



Nature based solutions demand assessment framework

A catchment-oriented Policy Brief from the Interreg North Sea Region Building with Nature project by Rijkswaterstaat, The Netherlands

Key messages

1. There is emerging and repeated evidence that Building with Nature (BwN) can help to restore the natural environment providing co-benefits for people and wildlife
2. Rivers and their basins have been modified in the past. This has increased the risk of flooding which is exacerbated by climate change.
3. BwN helps mitigating flooding impacts, reducing both the level of flood risk and our dependence on engineered flood control structures
4. As the benefits of BwN are realised, more people are likely to see these benefits and request BwN to be implemented in their catchment. Monitoring the performance of BwN is required to demonstrate improved

flood risk management benefit and other benefits

5. BwN can help us to be resilient to climate change

Sense of Urgency

As a result of several centuries of river training in The Netherlands and Germany and the construction of dams in Germany, the Rhine river can be considered as a river system that is out of balance. As a response to the changes in the system, the river bed is degrading, which causes problems that are related to e.g. desiccation of the floodplains, associated ground water problems and navigation and the coverage of pipelines. Climate change adds to these problems, causing sea level rise and a changing discharge (both water and sediment) regime. Both lead to a further imbalance of the river system from morphological and hydraulic point of view.

The Room for the River programme (the construction of more than 35 projects that increase the discharge capacity and adds to improving what is called 'spatial quality' of the Dutch riverine landscape) can be considered as a good example of BwN-measures. These measures are not 'grey'. They are green (side channels, floodplain restoration, removing obstacles from the floodplains, etc.) perhaps with some grey elements.

Building with Nature in fluvial systems

To mitigate effects of increased discharge, one can use classical engineering measures, like reinforcing dikes or constructing dams for discharge regulation. These solutions, however, have little added values (co-benefits) with respect to increasing bio-diversity, adding to recreational purposes, improving navigation, adding to ecosystem services, etc. Building with Nature measures (also known as Nature-Based Solutions (NBS), Natural and Nature-Based features, Engineering with Nature, Natural Flood management Measures; we will use BwN and NBS interchangeably in this brief) have the ability to solve a particular problem (i.e. increased flood risk, or perturbed sediment balance) and, meanwhile, provide the co-benefits mentioned

above. Nature-based solutions are defined as the sustainable management and use of nature for tackling socio-environmental challenges.

Sediment nourishment in the river system to mitigate bed erosion is considered to be a NBS (because the sediment is distributed by the river itself), as are the creation of side channels, floodplain restoration, woodland planting and leaky/woody barriers. Not all NBS work in the same way: it depends on the location and the size of the catchment what NBS works well. In the headwaters, one typically wants to hold the flow, or slow down the flow. In the bigger rivers towards estuaries, one wants to increase the discharge capacity with e.g. side channels.

Both BwN measures (slowing down or increase the flow) have co-benefits with respect to ecosystem services and contribute to what people experience as a natural river. Also, this experience can be considered as a co-benefit. To assess the co-benefits, and hence to show that BwN works and indeed has added values, there is a need to set up appropriate assessment frameworks, with suitable indicators. To quantify the information in the assessment framework, long-term data-series (obtained by monitoring) are needed.

The importance of monitoring

The Gameren side channel system along the Waal River is an excellent example where long term data monitoring and modelling is used to get insight in the functioning of this floodplain. This enables the scientists to detect trends in the aggradation of the side channels, and determine time scales associated to the closing of the side channel. River managers can use that information for design, construct, operation and maintenance. There are, however, also many measures where the monitoring is absent, or only carried out for a limited number of years. This is very unfortunate and should be avoided, as it increases maintenance costs. Partly, this also applies to the Gameren system, where there is a gap in monitoring data of some years, which makes interpretation of developments in the field sometimes difficult.



We acknowledge that it is not about making a choice between grey or green measures. Grey solutions can be made more green (with associated co-benefits) and green solutions still might have grey engineering elements. With this Interreg NSR Building with Nature project, we have contributed to a science evidence-base that is needed to mainstream BwN solutions in national policy and investment programmes.



Lessons learned from the Interreg BwN project

Lesson 1: Effect of governance arrangements on the implementation of BwN solutions

In the Catchment work package of this BwN-project, different organisations around the North Sea are involved. They all manage fluvial systems with different scales, under different laws. Therefore, the governance-setting is different. In carefully comparing these settings, and see how laws are implemented and legislation is organized, how stakeholder involvement is arranged, and what role land-ownership plays, the different organisations learn from each other and become aware of pitfalls and success factors in the implementation of NBS.

Lesson 2: Need for an assessment framework with appropriate indicators

To provide an evidence base, it is needed that NBS can be compared to each other in an objective way. For that, an assessment framework with appropriate indicators is needed. The development of such a framework is not straightforward (what are the correct indicators, how to score them, what data is needed), but extremely important, because the application of the framework adds to the evidence base.

Lesson 3: Monitor!

Without data, projects cannot be evaluated and without that evaluation, it is hard to tell whether the goals that were agreed upon at the beginning of the project, have been met. Therefore, there is an absolute need to carefully log the process on the implementation of the measures and for long lasting monitoring plans to gather hydraulic and morphological, ecological and societal (i.e. awareness) data. This data can then also be used in the assessment framework.



Challenges

- a) There is a need for a tested assessment framework to compare BwN measures (that may differ in size and scale). An assessment framework is able to quantify the co-benefits of NBS. These are needed to provide the evidence that NBS are indeed an alternative with respect to (purely) grey engineering solutions.
- b) Constructing NBS without monitoring is useless. In that case, it cannot be shown that BwN indeed solves the issue (reduce flood risk, establish a balanced river system, etc.) and that there are added values (co-benefits).
- c) The scale and legislation sometimes make it difficult to carry out measures in the Rhine river. Implementation in a smaller stream is often easier and may act as a template for larger systems.
- d) Dare to implement without first having complete understanding of all the consequences, processes, risks and pitfalls.
- e) Learn from systems that differ in scale and location.

Policy recommendations

- i. Put effort in the construction of a tested and well-functioning assessment framework for BwN measures. An assessment framework is able to quantify the co-benefits of NBS. These are needed to provide the evidence that NBS are indeed an alternative with respect to (purely) grey engineering solutions.
- ii. Invest in long-term monitoring plans, whenever constructing BwN measures. The monitoring should be tuned to the indicators of the assessment framework.
- iii. Learn from the regional system. Experiences of smaller regional systems might be translated towards the bigger rivers and might lead to new insights and solutions.
- iv. Apply Learning-by-doing. The smaller catchments (or the tributaries to the larger rivers) are most suited for 'learning-by-doing' as application in bigger rivers is too risky due to navigation interests.
- v. Invest in transnational research and academic cooperation with case-studies in different catchments.

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