



### ***Opportunity mapping Interreg VB North Sea Region Building with Nature***

This map is one of the deliverables of Work Package 5 ‘Upscaling: business case development and opportunity mapping’. The objective of WP 5 is to: 1) show available methodologies for business case development and valuation; 2) provide guidance for BwN concepts to approach business case development; and 3) to demonstrate opportunities of BwN by giving good examples of business cases for BwN.

Based on the methodologies for business case development and lessons learned during the implementation of the BwN laboratories the consortium was also able to identify some potential locations in the north sea region for implementing nature based solutions. The background and methodology for identifying these locations is discussed in deliverable 5-3 *Discussion paper BwN opportunity mapping*.

Relevant documentation for this map:

<https://building-with-nature.eu/publications/finance-valuing-businesscase/>

- [Business case guidance](#)
- [Business case approach](#)
- [Discussion paper BwN opportunity mapping](#).

The locations are briefly clarified below:

## **The Netherlands**

### **Schiermonnikoog**

The North West coast of the island of Schiermonnikoog is slowly eroding. This is likely to cause issues for flood risk management within a couple of years. The question is how to mitigate this erosion so the flood risk protection levels can be met. The island of Schiermonnikoog has never been nourished by men. It has been receiving sediments from the outerdelta of the Zoutkamperlaag inlet due to the damming of the Lauwerszee in 1969. This effect has stopped about 20 years ago. The sediment reserves of the coast are diminishing quickly now. Primary goal is coastal erosion compensation and flood risk management reduction. Long term benefits for ecology are likely positive. However on the short term disturbance to the ecosystem are likely to prevail over this.

### **Lauwersmeerdijk**

The primary goal is to gain foreland which reduces the wave conditions during high water conditions. By this the next moment of strengthening the dike can possibly be extended. It is important that the foreland can follow the sealevel rise to maintain its impact. This can be done by using the same system of 'building' the salt marsh (kwelder)-area as about 100 years ago. At this moment the effects of new foreland are not taken into account with the design of the new dike. This is to be seen as a measure for the future. By constructing the salt marsh as soon as possible it can grow by following the natural process, and keep pace with sea level rise. It fits well in the local landscape and biosphere. Pioneer habitat can develop in this area which enriches the total biosphere of the area. Another opportunity might be softening the salt-fresh water gradient by reestablishing connectivity between the Waddensea and interior waterbodies. Specific provisions are needed in the dike to prevent the increase of flood risk. The only viable moment to realize this is to combine it with reinforcement measures. It might give way to enlarge the area of influence of the increased connectivity to the open water surfaces that form the core of the Lauwersmeer.

### **Drentsche Aa**

The water of the Drentsche Aa catchment supplies surface drinking water for the City of Groningen. It is a challenge, particularly with regard to climate change impacts, to control drainage and ensure a basic level, or increase this where possible. Another challenge is to improve water quality – specifically in relation to run off from pesticides from the surrounding farming areas. It remains a balancing act to protect the various interests (drinking water, environment, nature) while also providing an economic perspective for the agricultural sector. From a political point of view, the long term challenge is to find less conflicting uses for the area, focusing on sustainable water extraction, the development of environmental values (Natura 2000), retaining the rich landscape and suitable, area-based agriculture.

### **Slidrechtse Biesbosch**

A large part of the Biesbosch area contains sludge contaminated with zinc which was carried by the river Maas from zinc mines upstream in the last two centuries. A major challenge would be to develop a nature based solution for neutralizing the contaminated sludge. The Biesbosch is also known for its complex freshwater tidal area. Developing a nature based solution that supports the regulation of water streams could be beneficial for maintaining the local landscape and biodiversity.

## **Belgium**

### **Grote Nete Valley**

After the Laak flooded in 2016, the Flanders Environment Agency found that the newly disposed sediment layer in the Laak valley displayed abnormal contamination levels. This pollution also affects the implementation of flood risk measures further downstream in the Grote Nete valley. Currently, this means that many potential valuable areas for water retention cannot be used as such, impeding the execution of flood risk management plans. Given the ecological and health risks of heavy metal pollution and the negative consequences for flood risk management, the remediation of polluted watercourses is desirable. However, conventional remediation techniques, like excavation, are often not suitable for (polluted) water courses and water retention areas due to e.g. the large extent and the high quantity of the polluted sediment in the water courses (excessive costs) and the invasive nature of the conventional measure on the surroundings. However, recent research show the potential for nature based solutions to target both the pollution and increase flood resilience of the area.

## **Germany**

### **Süderau tidal channel**

Süderau is a tidal channel north of Hooge Island. Between this channel and Hooge occurs strong erosion that will most likely affect the security of the island in the future. If the sea level rises, tidal currents will be even stronger and erosion will increase. To deflect the currents away from the coast and the forelands for example a groin could be built. Side effects and durability of the groin would be uncertain, though. To serve both, the security of Hooge and the goals for the strategy, a nourishment could be placed instead, designed as „like the groin“ or even at the southern slope of the channel to deflect the tidal currents northwards. The two benefits would be that the tidal channel would find a new way farther away from Hooge (less erosion at Hooge) and the nourished sediments would be eroded and then transported into the wadden sea. It is most likely that this nourishment has to be repeated regularly. The most important side effect would be a periodic supply of sediments into the Wadden Sea.

### **Norderoogsand**

Norderoogsand is an example for several sands that may be feasible to be strengthened by nourishments. It is located at the western edge of the Wadden Sea. Due to the typical morphodynamic processes the sand wanders eastwards and feeds the Wadden Sea with sediments. Sediment deposits at the western edge of Norderoogsand will be distributed over the Wadden Sea by natural forces and therefore helps the Wadden Sea to grow and thus to compensate the sea level rise.

### **Sankt Peter-Ording**

At St. Peter-Ording a wide beach exists that is subject to erosion of up to 8m per year. The sediments are transported longshore to the north and south. The beach is still wide enough but in the future measures will be inevitable to maintain the coastline. North of St. Peter-Ording a bight called Tümlauer Bucht is located. As an alternative to strengthen the dike at Tümlauer Bucht an artificial dune could be built in front of the dike. Besides the fact that a dune has more co-benefits (tourism,

land use, habitat, ...) than a dike it is even likely that the dune can be built in a way that it will be fed (and therefore maintained) by the sediments resulting from the longshore transport. Therefore, after the creation of the artificial dune at Tümlauer Bucht, and at a point in time where measures at St.Peter-Ording beach will be necessary, nourishments at the beach will feed two goals: Protecting the shoreline and supplying sediments to the artificial dune.

## **Sweden**

### **Arvika**

An area which already "today" will flood with heavy rain or prolonged rain. The area can be reshaped to be optimized as a nature based solution for flooding.

## **Denmark**

### **Western part of Limfjorden**

The western part of Limfjorden is very low lying. The area is therefore exposed to flooding when winds come from the west and water is dragged into the Limfjord.

### **Randers fjord**

The river Gudenå ends in Randers Fjord. In certain situations where winds from the west have dragged water into the inner sea of Kattegat after which the winds turn from an eastern direction, water is dragged into Randers fjord where it can cause massive floodings as it also blocks for the outflow of the river Gudenå.

### **Juelsminde**

This is a large residential area. The area is low lying and is very exposed to flooding from the sea. At the same time the area has problems with a high groundwater table. Juelsminde is thus facing a risk of flooding from both the sea and from the underground.

### **Helene Kilde**

Helene kilde is a moraine coast under erosion where houses are built on the very edge of the 30 m high cliff. The coast is part of the so called Riviera of North Zealand, but due to grey coastal protection measures the beach has diminished and will continue to do so. The recreational value has dropped significantly, which leads to challenges for the tourist industry like the famous Helene Kilde resort.

### **Korsør/Halsskov**

Korsør/Halsskov is a low lying coast with 400 long 10 m high moraine coast under minor erosion where houses are built on the edge of the high cliff. The municipality would prefer a possibility to walk from the city of Korsør to the recreational area Halsskov along the costa, but due to grey coastal protection measure the beach has been lost.

### **Købæk strand**

Kobæk strand is a very low lying summer holiday house area. The cottages are built on a long low ridge. Under consideration is to build a traditional dike around the settlement, but there is room enough for a coastal landscape, designed to be resilient to climate change and to increase bio diversity.