

Nature-based solutions implementation: barriers and enablers

Freins et moteurs au développement de solutions fondées sur la nature

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RÉSUMÉ

Dans le secteur de l'eau, les solutions fondées sur la nature sont de plus en plus reconnues comme des solutions permettant de relever les défis sociétaux, tout en offrant simultanément des avantages en termes de bien-être humain et de biodiversité. Ces solutions contribuent à l'atténuation et à l'adaptation climatique, à l'augmentation de la résilience des villes face aux inondations, à la réduction de la pollution, à la restauration de la biodiversité et à la fourniture de services écosystémiques. Cependant, leur mise en œuvre reste lente pour plusieurs raisons. Tout d'abord, le concept est encore récent, relativement inconnu pour de nombreux acteurs de l'eau, ce qui nécessite des efforts plus approfondis pour généraliser leur adoption. En outre, leur fiabilité, leur rentabilité et leurs performances à long terme suscitent des inquiétudes. Parallèlement à ces préoccupations, il existe des obstacles financiers et de gouvernance, et également des barrières techniques. Dans cette communication, nous consolidons la définition des solutions fondées sur la nature par rapport aux infrastructures connexes, telles que les systèmes naturels, verts ou hybrides, et nous synthétisons les connaissances liées à la recherche et aux résultats opérationnels de la mise en œuvre à grande échelle de solutions de gestion de l'eau basées sur la nature, dans le but d'identifier les avantages mais aussi les inconvénients potentiels et les exigences de mise en œuvre. Enfin, nous présentons les moyens de surmonter les obstacles identifiés et les recommandations de recherche attendues dans les secteurs de la gouvernance de l'eau et de la planification urbaine.

ABSTRACT

In water sector, nature-based solutions (NBS) are increasingly recognized as solutions to address societal challenges, while simultaneously providing human well-being and biodiversity benefits. NBS contribute to climate mitigation and adaptation, to increase flooding resilience of cities, reduce pollution, support biodiversity restoration, and enable ecosystems services provision. However, the implementation of nature-based water management solutions remains slow for several reasons. First, NBS are still novel concept, relatively unknown for many water-related stakeholders, necessitating more insight efforts to generalize their adoption. Moreover, concerns exist over their reliability, cost-effectiveness, and their long-term performance. Alongside those concerns, financial and governance barriers to implementing NBS exist, exhibiting additional needs for further research. Least but not last, technical barriers can also represent impediments in NBS implementation. In this communication, we consolidate the NBS definition comparatively to related infrastructures, such as natural, green or hybrid systems and synthesize the knowledge related to research and operational outcomes from full-scale implementation of nature-based water management solutions with the aim to identify delivered benefits but also potential drawbacks and requirements for a successful implementation. At the end, the ways to overcome the identified barriers and research recommendations are presented with the aim to foster the NBS implementation within water governance and urban planning sectors.

KEYWORDS / MOTS-CLÉS

Infrastructures vertes, systèmes hybrides, lacunes dans les connaissances, SFN, recommandations
Green infrastructures, hybrid systems, knowledge gaps, NBS, recommendations

1 INTRODUCTION

The International Union for Conservation of Nature (IUCN), defines nature-based solutions (NBS) as “actions to protect, sustainably manage and restore natural or modified ecosystems, which address societal challenges (e.g. climate change, food and water security or natural disasters) effectively and adaptively, while simultaneously providing human well-being and biodiversity benefits” (Cohen-Shacham et al. 2016) (Figure 1). According to the European Commission, NBS are “Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions” (European Commission 2016). While IUCN definition seems restricting the concept of NBS to solutions powered by functioning ecosystems, the EU definition allows for solutions which are inspired and supported by nature; therefore, broadening the range of solutions from mainly functioning ecosystems (as per IUCN definition) to other solutions assisted by living systems. In addition, the term “inspired” could open up to solutions that not only utilize living systems, but are inspired by some natural principles or mechanisms.



Figure 1. Nbs as an umbrella term for ecosystem-related approaches (from Cohen-Shacham et al. 2016)

The implementation of nature-based water management solutions remains rather slow for several reasons, such as insufficient capacity building, concerns over reliability, cost-effectiveness, and resilience to climate change, and financial and governance barriers among others. In this presentation, we consolidate the NBS definition comparatively to related infrastructures, such as natural, green or hybrid systems and synthesize the knowledge related to research and operational outcomes from full-scale implementation of nature-based water management solutions with the aim to identify delivered NBS benefits but also potential drawbacks and requirements for a successful implementation. At the end, we present the ways to overcome the identified barriers and research recommendations with the aim to further foster the NBS implementation within water governance and urban planning sectors.

2 NBS AND HYBRID & GREEN INFRASTRUCTURES

NBS refers to various approaches that are not all novel (Figure 2). In fact, multiples were already used in the field under the names “blue-green infrastructures” or “ecosystem services” (O’Sullivan et al., 2020). However, the NBS concept enables a re-imagining of these approaches in a manner that makes them more practical for urban governments that need to demonstrate their success. Concerning how NBS are defined and perceived, the numerous definitions bring richness but also complexity. In general, actions considered as NBS need to be context specific, tailored for local societal and environmental conditions, include broad participation of stakeholders, are based on the theory of change, iterative learning and adaptive management approach, are financially balanced

between costs and benefits and monitored at landscape scale not as a single “point” scale intervention (Sowinska-Swierkoz & Garcia 2022). For example, in water sector, NBS encompass the blue-green infrastructure, ecological engineering, and all the terminology related to stormwater control measures such as Sustainable Urban Drainage System, Low Impact Development, Best Management Practices, Water Sensitive Urban Design, etc. (Fletcher et al., 2015). However, all on the condition, that such infrastructure provide benefits for the human population and the nature, and that it addresses societal challenges.

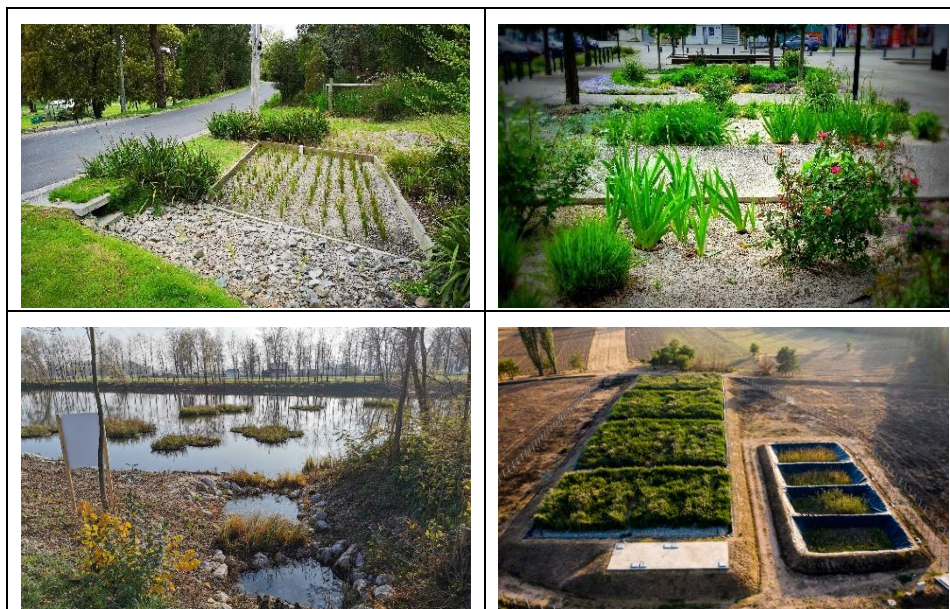


Figure 2. Example of NBS in the water sector: (a) a swale for stormwater management in Melbourne, Australia – F. Cherqui; (b) raingarden in Lyon, France – F. Cherqui, (c) floating islands to improve the water quality in eutrophic systems in Križevci, Slovenia – Limnos; d) wastewater treatment in Karbinci, Slovenia – Limnos).

The benefits of NBS can be categorized as water-, nature-, or people-related. The water related benefits are for example directly associated with water, and include flood mitigation, drought and flood resilience, water treatment, water storage and reuse, and groundwater and surface water quality while the nature related benefits are associated with the environmental features of soil, air, and vegetation, and include infiltration, biodiversity, and soil quality. NBS can for example slow the runoff and store stormwater, which reduces downstream flooding; and can be used in combination with grey infrastructure. To overview, NBS can help in closing water loops, by providing safe water source, improving carbon sequestration and increasing biodiversity (Brill et al., 2021).

3 THE WAYS TO OVERCOME THE IDENTIFIED BARRIERS

In order to overcome the existing technical and non-technical barriers, different instruments and approaches such as regulation, economic/fiscal incentives, capacity building, dissemination and awareness rising need to be introduced. One of the very important approaches is development and implementation of performance indicators to measure NBS impact and effectiveness. Moreover, these findings need to be shared among individual cases through common tools such as common databases. Education, capacity building and multiple stakeholder involvement with initiation of multi-stakeholder dialogue during planning, implementing and operating of NBS is also very important for successful NBS implementation. Mobilising and informing of all stakeholders, politicians and local communities from the start is necessary for overcoming institutional and socio-cultural barriers. Proper and suitable multipurpose NBS solutions need to be found for individual contexts. Very important is cross-sectoral collaboration and engagement on a European level for establishing dialogue channels between different sectors, by this NBS can contribute significantly in achieving sustainability, adapting to climate change, tackling many challenges including urbanization and also supporting the Green Deal. Crucial is also providing more funding opportunities through European collaboration to upscale the NBS projects and ensure the expansion of NBS implementation. Lastly but not less important, involvement of private sector through

legislative, market and social aspects, can enhance the NBS implementations, as well as enlightening the innovation angle of NBS which can attract young professional and other talents from different sectors and lead to boosting of this sector.

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