Water runoff

Concept

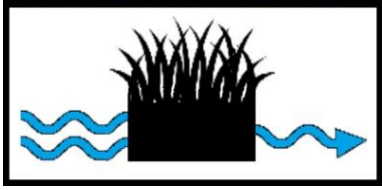
Urban flooding caused by intense or prolonged rainfall which exceeds the capacity of the drainage system is a major challenge in towns and cities across Europe. There has been a shift in how urban areas perceive and manage surface water, moving from one of engineered 'flood defence' to one of 'flood resilience'. At the heart of the flood resilience approach is the use of Nature-based Solutions (NBS) and associated sustainable drainage principles. These are deployed to attenuate, infiltrate, store and re-use surface water - replicating natural hydrological processes. In the three frontrunner cities (Manchester, Valencia and Wroclaw) **NbS** features were deployed to manage surface water runoff - see table below.

Key data

Three Key Performance Indicators (KPIs) were selected to assess the role of the NBS demonstration projects in reducing runoff in the three frontrunner cities. These were: 1) reduction in peak flows, 2) reduction in total volumes, and 3) the rainfall-runoff coefficient. Key characteristics of NBS deployment and associated runoff monitoring is shown in the table below.

	NbS features monitored	Monitoring period	Rainfall-runoff events captured
Manchester	Swale (3)	2/6/20 - 12/6/22	135
	Raingarden (2)	2/6/20 - 12/6/22	104
	Tree pit (1)	2/6/20 - 12/6/22	4
Valencia	Infiltration basin (1)	19/11/21 - 3/5/22	3
	Infiltration trench (1)	19/11/21 - 22/3/22	3
	Permeable paving (1)	26/7/21 - 3/5/22	15
	Filter strip (1)	26/7/21 - 3/5/22	15
Wroclaw	Retention ditch (1)	30/1/22 - 30/7/22	3

The hydrological monitoring carried out in the frontrunner cities has provided strong evidence for the ability of NBS features to reduce urban runoff. Summary data for comparable NBS features is shown in the schematic below, representing hydrological performance for the swales (Manchester), infiltration basin (Valencia) and retention ditch (Wroclaw).



	Man	Val	Wro
Volume reduction (%)	99.6	100	70.2
Peak flow reduction (%)	99.5	100	-
Runoff coefficient	0.001	0	0.29

Lessons learned

Well-designed and well-delivered NBS interventions are effective in reducing the frequency, rate and volumes of runoff. Integrating hydrological monitoring requirements within the design and construction of NBS features needs careful planning and supervision. Acquiring robust hydrological evidence for NBS performance and efficiency is time consuming and challenging, especially in complicated urban contexts where a variety of non-climatic factors may have an influence. Hydrological performance of NBS is impacted by the maintenance and management of the features. Like all urban drainage systems, NBS features deployed in the context of water management should be routinely inspected and regularly maintained. This ensures efficient operation and optimum hydrological performance. The maintenance and management of NBS should include *all* components of the scheme deployed.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement number: 730283.
The project will run from June 2017 – November 2022.