Catherine Wilson
Guest Editor

Ellis Penning
Guest Editor

Angelos Findikakis
Hydrolink Editor

# EDITORIAL

## Nature-based Solutions for flood and Water Management in a Climate Change

Techniques that use nature to reduce runoff and floods, reduce soil erosion, 'slow the flow' and retain water within the landscape have been used by civilisations for thousands of years for managing water for consumption, washing, and improving agricultural production for food security. This includes the use of forests, trees, hedges, terraces, swales, ponds, and (constructed) wetlands to attenuate runoff, enhance infiltration, and control flow. In addition, coastal ecosystems such as mangroves, salt marshes, corals, oyster reefs, and dune systems provide coastal flood defence systems. Such approaches where ecosystems provide important roles in water management can therefore be considered the earliest types of Nature-based Solutions.

In the last twenty years terms such as Natural Flood Management, Green Infrastructure, Sponge Cities, Natural Water Retention Measures, Building with Nature, and Engineering with Nature have become common descriptions to express actions taken to provide flood and drought protection and reduce soil erosion. The focus of such schemes is on the benefits that nature may provide for humans[1]. In 2022, the 19[2] member states of the United Nations Environmental Assembly agreed on a singular definition of Nature-based solutions (NbS), which they defined as: 'actions aimed at protecting, conserving, restoring, and sustainably managing natural or modified terrestrial, freshwater, coastal, and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits'[2]. This definition is noteworthy as it balances the protection and conservation of nature, with the human benefits such schemes can bring.

This edition of Hydrolink brings to you a taste of different Nature based Solutions employed for flooding, droughts and water management from around the world, ranging from examples in upstream catchments and streams, large rivers, urban areas, and coastal zones. It is written by members of the IAHR NbS Working Group which was established at the 39th IAHR Congress in Granada (Spain) in 2022 which is rapidly growing and gaining momentum, with presence not only during the World Congresses, but also in other IAHR conferences such as the RiverFlow 2024 conference in Liverpool and the ISEH 2024 in Aberdeen. In all of these events we aim to bring together people with a shared passion to find solutions in flooding, drought and water management related problems in a sustainable way, working with nature rather than against it.

This edition comprises of six articles, five of which focus on their use in wetland, riverine and coastal settings, and illustrate their potential effectiveness to provide flood and drought resilience to communities while providing a plethora of other environmental and societal benefits. The examples given in these articles show that care needs to be given to good monitoring and modelling for a sound understanding of the functioning of these measures under a wide variety of hydrometeorological events. An essential ingredient of what makes a scheme successful is the involvement of all stakeholders in its co-design and adoption. The sixth and final article focuses on the role and benefits of community involvement in a scheme in South-West Uganda for managing drought and providing food security in agricultural production. One thing we, as a community of researchers and practicing engineers can further improve on is a wider more integrated assessment of all types of proposed measures, both green and grey, on their impact on co-benefits such as biodiversity, water quality, socio-economic aspects, and human well-being. Even in the stories in this Hydrolink we notice this is still frequently lacking. Furthermore, monitoring and evaluating all aspects of NbS and grey measures is challenging and requires interdisciplinary teams, yet this should not keep us from doing it, as working together will bring a greater breadth of view. For instance, considering biodiversity and human well-being impacts will make NbS schemes more desirable compared to the current practice where civil engineering measures are typically optimized based on one goal, which is the economics, and more specifically the monetised benefits from the damages that have been avoided due to the scheme.

The IAHR Singapore Congress in June 2025 will feature multiple sessions on Nature based Solutions as a formal part of the conference programme for the first time bringing the topic outside of the special sessions domain, and into the domain of 'regular' sessions. These sessions will bring new valuable insights of system functioning and help build a quantitative evidence base on objective information. In addition, there will be many other NbS events including a Masters' Class on Nature-based Solutions for early stage researchers, a workshop on stakeholder engagement and a technical visit to Bishan Park where urban NbS have been implemented.

We are super excited about the new scientific and engineering insight that the IAHR Community can bring to the NbS domain and we hope to see you in Singapore or at any of the other future IAHR conferences and events.

1 | Nesshover C. *et al.* (2017). The science, policy and practice of nature-based solutions: An interdisciplinary perspective. Sci. Total Environ. http://dx.doi.org/10.1016/j.scitotenv.2016.11.106

2 | UNEA-5 (2022). https://www.unep.org/environmentassembly/unea-5.2 accessed 07/12/2024