendation 2: Overcome Institutional Silos by Using Integrated Water Governance

NRR Articles 14 and **15** require Member States to prepare NRPs that outline implementation measures, financing arrangements, and coordination with other relevant planning frameworks.

To strengthen implementation capacity, national authorities could align planning, financing, and infrastructure governance processes across departments and agencies to support more coordinated urban water restoration and multifunctional green infrastructure planning.

Case Study 1: Targeting Nature-based Solutions Through Watershed Modelling

The NICHES project combined surface runoff and drainage-network modelling to identify urban areas with elevated stormwater and sewer overflow risks. Using the InVEST and BATT models, researchers identified runoff hotspots and sewer outlets with frequent overflows, demonstrating how spatially explicit modelling can support strategic urban water planning and the targeting of NbS such as bioswales and urban wetlands.

Case Study 2: Using Transition Pathways to Support Integrated Water Governance

NICHES examined governance barriers affecting the implementation of NbS across multiple cities. Through stakeholder workshops, policy analysis, and the SETS framework, the project identified how fragmented governance structures can limit coordination between water management, urban planning, and public green-space investment. To address these challenges, the project co-developed **transition pathways** to support more integrated urban water governance.

Benthemplein Water Square in Rotterdam Functions as Both a Football Court and a Stormwater Retention Basin (© De Urbanisten, 2013)

Figure 2 - Recommendations for the Delivery and Assessment of First Major Restoration Targets phase

Delivery and Assessment of First Major Restoration Targets (2-6 years / 2028 – 2032)

Recommendation 3: Integrate Habitat-Diverse Design Requirements into Urban Water and NbS Projects

NRR Article 15 requires Member States to include implementation arrangements and long-term planning considerations within their NRPs. This is important for supporting the long-term delivery of urban ecosystem objectives under Article 8.

Implementing authorities could require that urban water and NbS projects incorporate habitat heterogeneity, including varied vegetation structure, shallow and deep-water zones, naturalised banks and hydro-regimes.

Case Study 3: Designing Biodiversity-Supporting Aquatic NbS

The BiNatUr project assessed 60 urban aquaNbS across five European cities to examine how habitat design influenced biodiversity outcomes. Surveys recorded 103 aquatic plant species and showed that uniform systems with limited habitat variation often supported lower ecological quality and species diversity. The project demonstrated how varied substrates, naturalised banks, and heterogeneous vegetation can support broader urban biodiversity.

Image: Fish Ladder in an Urban Setting

Figure 3 - Recommendations for the Review and Revision Cycle, Scaling and Preparing for 2040/2050 Targets phase

Review and Revision Cycle, Scaling and Preparing for 2040/2050 Targets (6+ years / 2032 Onwards)

Recommendation 4: Deploy Multi-Tracer Testing to Monitor Urban Water Resilience

Pursuant to **NRR Article 20** and **Article 21**, Member States must monitor and report restoration progress every six years from 2031 onwards.

Environmental agencies could adopt integrated multi-tracer monitoring approaches capable of generating more comprehensive ecological data across urban freshwater systems to strengthen NRR monitoring and reporting.

Case Study 4: Testing Water Health Using the Multi-Tracer Approach

BiNatUr applied an integrated monitoring framework across urban aquatic NbS sites in Antwerp, Berlin, Helsinki, Lisbon, and Poznań, assessing habitats, vegetation, macroinvertebrates, microbes, hydrology, and water quality. Using stable isotope analysis and environmental DNA (eDNA), the project demonstrated how eDNA can support biodiversity assessment and continuous monitoring of urban freshwater ecosystems, strengthening ecological assessment and long-term

Recommendation 5: Use Integrated Planning Frameworks to Support Long-Term NbS Implementation

NRR Article 9 and Article 15 support more coordinated approaches to river restoration, infrastructure planning, and long-term implementation within NRPs.

Authorities can incorporate integrated planning and assessment approaches into infrastructure renewal and long-term urban water management processes. This can support more coordinated and resilient green-grey infrastructure planning over time.

Case Study 5: Comparing Grey Infrastructure and NbS Pathways

The NICHES project used watershed-scale scenario modelling to compare conventional grey infrastructure with alternative NbS pathways across urban catchments. By assessing impacts on stormwater runoff, nutrient loading, and water resilience under different development scenarios, the project demonstrated how integrated green-grey approaches can support long-term infrastructure planning and decision-making.

Link to sources

BiNatUr
NICHES

Scientific publications used in this policy brief can be found in the Information Sheet of this briefing down-loadable from: **www.biodiversa.eu/policy-briefs**

Photos:
pg 1 (header) - Hamburg, Germany
2025, by 1912196525 via iStock
pg 2 - Benthemplein, Rotterdam, The Netherlands
2013, by De Urbanisten via Architectenweb
pg 3 - Fish ladder, Location Unknown
2019, by Ralf Geithe via iStock

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About this Policy Brief

This Policy Brief is part of a series aiming to inform policymakers involved in the implementation of the Nature Restoration Regulation with policy recommendations based on the results of the BiodivRestore funded projects.

The series of Biodiversa+ Policy briefs can be found at www.biodiversa.eu/policy-briefs/.

This publication was commissioned and supervised by BiodivRestore and produced by Eli Morrell (Nature^Sqaured) and Iris Visser (Nature^Sqaured) with support of Cloé Durieux and Julie de Bouville, designed by Kelly Hartholt.

The key research results presented were co-drafted and validated by coordinators from the BiodivRestore funded projects BiNatUr and NICHES.

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Co-funded by the European Union under Grant Agreement 642426

MIX Paper from responsible sources FSC® C019064

Produced in June 2026