



Flood Risk Mitigation – The Case for a Hybrid Approach

KEY POLICY MESSAGES

- While nature-based approaches are gaining traction in policy and funding priorities within the European Union and beyond, their implementation is complex.
- Combining nature-based, grey, and hybrid flood risk measures can often offer the most effective mitigation of flood risk.
- To fully understand the benefits of various flood mitigation measures, their effectiveness, feasibility, and acceptability must be assessed in real-world settings throughout each project's lifecycle to inform future projects.

■ Brdnikova flood retention reservoir in Ljubljana, Slovenia © Nejc Bezak

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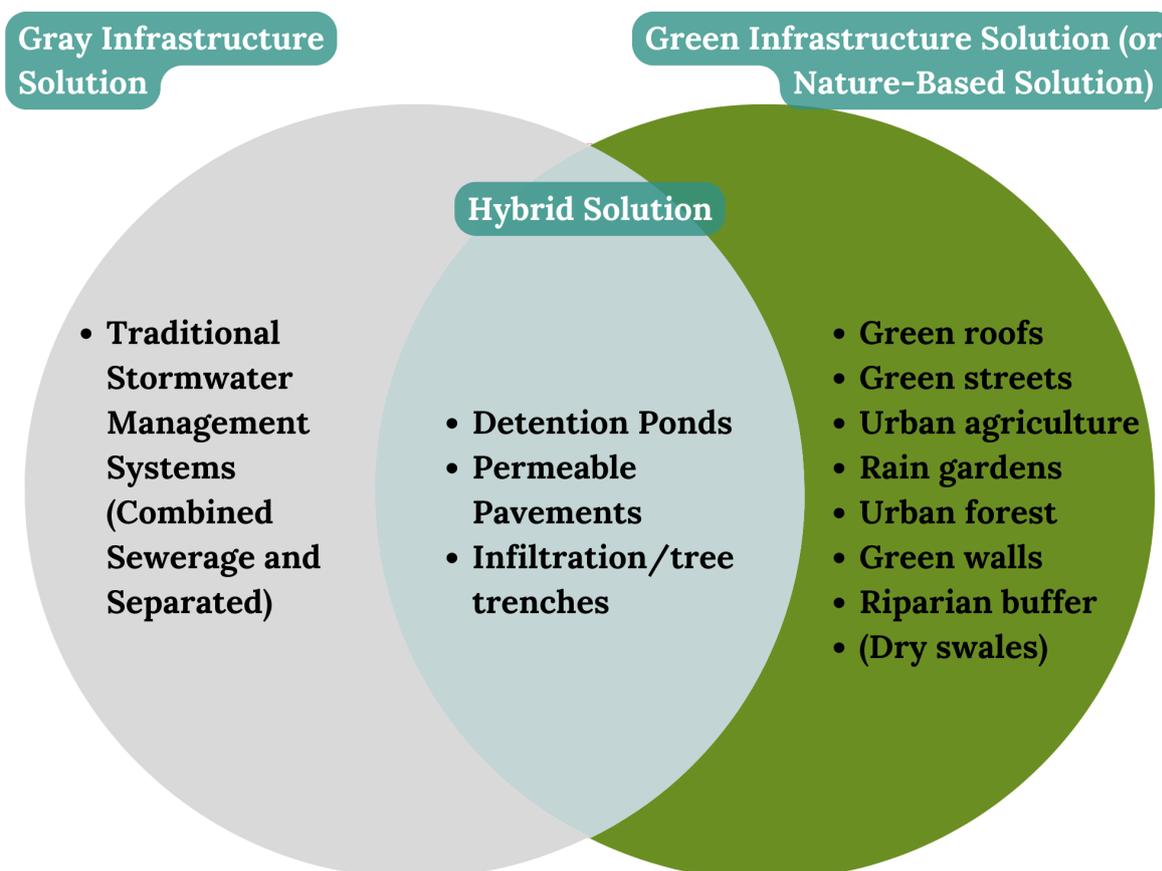
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Climate change is significantly changing the frequency, magnitude, and seasonality of floods, requiring different types of mitigation measures.

Traditionally, grey infrastructure solutions such as dams have dominated in controlling flood risk by relying on artificial components and mechanical infrastructure. However, over the past two decades, nature-based approaches (i. e. “green” infrastructure) that are inspired by, supported by, or copied from nature have risen in popularity for their co-benefits and cost-effectiveness. More recently, hybrid measures combining grey and nature-based elements are emerging, though the boundaries between these measures can blur.

The effectiveness, feasibility, and acceptability of green, grey, and hybrid flood risk mitigation measures vary, and framing these solutions too simply can distort our understanding of how each works in implementation. For example, in some cases, the nature-based approaches provide only limited flood risk reduction, such as during catastrophic rainfall events.

However, while the boundary between these measures is blurry, the current funding schemes continue to promote projects that explicitly involve nature-based approaches. This can be illustrated by the number of calls opened by the EU Funding and Tenders Portal and by the increasing number of nature-based projects globally.



■ Source: Adapted from the information in Eraz et al. 2024

For the purposes of this policy brief, nature-based solutions are treated synonymously with green infrastructure. While distinctions exist in other contexts (i.e., classifying green infrastructure as a type of nature-based solution), this brief uses the terms interchangeably for clarity and consistency.



THE NEED FOR A NUANCED APPROACH TO HAZARD MITIGATION

Real-world challenges often require a more nuanced approach that enables the design of context-sensitive, complex measures. In some contexts, such as densely urbanized landscapes, green measures can be more feasible for spatial planning. However, local communities may find these to be more effective and acceptable when combined with hybrid and grey solutions. Hybrid measures may offer advantages by addressing uncertainties about future hazard frequency and accommodating customized institutional arrangements at different sites.

PERCEPTION AS A DETERMINING FACTOR FOR UPTAKE OF NATURE-BASED APPROACHES

Bezak et al. (2024) found that institutional and sociodemographic factors significantly shape public perceptions of different types of flood risk measures. In their study, respondents across three European countries viewed conventional grey measures like dams and cisterns as more effective and acceptable but harder to implement. In contrast, green and hybrid measures were seen as more feasible and less expensive, though less effective and acceptable. This persistent preference for grey measures highlights the need for tailored communication strategies and policy recommendations, addressing country-specific perceptions of each measure's effectiveness and acceptability. The study also found a link between the perceived effectiveness and acceptability of different measures.

■ Brdnikova flood retention reservoir in Ljubljana, Slovenia © Nejc Bezak

RECOMMENDATIONS

CLARIFY THE COMPOSITION OF HAZARD MITIGATION PROJECTS

Public funding agencies should require hazard mitigation projects to disclose the proportion of nature-based, grey, and hybrid components in their design, and provide a clear justification for each choice. Over-framing projects as nature-based can limit our understanding of the individual and combined effects of these measures, potentially skewing expectations and decision-making.

AVOID MISCHARACTERIZING FLOOD RISK MITIGATION MEASURES

Projects should avoid mischaracterizing grey or hybrid measures as nature-based or green just to secure funding. This misrepresentation can distort perceptions of the effectiveness and feasibility of different measures.

Framing projects as predominantly nature-based may constrain our understanding of the effects of both the individual nature-based components and how they function in complex hazard mitigation projects.

IMPLEMENT EX-ANTE ASSESSMENTS AND EX-POST MONITORING

If proper ex-ante assessments of hazard mitigation aren't possible for nature-based solutions, we must determine whether they qualify as no-regret measures. Funded projects should be required to establish clear monitoring and reporting frameworks to track the effects of different measure combinations, focusing on their classification and impact on specific hazards (e.g., floods, soil erosion, and landslides). This will clarify the capabilities and limitations of nature-based approaches to improve future planning and decision-making.

Policy and funding priorities increasingly support nature-based approaches, but public perception does not always see them as the most effective. To determine when these approaches are best suited for flood risk mitigation, real-world evaluation and clear characterization are essential.



■ Flooded small village with residential houses © Pok Rie

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Authors

Lenka Slavikova
Pavel Raška
Nejc Bezak

IWRA Policy Briefs Editor

Jesse Ferraioli

IWRA Policy Briefs Coordinator

James E. Nickum

Layout

Agnieszka Krol