

A coastal management comparison of Nature-Based solutions for climate change resilience in the North Sea region

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1. Introduction

Coastal management along the sandy North Sea Region (NSR) coasts yields a variety of approaches; every nation or province has its own policy. Common in these approaches is the use of Nature-Based solutions (NBS), also known as Building with Nature (BwN) solutions. BwN solutions are implemented to be resilient for the effects of climate change, in specific sea level rise. This Building with Nature project has been granted by the European Union Interreg VB NSR and will last from 2016 up to 2020. The Interreg VB NSR BwN projects aims to make coasts more adaptable and resilient to the effects of climate change. The project will exchange transnational knowledge, provide lessons learned and develops an evidence base for BwN solutions in coastal risk management based on state-of-the-art (co)analyses in Sweden, Denmark, Schleswig-Holstein (Germany), Lower Saxony (Germany), the Netherlands and Flanders (Belgium). In addition, the project will elaborate on business case development and upscaling for coastal laboratories as well as natural catchments in the North Sea region.

In this paper we introduce the outline of the project, compare the current practices in coastal flood risk management and describe the methodology to be used in the project.

2. Coastal laboratories

Nine coastal laboratories have preliminary been selected along the North Sea region, shown in Figure 1. These (potential) sandy managed coasts make use of (pilot) Building with Nature solutions. Most attention will be paid to shoreface nourishments as well as BwN solutions like the use of Eelgrass to stabilize coasts and counteract coastal erosion.



Figure 1. Preliminary selected coastal laboratories. A: Ystad – Sweden, B: Danish West coast – Denmark, C: Sylt – Germany, D: Langeoog – Germany, E: Norderney – Germany, F: Ameland Inlet – Netherlands, G: Bergen-Egmond – Netherlands, H: Zandvoort – Netherlands, I: Oostende-Mariakerke – Belgium

3. Research steps

The first step of this research is to share and analyse current practices regarding BwN solutions in coastal flood risk management as is performed by Lodder & Sørensen (2015) on a smaller scale for a set of shoreface nourishments. The result is a matrix that describes a comparison of current practices, supported

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with a collection of factsheets of all current practices. The comparison shows the essential similarities and differences in the current approach of BwN solutions in coastal management per project partner. In addition, data factsheets on the availability of data per partner have been composed. The next step is to (co) analyse all coastal laboratories with a range of analyses (e.g. hydrodynamics, volume changes and design parameters) to investigate the behaviour of BwN solutions on coastal erosion. The analyses are to be performed using a shared methodology, reflect on shared defined common coastal state indicators and will contribute to the evidence base on the effectiveness of BwN solutions. The final result will be a NSR guidance document on the implementation of NBS projects with a focus on nourishments.

The sediment budget of the Waddensea is of great importance to the effectiveness of nourishments on the coasts adjacent to the Waddensea. During this project all relevant project partners will conduct research into sediment budgets by monitoring and analysing a tidal inlet. The analyses will contribute to a better understanding of the overall Waddensea sediment budget and is a first step in deriving the full sediment budget. The derivation of the full Waddensea sediment budget is outside the scope of this project.

4. Preliminary results

In Table 1, a snapshot of the comparison of current practices of all project partners is shown. All projects partners do have a flood risk reduction goal in coastal management. The underlying policy goals however are deviating as well as the choice to include NBS / BwN solutions. Full compensation of erosional losses is not common. In addition, the choice of which nourishment type will be applied is diverse. All partners have experience in applying beach nourishments. Shoreface nourishments are not commonly applied yet. An interesting similarity is the annual assessment of erosional hotspots. This will be further explored in the paper, as well as the monitoring criteria.

Table 1 - Snapshot overview comparison current practices. P(f) indicates the flood risk reduction standard expressed as an annual probability of an extreme event that a flood defence should be able to withstand. * Restricted by financial budget.

	Flood risk reduction goal	Policy goals (criteria)	Compensate erosion goal	NBS/BwN solutions in policy	Assessment cycle	Nourishment type (Beach and/or shoreface)
1. DCA (DK, central North Sea coast)	Yes	$P(f): \frac{1}{100}$, exceptional $P(f): \frac{1}{1000}$ (Hold the line)	Yes*	Yes	Annual	Both
2. LKN.SH (DE)	Yes	(Hold the line)	Partly	Yes	Annual	Both
3. NLWKN (DE)	Yes	Protect other functions (Hold the line and dune safety)	No	Yes	Annual	Beach
4. RWS (NL)	Yes	1) $P(f): \frac{1}{300}$ up to $P(f): \frac{1}{100,000}$ 2) Protect coastal functions (Hold the line)	Yes	Yes	Annual	Both
5. MDK (BE)	Yes	1) $P(f): \frac{1}{1000}$ 2) No fatal casualties allowed (Hold the line)	No	Yes	6 year cycle, Annual at hotspots	Beach and experimental shoreface
6. LST (SE)	No	Shoreline protection (Building prohibited within range coastal zone)	No*	No	-	Beach and experimental shoreface

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References

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