# An assessment of Nature Based Solutions (NBS) : A comparative case study from Scotland, Sweden, Belgium and the Netherlands

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## 1 Introduction

Nature Based Solutions (NBS, sometimes also denoted by Building with Nature (BWN)) aims at promoting nature as a source of inspiration to mitigate the impact of flooding whilst delivering other ecosystem services. Whilst the evidence for the effectiveness of NBS-measures is rising, at least at a local scale, scientific 'proof' that it can really work alongside or as an alternative to hard engineered solutions is still lacking. Hence, there is a need for a framework, or a set of guiding principles that can be used to assess the ability of these measures to tackle societal challenges, and to measure the added value of NBS. Such a framework could be used by governments to properly strike a balance between the complementary use of engineering solutions and NBS.

## 2 Aim and Method

The number of publications on NBS and related fields has rapidly increased over the last couple of years and is still rising. Although relatively new, "… the concept it represents is of vital and urgent significance" (editorials, Nature (541), 2017). There, it is also stated that: "… NBS will require the research community, its supporters and funders to answer a series of questions.".
There are several frameworks (principles, guidelines) for the assessment of (planning, evaluation, monitoring) NBS already available in literature. We want to conduct a literature survey to come to a list of common indicators that we can use to assess NBS that we encounter in the INTERREG North Sea Region Building with Nature project. Cases arise from Sweden, Scotland, The Netherlands and Belgium.

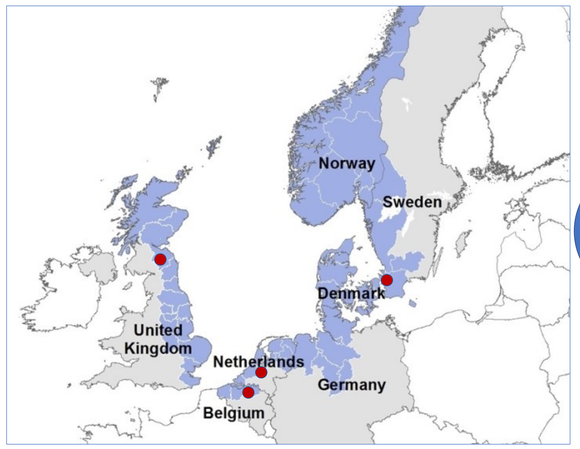
## Examples

**E1** **Example 1: Nesshöver et al. (2017)** They discuss five elements that are relevant to enabling effective and equitable development of NBS.
1. Dealing with uncertainty and complexity: e.g. through an adaptive management approach
2. Ensuring the involvement of multiple stakeholders
3. Ensuring the sound use of multi- and transdisciplinary knowledge
4. Developing a common understanding of multifunctional solutions, trade-offs and natural adaptation
5. Evaluating and monitoring for natural learning

**E2** **Example 2: Raymond et al (2017)** They have a slightly different approach and consider ten key societal challenges, and identify four elements needed to be incorporated into NBS design principles:
1. Understanding the environmental and socio-ecological context so that costs and benefits are valued
2. Design such that multiple interconnected challenges are addressed and hence take advantages of eco benefits
3. Implement NBS by learning by doing and use adaptive management in response to emerging risks
4. Manage, maintain, monitor and assess to navigate trade offs

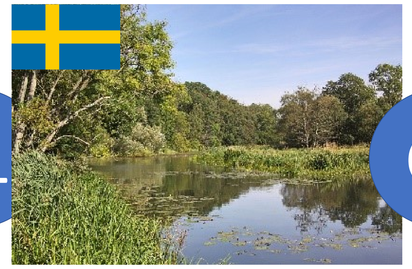
**E3** **Example 3: Weber et al (2017)** do not mention explicitly NBS but consider more general river restoration projects. They developed four goals and nine principles for monitoring and evaluation.
Goals:
1. Account for complexity, Uncertainty, and Long-term Change
2. Promote Collaborative Learning and Adaptation
3. Verify to What Extent Restoration Has Been Achieved
4. Identify why the Observed Effects were Present

In E1-E3, similar colours denote similar elements.




## Cases

**C1**



- Goal: Enhance natural values
- Measure: Wetland restoration and nature conservation
- Approach: Community involvement and education
- Scale: Small

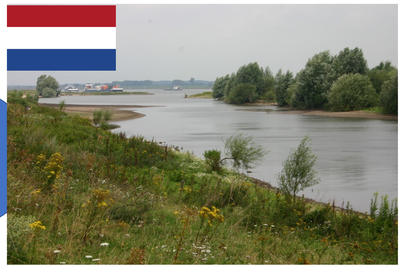
**C2**

- Goal: Flood protection and ecological improvement
- Measure: Tree planting, wetland creation, woody debris and re-meandering
- Approach: Stakeholder engagement, practical measures to achieve multiple benefits and associated monitoring
- Scale: small/intermediate

**C3**

- Goal: Flood protection
- Measure: River restoration (side channels)
- Approach: mitigate morphological effects
- Scale: Large

**C4**



- Goal: Flood protection
- Measure: River restoration (side channels)
- Approach: mitigate morphological effects
- Scale: Large

## 3 Conclusion and next steps:

Comparing existing frameworks will help to develop a list of key factors that may be used to assess NBS measures in various countries. Revealing successes and failures in the various countries may contribute to a scientific evidence base and design guidance to establish the multiple benefits of NBS across countries and geographical scales.

## R References

Christopher M. Raymond et al. (2017) A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas, In Environmental Science & Policy, Volume 77, Pages 15-24, ISSN 1462-9011, https://doi.org/10.1016/j.envsci.2017.07.008.

Carsten Nesshöver et al. (2017) The science, policy and practice of nature-based solutions: An interdisciplinary perspective, In Science of The Total Environment, Volume 579, Pages 1215-1227, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2016.11.106.

Christine Weber et al. (2017) Goals and principles for programmatic river restoration monitoring and evaluation: collaborative learning across multiple projects. WIREs Water, 5: n/a, e1257. doi:10.1002/wat2.1257

European Geosciences Union General Assembly 2018
Vienna | Austria | 8–13 April 2018

Interreg North Sea Region Building with Nature
European Regional Development Fund
EUROPEAN UNION