



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



## 'Wrauster Bogen'

Measure analysis 07  
in the framework of the Interreg IVB project TIDE

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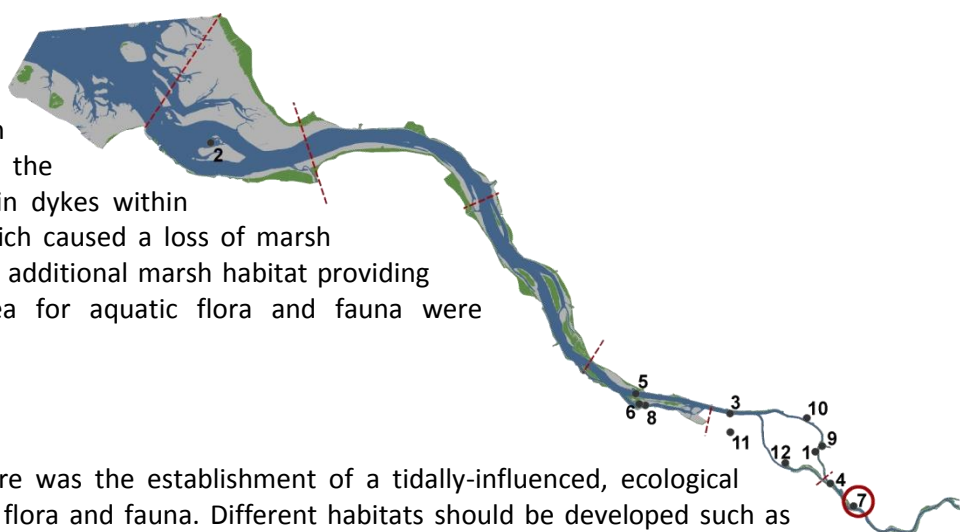


## Part 1: Measure description

measure category	biology, ecology
estuary	Elbe
salinity zone	freshwater
pressure	habitat loss and degradation
status	implemented 1991
river km	595
country/location	Germany, Hamburg Kirchwerder
responsible authority	(former) Ministry of construction and transport

### 1.1 Introduction

The realignment of the area ‘Wrauster Bogen’ was carried out 1991 in order to compensate the strengthening of the main dykes within the City of Hamburg, which caused a loss of marsh habitat. A tidal creek and additional marsh habitat providing ecologically valuable area for aquatic flora and fauna were established.



### 1.2 Objectives

The target of the measure was the establishment of a tidally-influenced, ecological valuable area for aquatic flora and fauna. Different habitats should be developed such as shallow water, mudflats and tidal influenced marsh habitat. The area of the ‘Wrauster Bogen’ with its humid tall herbaceous vegetation serves as a habitat for the ‘Elbe Water Dropwort’ (*Oenanthe conioides*), which has to be preserved according to the European Habitat Directive.

### 1.3 Background and side conditions

The reason for the realignment of the ‘Wrauster Bogen’ (situated at Hamburg Kirchwerder) was to compensate the construction of the ‘Hower and Warwischer main dyke’ in 1989. The meadowy countryside and grassland belonged to the vulnerable wetlands. Along the Elbe estuary only a few low dynamic zones exist, due to the straightened shape of the shores. The marsh habitat of the ‘Wrauster Bogen’, located at a bend of the river provided the opportunity for creating a new stagnant water zone.



Figure 1: Realignment side Wrauster Bogen

## 1.4 Measure

An area of 2.2 ha was realigned at the northern shore of the Elbe estuary upstream of the City of Hamburg. The position of the dyke was changed in order to create a tidal creek of approximately 400 m length (flow through system) in combination with an island of 300\*40m<sup>2</sup>. The northern shore of the creek was planted with grasses and willows aiming at accelerating the succession of the vegetation.

At flood tide a complete exchange of water occurred. However the creek could not be permanently used by fish due to too low water levels during ebb tide. Therefore the downstream opening of the creek was closed in 1994, and a sill was placed in the other opening in order to prevent the complete drainage of the creek

## 1.5 Expected effect

Different monitoring programs were carried out. In 1992 an ecological study was conducted, and amongst others the succession of the vegetation was investigated (Golombek et al. 1993). The shore and aquatic vegetation developed in a very good way but the water level in the creek proved to be too low for a permanent colonization by fish. Due to the slope steepness and high flow velocities in the creek, erosion occurred at the creek banks and the slopes. As a result sand from the creek was transported into the Elbe estuary at low tide. A balance could not be reached, and even more erosion was caused by high flow velocities. Only monotonous biotope structures developed under these circumstances. Specific protected species did not develop due to the high flow velocities.



Figure 2: View of the measure area



Figure 3: View of the erosion of the slope

The problem was solved in 1994 by a morphological rearrangement of the creek. One side of the creek was closed in order to decrease the flow current. The slope of the embankments was flattened. A positive influence on the erosion and sedimentation processes was observed. Fine and silt sands deposited, which led to the development of heterogeneous biotope structures.

The effect of the morphological rearrangement on the development of the area and especially on the current regime, as well as on the morphological stability inside the creek was monitored (Golombek et al., 1996). Furthermore the development of the macro fauna and other important parameters like O<sub>2</sub> content, pH and water temperature were studied. In 1997 the abundance and distribution of fish species at this location was compared to several similar inlets elsewhere in the river (Thiel et al., 1998). As a result it could be concluded that the population of fish reached a good status, and that the new design of the measure resulted in a geomorphologic ideal shore habitat.



## Part 2: Execution of the main effectiveness criteria

### 2.1 Effectiveness according to development targets of measure

*Definition of development targets:*

- Development of 2.2 ha of new valuable marsh habitat created by dyke realignment.
- Creation of shallow water area within the creek, which should function as a resting and growing habitat for special protected fish species.
- Development of alluvial forest on the island.

*Achievement of development targets*

- The new habitat developed in a favorable way. After the adjustment of the tidal creek (see above) the flow velocities in the river channel decreased and mudflats could evolve and thus provide food for the resting fish species.

### 2.2 Impact on ecosystem services

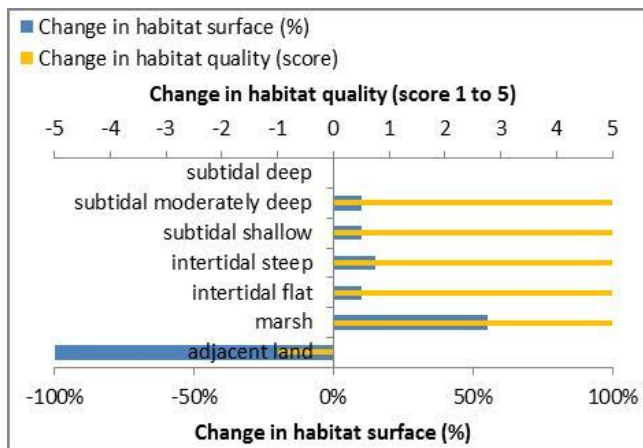


Figure 4: Ecosystem services analysis for Realignment Wrauster Bogen: Indication of habitat surface and quality change, i.e. situation before versus after measure implementation.

- From the ES assessment it is concluded that this measure generates overall a positive expected impact for many ES, mainly for:
  - o “biodiversity”
  - o Cultural services: Aesthetic information; Inspiration for culture, art and design; Information for cognitive development
  - o Some regulating services: Erosion and sedimentation regulation (by water bodies); Water quality regulation: reduction of excess loads coming from the catchment; Climate regulation: Carbon sequestration and burial; Regulation extreme events or disturbance: Flood water storage
- The expected impact on the development targets (“Biodiversity”) is very positive.
- The expected impact for the different beneficiary groups is overall positive, with a very positive expected impact for future and local use.



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Table 1: Ecosystem services analysis for Realignment Wrauster Bogen: (1) expected impact on ES supply in the measure site and (2) expected impact on different beneficiaries as a consequence of the measure.

Realignment Wrauster Bogen		
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	3
R3	Water quality regulation: transport of pollutants and excess nutrients	0
R4	Water quantity regulation: drainage of river water	0
R5	Erosion and sedimentation regulation by biological mediation	2
R6	Water quantity regulation: transportation	0
R7	Water quantity regulation: landscape maintenance	2
R8	Climate regulation: Carbon sequestration and burial	3
R9	Water quantity regulation: dissipation of tidal and river energy	0
R10	Regulation extreme events or disturbance: Wave reduction	1
R11	Regulation extreme events or disturbance: Water current reduction	1
R12	Regulation extreme events or disturbance: Flood water storage	3
P1	Water for industrial use	0
P2	Water for navigation	0
P3	Food: Animals	0
C1	Aesthetic information	3
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	3
Regional users	2
Global users	1

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

X Targeted ES

\*: 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.

The screening of the ecosystem services (ESS) that were effected by the measure `Wrauster Bogen` showed the additional benefits that were achieved with the implementation of the realignment.

### 2.3 Degree of synergistic effects and conflicts according the uses

At the beginning of the implementation of the measure, the inhabitants of the area (behind the dyke) feared disadvantages for the flood protection. However, after the measure was carried out it became clear that the high flood protection status could be kept.

The implementation of the measure positively influenced the local fish population which was good for local fishery activities, due to the generation of additional spawning and growing habitat for some species.



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

In the time the measure “Wrauster Bogen” was implemented neither the BHD nor the WFD existed. Therefore the aim of measure was not related to these European directives. This evaluation is based on the current function of the measure.

#### 3.1 Degree of synergistic effects and conflicts according WFD aims

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

Indicator Group	Code	Main pressures freshwater zone Elbe	Effect?					Description: Aims of the measure ‘Wrauster Bogen’
			--	-	0	+	++	
S.I.	-	Habitat loss and degradation during the last about 100 years: Subtidal			0			
S.I.	1.1	Habitat loss and degradation during the last about 100 years: Intertidal					++	Creation of new marsh habitats and intertidal areas
S.I.	1.4/ 1.5	Gross change in morphology/hydrographic regime during the last about 100 years			0			
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 marsh habitats and intertidal areas
D.I.	2.6	Capital dredging			0			

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

The measure ‘Wrauster Bogen’ was implemented before the WFD become effective. But nevertheless the measure has a positive influence on the main pressures of the freshwater zone.

### 3.2 Degree of synergistic effects and conflicts according NATURA 2000 aims

Table 3: Effect of the measure concerning the main conservation objectives in the operational area 1.

Operational area (zone)	Natura 2000 conservation objectives	Effect of Measure on conservation objectives			Description
		Positive	No effect	Negative	
1	Prevention of further increase and/or reduction of tidal range (energy)	+			
1	Conservation and development of primarily floodplain/alluvial forest (*91E0)	?	?		
1	Conservation and improvement of alluvial meadows of river valleys (6440) and lowland and hay meadows (6510)		+		
1	Conservation of the primarily 'Elbe Water Dropwort' ( <i>Oenanthe conioides</i> ) with species specific dynamic, development of further habitats to improve the habitat network	+			
1	Conservation and development of spawn and growth habitats for asp, ensuring the habitat potential for the twaite shad	+			
1	Conservation and development of the transition functionality between the Middle Elbe and the Estuary downstream for migratory fish species of Annex II BHD	+			

The measure 'Wrauster Bogen' was implemented before the BHD become effective. But nevertheless the measure has a positive influence on BHD conservation objectives of the freshwater zone.

#### Part 4: Crux of the matter

In order to promote sedimentation in the creek a reworking of the branch of the tidal creek closing one of the openings became necessary.

The monitoring showed that the high flow velocities prevented that mudflats could evolve and that fish could use the creek as resting and growing habitat. Therefore the creek was reworked leading to favorable results concerning the achievement of the development targets. A monitoring after the implementation phase turned out to be necessary in order to check whether the targeted results finally have been achieved.

## Contact

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## References

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