TIDE
Tidal River Development

Project part-financed by the European Union (European Regional Development Fund)

The Interreg IVB North Sea Region Programme

‘Spadenlander Busch’

Measure analysis 01
in the framework of the Interreg IVB project TIDE

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Table of Contents

Project part-financed by the European Union (European Regional Development Fund)

The Interreg IVB North Sea Region Programme

List of tables

List of figures

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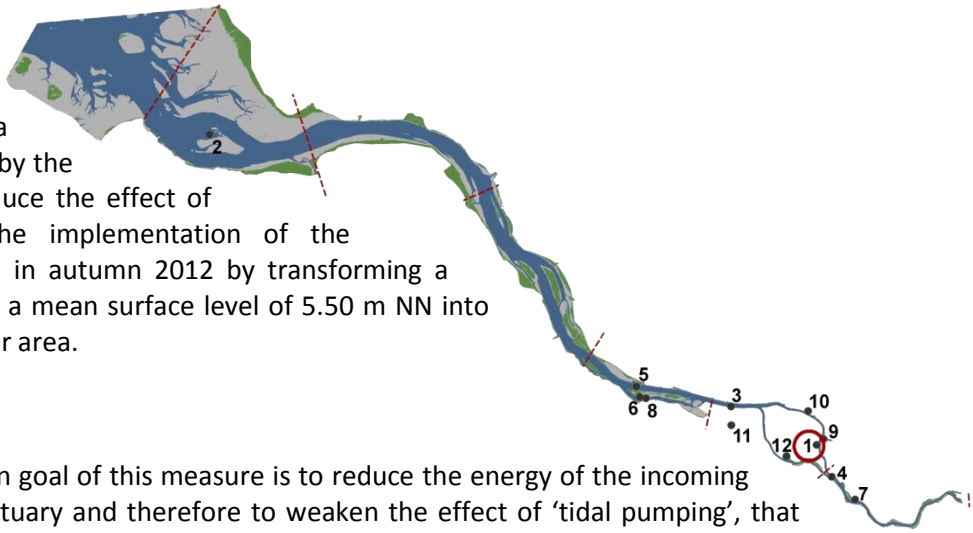
Part 1: Measure description

measure category	hydrology, morphology
estuary	Elbe
salinity zone	limnic
pressure	gross change in morphology and hydrographic regime
status	currently under construction (2012-2015)
river km	615-613 (northern Elbe)
country/location	Germany, City of Hamburg
responsible authority	Hamburg Port Authority

1.1 Introduction



The measure "Spadenlander Busch" is aiming at creating an area of 47 ha influenced by the tide in order to reduce the effect of 'tidal pumping'. The implementation of the measure has begun in autumn 2012 by transforming a former spoil area at a mean surface level of 5.50 m NN into mostly shallow water area.

1.2 Objectives

The overall and main goal of this measure is to reduce the energy of the incoming tidal wave in the estuary and therefore to weaken the effect of 'tidal pumping', that leads to a permanent upstream sediment transport from the North Sea to the Port of Hamburg.

The tidal asymmetry between high and low tide (ebb flow and high water flow) near the City of Hamburg should be reduced by increasing the mean tidal low water level. At the same time the measure could serve nature conservation goals. Therefore it was decided in 2010, that the measure should also account for securing the coherence of the NATURA 2000 network according to the planned deepening procedure of the Elbe fairway.

Marsh habitats, shallow water areas, mudflats and other ecological valuable areas will be developed in the area 'Spadenlander Busch'. Furthermore habitats for the endemic plant 'Elbe Water Dropwort' (*Oenanthe conioides*) which is protected by EU legislation will be developed in order to ensure the coherence of the NATURA 2000 network.

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Figure 1: The former disposal site 'Spadenlander Busch''(original) and the disposal site after the planned implementation (photomontage)

1.3 Background and side conditions

After the realignment of the 'Kreetsander' main dyke in 1999 and the removal of the old dyke in 2004, the former spoil area for dredged material was not altered into foreland as it was initially planned.

Therefore Hamburg Port Authority decided to carry out a pilot project that was related to the content of the 'River engineering and sediment management concept'. The concept was developed by the Hamburg Port Authority and the Federal Administration for Waterways and Navigation, which was approved by the Senate of the City of Hamburg. It should contribute to reduce the tidal energy in order to be able to better safeguard the accessibility of the port of Hamburg.

In order to meet the main target the old spoil area was designed in a way that shallow water areas as well as marsh habitats and other valuable habitats such as floodplain forest and reeds could develop. While the measure fulfilled this target the hydraulic criteria could be pursued as well. A synergistic effect between the interests and targets of shipping and ports, and nature conservation is expected. Therefore groups with economic as well as ecological aims are interested in the success of the measure.

1.4 Measure

At the site 'Spadenlander Busch/Kreetsand' 47 ha of a former spoil area is transformed into an area which is influenced by the tide in order to create new tidal volume and valuable natural area. From this area 17 ha will be kept as land and 30 ha will be transformed to shallow water area under tidal influence. The measure will be established by the removal of high-lying soils from an area where a dyke had been realigned. Expected benefits of the measure are the generation of approximately 1.1 mill. m^3 of additional tidal volume and the establishment of adjacent habitats like mudflats, reed and floodplain forests.

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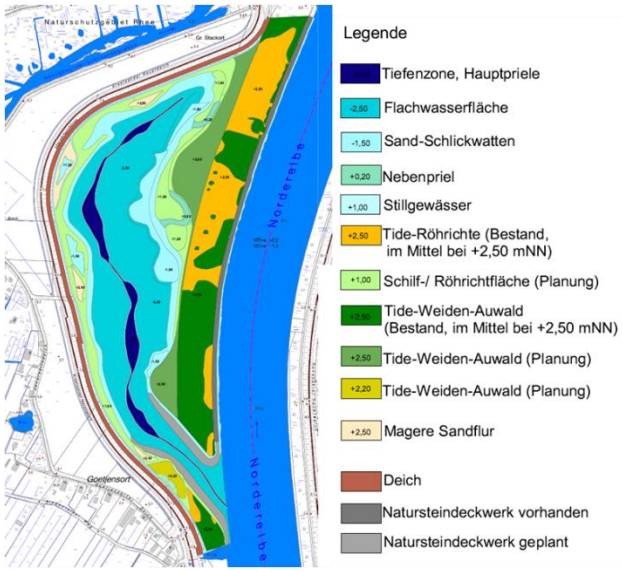

Figure 2: Planned habitat types after implementation

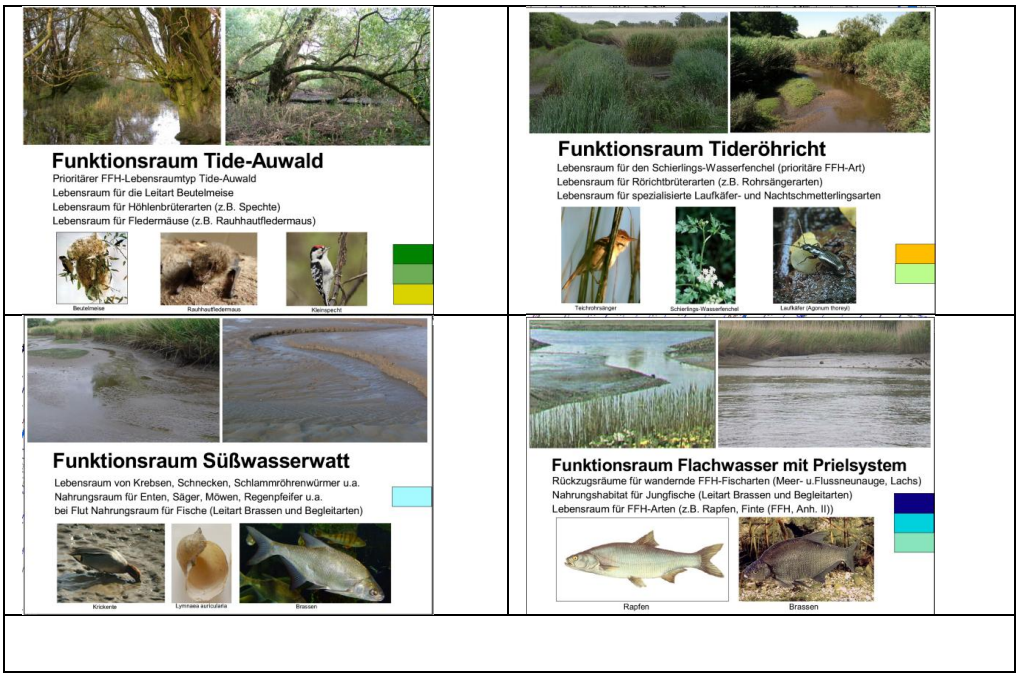

Figure 3: Description of habitat types

The area was already added to the Natura 2000 area ‘Hamburger Unterelbe’ and the nature protection area ’Norderelbe‘. Estimated costs for the measure are > 50 mill € due to the huge amount of heavy contaminated soil that has to be removed and treated in a special way. A period of three years is expected for the construction time.

In order to introduce the tidal influenced landscape to a wide-ranging public, a ’tidal park‘ is planned. The aim of the concept is to introduce basic tidal specific phenomena to the public. The complexity of

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the tidal dynamics and estuarine functioning will be shown within the landscape and not only by informative posters, in order to allow individual experience of the landscape. Objects, textures, vegetation and buildings will be used to present all aspects of the tides.

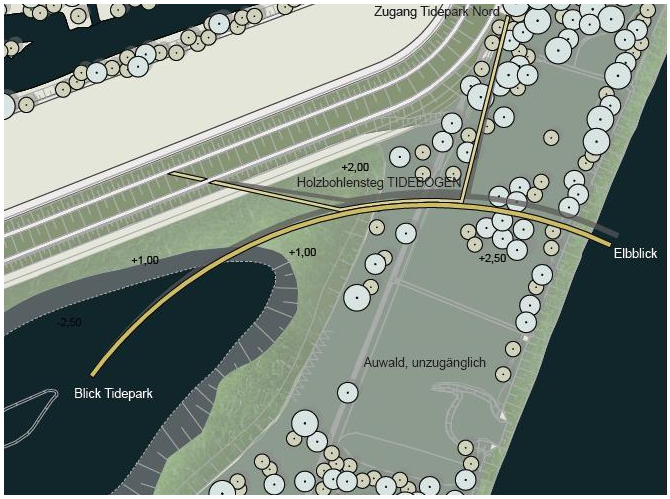

Figure 4: Example of one 'brick' of the tidal park concept: a bridge that connects the water expanse of the Elbe estuary and the new shallow water area

1.5 Expected effect

The measure is a prototype for an example of river engineering measures which equally serves several purposes. Mainly more valuable habitats will be created, as well as tidal volume to compensate the 'tidal pumping' effect. At the same time, by identification and communication of the benefits for quite different concerns, such as water management, nature conservation, recreational use, public perception of tidal action, etc. a broad public acceptance can be achieved. The understanding of tidal action and estuarine functioning can be fostered by measures like this.

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Part 2: Execution of the main effectiveness criteria

The analysis is based on expert knowledge and the calculations which are documented in the planning approval document, and not on monitoring results.

2.1 Effectiveness according to development targets of measure

Definition of development targets:

- Reduction of tidal energy (hydraulic effect) and thus, reduction of the so called 'Tidal pumping effect'. Additionally:
  - Creation of a valuable floodplain forest and shallow water habitat
  - New development target: Creation of habitats for the 'Elbe Water Dropwort' (*Oenanthe conioides*) to meet the aims of the NATURA 2000 network

Achievement of development targets:
The measure is not implemented and monitored yet. Though the achievement of the different development targets are considered to be as high as estimated as described in the planning approval documents.

2.2 Impact on ecosystem services

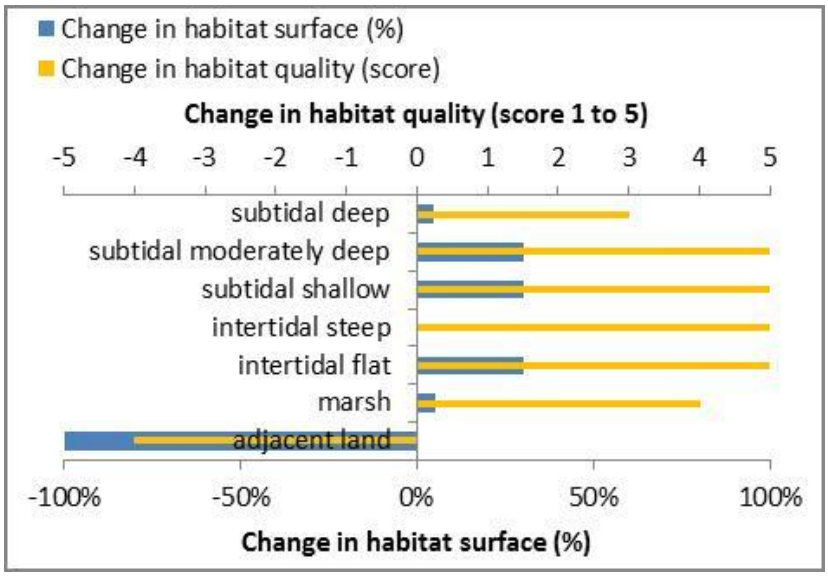

Figure 5: Ecosystem services analysis for Spadenlander Busch/Kreetsand: Indication of habitat surface and quality change, i.e. situation before versus after measure implementation.

From the ES assessment it is concluded that this measure generates overall a positive expected impact for many ES, mainly for:

- "biodiversity"
- Cultural services: Inspiration for culture, art and design; and Information for cognitive development
- Regulating service: Erosion and sedimentation regulation (by water bodies

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- The expected impact for the first development target “Water quantity regulation: dissipation of tidal and river energy” is slightly positive, and for the second target “Water for navigation”) neutral.
- The expected impact for the different beneficiary groups is overall positive, with a positive to very positive expected impact for indirect and future use and for local and region use.

Table 1: Ecosystem services analysis for Spadenlander Busch/Kreetsand (1) expected impact on ES supply in the measure site and (2) expected impact on different beneficiaries as a consequence of the measure

Spadenlander Busch/Kreetsand

Cat.	Ecosystem Service	Score
S	"Biodiversity"	3
R1	Erosion and sedimentation regulation by water bodies	3
R2	Water quality regulation: reduction of excess loads coming from the catchment	1
R3	Water quality regulation: transport of polutants and excess nutriënts	1
R4	Water quantity regulation: drainage of river water	1
R5	Erosion and sedimentation regulation by biological mediation	1
R6	Water quantity regulation: transportation	0
R7	Water quantity regulation: landscape maintenance	1
R8	Climate regulation: Carbon sequestration and burial	1
R9	Water quantity regulation: dissipation of tidal and river energy	1
R10	Regulation extreme events or disturbance: Wave reduction	0
R11	Regulation extreme events or disturbance: Water current reduction	1
R12	Regulation extreme events or disturbance: Flood water storage	1
P1	Water for industrial use	1
P2	Water for navigation	0
P3	Food: Animals	0
C1	Aesthetic information	2
C2	Inspiration for culture, art and design	3
C3	Information for cognitive development	3
C4	Opportunities for recreation & tourism	2

Beneficiaries:	
Direct users	0
Indirect users	2
Future users	3
Local users	2
Regional users	2
Global users	1

X Targeted ES

Legend: expected impact*	
3	very positive
2	positive
1	slightly positive
0	neutral
-1	slightly negative
-2	negative
-3	very negative

*: Indicative screening based on ES-supply surveys and estimated impact of measures on habitat quality and quantity. Quantitative socio-economic conclusions require local supply and demand data to complement this assessment.

A first screening of the ecosystem services that were affected by the measure Spadenlander Busch showed that there were a lot of additional (not targeted) ESS that were positively influenced. The effect on the targeted ecosystem services “Dissipation of tidal energy” and “Water for navigation” could not be pointed out in this first screening.

2.3 Degree of synergistic effects and conflicts according the uses

The degree of synergistic effects is very high, because the agreement with all appropriate (nature) organizations was not only to create a retention area but also to create a new valuable shallow water area with a natural riparian shape and vegetation.
Therefore the measure will not only lead to the estimated benefits for the dredging activity inside the port but also to positive effects on nature conservation (the area is beforehand assigned as a nature protected area), and on leisure and local recreation. In the area no trespassing is allowed, but it is planned to establish public footpaths along the new build shore and to establish a set of presentation boards which will provide additional information concerning the new developed tidal influenced biotopes.

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Part 3: Additional evaluation criteria in view of EU environmental law

3.1 Degree of synergistic effects and conflicts according WFD aims

Table 2: Effect of the measure concerning the main pressures in the estuarine freshwater zone

Indicator Group	Code	Main pressures freshwater zone Elbe	Effect?					Description: Effects of the measure Spadenlander Busch
			- -	-	0	+	+ +	
S.I.	-	Habitat loss and degradation during the last about 100 years: Subtidal				+		Creation of new sub- and intertidal area
S.I.	1.1	Habitat loss and degradation during the last about 100 years: Intertidal				+		
S.I.	1.4/ 1.5	Gross change in morphology/hydrogr aphic regime during the last about 100 years				+		Attempt to influence the hydrodynamic system in a beneficial manner
S.I.	3.1/3. 2	Decrease of water and sediment chemical quality			0			-
D.I.	2.3	Discharge of nutrients or harmful substances			0			-
D.I.	1.3	Land claim during the last about 100 years				+		Creation of new sub- and intertidal area
D.I.	2.6	Capital dredging				x		Could lower the bad side effects of capital dredging

S.I. = state indicator; D.I. = driver indicator

The measure Spadenlander Busch has positive effects on five out of seven main pressures according to the WFD.

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3.2 Degree of synergistic effects and conflicts according NATURA 2000 aims

Table 3: Effect of the measure concerning the main objectives of the operational area 2

Operational area (zone)	Natura 2000 conservation objectives	Effect of Measure on conservation objectives			Description
		Positive	No effect	Negative	
2	Reestablishment of natural sediment- and tidal-dynamics	+			
2	Development of alluvial forests and species-rich aggregates of tidal reeds and tall herb communities	+			
2	Development of a network of step-stone habitats for the 'Elbe Water Dropwort' (*Oenanthe conioides*)	+			
2	Conservation and development of adequate rest-habitats for migratory fish and lamprey species along their route	+			
2	Conservation of relevant functions for bird protection, esp. in the nature protected areas Westerweiden for roosting goose and Holzhafen for roosting ducks.		+		
2	Strengthening the NATURA 2000 network, particularly the construction of an ecological valuable bypass to avoid the Port of Hamburg.	+			

The measure 'Spadenlander Busch' will have a high degree of synergistic effects concerning the management targets of the functional zone 2 (Integrated Management Plan of the Elbe estuary, IBP).

Part 4: Crux of the matter

The planning process of the measure Spadenlander Busch /Kreetsand implied a broad stakeholder involvement (see study: Development of a new communication strategy). This turned out to be beneficial during the whole process and the now started implementation of the project.

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References

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Melchior + Wittpohl (2010): Entwicklung eines tideelbebeinflussten Flachwassergebietes Spadenlander Busch / Kreetsand. Erläuterungsbericht zum Antrag auf Planfeststellung. i. A. der Hamburg Port Authority (HPA).

Several planning maps are available (in German).

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