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HRB-D4RUNOFF-WATERUN-STOPUP

Innovative urban water runoff management across Europe

Policy Brief

HORIZON RESULTS BOOSTER

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Executive Summary

The collaborative efforts of D4RUNOFF, WATERUN and STOPUP have been instrumental in addressing the growing challenges of urban water runoff management across Europe. Through their complementary expertise, these projects have developed innovative monitoring technologies, sustainable infrastructure solutions, and actionable policy recommendations to reduce pollution and improve water resilience.

This policy brief combines the innovative approaches of the three projects, that have come together under the umbrella of Horizon Results Booster programme (HRB) of the European Commission to jointly disseminate results that help tackle key challenges and offer recommendations on sustainable urban water management and pollution control.

The insights presented in this policy brief, which were showcased during a collaborative webinar held on September 18, 2024, on World Water Monitoring Day, provide a comprehensive framework to guide future water management policies. This brief outlines the current policy landscape, key challenges, and actionable recommendations to inform decision-making and foster sustainable urban water management practices.

These recommendations lay the groundwork for effective water management frameworks and policies that can be scaled across European urban environments.

1. Topic Overview

Rapid urban growth across Europe has led to the replacement of natural landscapes with impervious surfaces, such as roads, parking lots, and rooftops. This artificial land cover prevents water from seeping into the ground, causing rainwater to accumulate and flow rapidly through urban areas.

As this runoff flows across city surfaces, it picks up pollutants from roads, rooftops, and industrial zones, including plastics, pesticides, chemicals, and hydrocarbons. These pollutants are carried into rivers, lakes, and coastal waters, posing risks to ecosystems and human health.

1.2 Managing Urban Water Runoff: a Holistic Solution

Urban water runoff (UWR) is increasingly recognised as a critical environmental challenge, as pollutants carried by runoff pose significant threats to ecosystems, human health, and water resources.

Urban water runoff management requires a multifaceted approach that integrates monitoring, prevention, and mitigation strategies, with a focus on both technical solutions and stakeholder collaboration.

The problem is further exacerbated by aging sewer systems that are not equipped to manage large volumes of stormwater, particularly during intense rainfall events. In many cities, heavy rain can overwhelm combined sewer systems, causing untreated water to overflow into natural water bodies. Climate change adds another layer of complexity, with extreme weather patterns alternating between droughts and intense precipitation, increasing both flood risks and pollution.

Another crucial consideration is pollution at the molecular level, particularly Contaminants of Emerging Concern (CECs), such as microplastics, pharmaceuticals, and endocrine disruptors. These pollutants are difficult to detect and are often overlooked in traditional water management practices. Addressing this issue requires a multifaceted approach to urban water runoff management—one that integrates cutting-edge technology, nature-based solutions, and collaborative policy frameworks to ensure sustainable and resilient water management.

1.3 Policy challenges

Urban water runoff management presents several policy challenges that require urgent attention. One key challenge is the lack of integrated frameworks that address both pollution control and flood management simultaneously. Existing regulations often focus on either water quality or flood prevention, resulting in fragmented approaches that fail to tackle the full complexity of urban runoff.

Moreover, outdated sewer systems and drainage infrastructure are struggling to cope with increasing urbanisation and the impacts of climate change, such as more frequent and intense rainfall events. This leads to issues like combined sewer overflows, where untreated stormwater mixed with sewage is discharged into rivers and lakes, posing risks to both ecosystems and public health.

Another challenge lies in monitoring and regulating CECs, such as pharmaceuticals, microplastics, and endocrine disruptors, which are not adequately covered by current water regulations. The identification and tracking of these pollutants require advanced technologies, yet many cities lack the financial resources and technical capacity to implement them.

Additionally, policy frameworks often do not promote the widespread adoption of Sustainable Urban Drainage Systems (SUDS) and Nature-Based Solutions (NBS), despite their proven benefits in reducing pollution and enhancing urban resilience.

Collaboration across sectors—such as water management, urban planning, industry, and agriculture—remains limited, leading to misaligned policies and missed opportunities for coordinated action.

To address these challenges effectively, policymakers need to adopt more holistic approaches, streamline regulations, and ensure that infrastructure investments and pollution control measures are aligned with climate resilience goals.

2. Recommendations

The following recommendations address key policy actions needed to improve urban water runoff management

2.1 Promote Sustainable Urban Drainage Systems (SuDS) and Nature-Based Solutions (NBS)

Encouraging the widespread adoption of SuDS is essential for effective stormwater management. Innovative materials and designs, such as the shell-filled systems successfully implemented by the WATERUN project in the Santiago de Compostela case study, demonstrate how runoff from industrial areas can be treated efficiently before entering natural water bodies. These systems prevent flooding while filtering pollutants, showcasing the potential of modern stormwater solutions. In parallel, greater investment in Nature-Based Solutions (NBS) is needed. Wetlands, permeable pavements, and vegetated swales offer dual benefits by reducing runoff and filtering out contaminants while also enhancing urban resilience to heavy rainfall events and promoting biodiversity. Together, SuDS and NBS present practical ways to address both the quantity and quality aspects of urban water runoff.

2.2 Adopt Risk-Based Decision Support Systems (DSS)

The integration of DSS tools into stormwater planning processes is essential to assess both environmental and public health risks. These tools enable water management stakeholders to make informed decisions regarding stormwater reuse, pollution control, and infrastructure investments. Moreover, involving stakeholders through collaborative workshops ensures that the tools are practical, user-friendly, and aligned with the needs of the communities they serve. Continuous development and funding are critical to refining DSS tools and keeping them relevant to real-world challenges. Policymakers must ensure that these systems evolve in tandem with shifting environmental needs, regulatory changes, and market demands to optimise stormwater management outcomes.

2.3 Foster Multi-Stakeholder Collaboration for Sustainable Water Management

Achieving sustainable water management requires strong collaboration across sectors. Municipalities, research institutions, and private companies must work together to design and implement innovative stormwater solutions. Collaborative partnerships promote knowledge exchange and ensure that research-based solutions, such as those developed through D4RUNOFF, WATERUN and STOPUP, are scalable and adaptable to local needs. Facilitating the exchange of best practices across European cities is equally important. This will allow cities facing similar challenges to replicate successful strategies, fostering a more unified and effective approach to urban water management across the continent.

2.4 Strengthen Monitoring and Regulation of Contaminants of Emerging Concern (CECs)

Addressing Contaminants of Emerging Concern (CECs), such as microplastics, pharmaceuticals, and endocrine disruptors, requires strengthening both monitoring efforts and regulatory frameworks. Aligning the REACH framework with urban water management policies and extending producer responsibility to reduce harmful additives in products will help curb pollution at its source. At the same time, digitalising pollution monitoring systems through the use of in-line sensors and smart sampling technologies will improve the tracking of pollutants and enhance data comparability across regions. These steps will ensure that cities are better equipped to detect, monitor, and address pollutants that pose risks to human health and ecosystems.

2.5 Modernise Urban Sewer Systems to Handle Increased Runoff

Aging sewer systems are not capable of managing the growing volumes of stormwater resulting from urbanisation and climate change. Upgrading these systems with advanced filtration technologies is essential to reduce pollutants entering natural water bodies. Future sewer infrastructure should be pollutant-targeted, capable of capturing both visible contaminants and microscopic pollutants like microplastics. Furthermore, aligning sewer upgrades with the revised Urban Waste Water Directive (UWWD) will ensure that new systems incorporate green infrastructure elements and innovative treatment methods. Modernising urban sewer systems is a crucial step in preventing untreated overflow events and safeguarding water quality.

2.6 Implement EU-Wide Urban Runoff Water Quality Management Plans (URUQ-MAPs)

The development of standardised Urban Runoff Water Quality Management Plans (URUQ-MAPs) across Europe will provide a consistent framework to manage stormwater and address diverse environmental challenges. These plans should be designed to account for varying urban, climatic, and demographic contexts, ensuring they are applicable across different regions. Incorporating Decision Support Systems (DSS) in the planning process will allow cities to identify the most suitable treatment technologies and implement solutions that are both cost-effective and environmentally sustainable. With the goal of having these plans fully operational by 2030, URUQ-MAPs will serve as a critical tool for promoting water resilience and achieving long-term environmental goals across the EU.

3. Project Group

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