Tidal River Development

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

The Interreg IVB North Sea Region Programme

TIDE Final Conference

One measure – many benefits

Mitigation measures in North Sea estuaries

Hamburg April 23rd – 25th 2013

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NLWKN

TIDE work on measures

Approach

- Making experiences received with the planning, realisation and monitoring of mitigation measures in estuaries available to estuary managers
- Giving examples of successful measures
- By this hopefully supporting the process of development and implementation of measures in large estuaries in future.

TIDE work on measures

Procedure

- Collection and selection of a set of diverse and well documented mitigation measures
- Putting together basic information
- Implementation of a data base on measures
- Development and application of analysis approach, exemplarily with regard to different measure categories and objectives (+ examples)

Additional activities

- To advance specific mitigation measure projections for estuaries within the TIDE project (pilot projects).
- To collect basic information on sediment management in estuaries in order to compare sm strategies

Collection and selection of measure examples

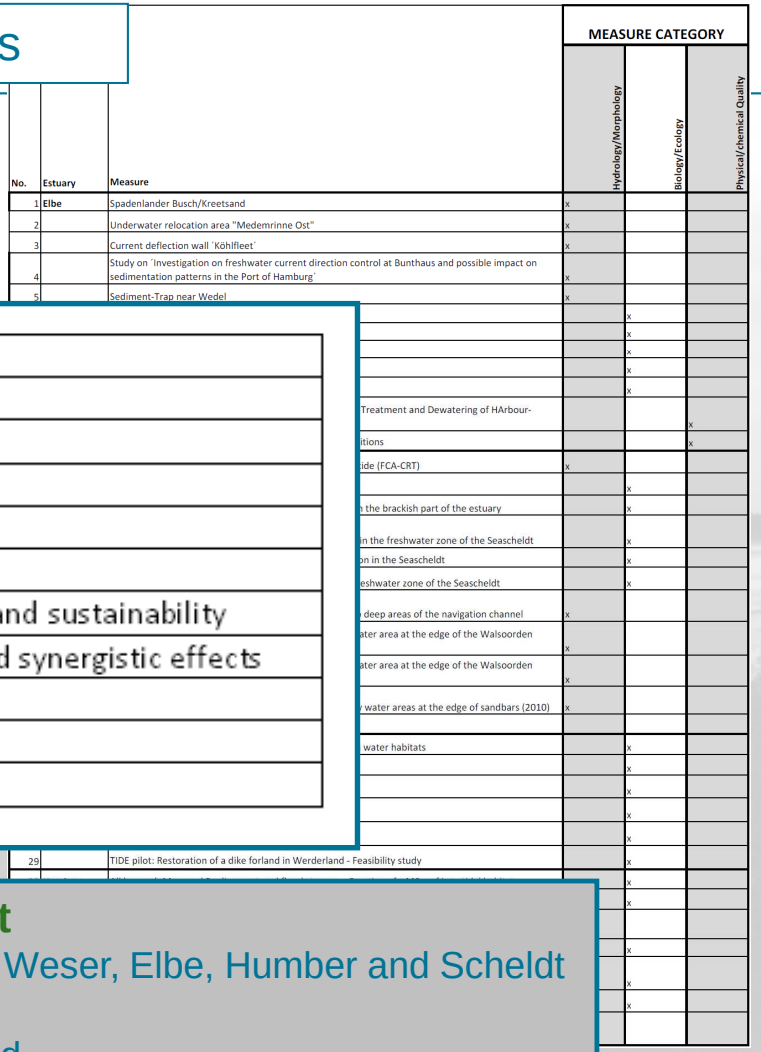
Categorisation

Measure Category	Development Target
Hydrology/ Morphology	Measure to reduce tidal energy, tidal range, tidal asymmetry and tidal pumping effects
	Measure for flood protection
	Measure to improve morphological conditions
	Measure to decrease the need for dredging
Biology/Ecology	Measure to develop and/or to protect specific habitats
	Measure to develop and/or protect specific species
	Other measure to develop natural gradients and processes, transition and connection
	Measure to prevent introduction of or to fight invasive species
Physical/ Chemical Quality	Measure to reduce pollutant loading (point and diffuse sources)
	Measure to reduce nutrient loading (point and diffuse sources)
	Measure to improve oxygen conditions
	Measure to reduce physical loading (e.g. heat input by cooling water entries)
	Other measure to improve self-purifying power

Collection and selection of measure examples

Requested information

Fundamental information	Description of measure
	Location of measure
	Status of measure
	Legislative assignment of measure
	Cost estimation
Extended information	Monitoring
	Initial assessment of effectiveness and sustainability
	Assessment of conflict potential and synergistic effects
	Site selection criteria
	Lessons learned
	Additional materials



No.	Estuary	Measure	MEASURE CATEGORY: Hydrology/Morphology	Biology/Ecology	Physical/chemical Quality
1	Elbe	Spadenlander Busch/Kreetsand	x		
2		Underwater relocation area "Medemrinne Ost"	x		
3		Current deflection wall 'Köhlfleet'	x		
4		Study on 'Investigation on freshwater current direction control at Bunthaus and possible impact on sedimentation patterns in the Port of Hamburg'	x		
5		Sediment-Trap near Wedel	x		
				x	
				x	
				x	
				x	
				x	
		Treatment and Dewatering of HArbour-			x
		itions			x
		ide (FCA-CRT)	x		
				x	
		the brackish part of the estuary		x	
		n the freshwater zone of the Seascheldt		x	
		on in the Seascheldt		x	
		eshwater zone of the Seascheldt		x	
		deep areas of the navigation channel	x		
		ater area at the edge of the Walsoorden	x		
		ater area at the edge of the Walsoorden	x		
		water areas at the edge of sandbars (2010)	x		
		water habitats		x	
				x	
				x	
				x	
				x	
29		TIDE pilot: Restoration of a dike forland in Werderland - Feasibility study		x	
				x	
				x	
				x	
				x	
				x	

Selection result

39 measures from Weser, Elbe, Humber and Scheldt

→ instructive

→ well documented

Analysis approach

Effectiveness according to development targets

Impact on ecosystem services

Conflict potential and synergistic effects regarding uses

Conflicts and synergistic effects regarding WFD

Conflicts and synergistic effects regarding Natura 2000

+ Crux of the matter: Frame conditions and lessons learned in a positive or negative sense, gaps of knowledge

No.	Estuary	Measure	MEASURE CATEGORY: Hydrology/Morphology	Biology/Ecology	Physical/chemical Quality
1	Elbe	Spadenlander Busch/Kreetsand	x		
2		Underwater relocation area "Medemrinne Ost"	x		
3		Current deflection wall 'Köhlfleet'	x		
4		Study on 'Investigation on freshwater current direction control at Bunthaus and possible impact on sedimentation patterns in the Port of Hamburg'	x		
9		Spadenlander Spitze		x	
10		Settlement of reed at the harbour location 'Haken'		x	
		Land treatment of dredged material including MEchanical Treatment and Dewatering of HArbour			
14		Groynes at Waarde		x	
15		Ketenisse wetland - small scale tidal wetland restoration in the brackish part of the estuary		x	
19		Schelde pilot project 2: Relocation of dredged sediment to deep areas of the navigation channel	x		
		TIDE pilot: Relocation of dredged sediment to a shallow water area at the edge of the Walsoorden			
23		Vispaaiplaats – Fish spawning pond			
24	Weser	Tegeler Plate – Development of tidally influenced brackish water habitats		x	
28		Cappel-Süder-Neufeld		x	
29		TIDE pilot: Restoration of a dike forland in Werderland - Feasibility study		x	
36		Creation of ~54 ha of intertidal habitat at Welwick		x	
37		All point source discharges into the Humber and its tributaries are controlled via discharge consents for nutrient loading, temperature and volume			

Analysis results

Degree of target achievement

Measure category	Degree of target achievement			
	high	medium	low	not clear yet
Hydrology/Morphology	4	4	1	3
Biology/Ecology	15	7	-	5
Physical/Chemical Quality	1	1	1	-
Total	**20**	**12**	**2**	**8**

*Measures not assignable to one single measure category are listed multiply. This refers to 3 of 39 measures.

Analysis results

Measure impacts on ecosystem services

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

Estuary	Measure	Zone	Categ.	'Biodiversity'	Erosion and sedimentation regulation by water bodies	Water quality regulation: reduction of excess loads coming from the catch	Water quality regulation: transport of pollutants and excess nutrients	Water quantity regulation: drainage of river water	Erosion and sedimentation regulation by biological mediation	Water quantity regulation: transportation	Water quantity regulation: landscape maintenance	Climate regulation: Carbon sequestration and burial	Water quantity regulation: dissipation of tidal and river energy	Regulation extreme events or disturbance: Wave reduction	Regulation extreme events or disturbance: Water current reduction	Regulation extreme events or disturbance: Flood water storage	Water for industrial use	Water for navigation	Food: Animals	Aesthetic information	Inspiration for culture, art and design	Information for cognitive development	Opportunities for recreation & tourism
				S	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	P1	P2	P3	C1	C2	C3	C4
Elbe	Spadenlander Busch	Fresh	HB	3	3	1	1	1	1	0	1	1	1	0	1	1	1	0	0	2	3	3	2
Elbe	Medemrinne Ost	Meso	H	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1
Elbe	Current deflection wa	Fresh	H	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1
Elbe	Current direction cont	Fresh	H	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1
Elbe	Sediment trap Wedel	Fresh	H	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1
Elbe	Hahnöfer Nebenelbe	Fresh	HB	-1	0	0	1	0	-1	0	-1	-1	1	-1	0	-1	0	0	1	-1	0	0	1
Elbe	Wrauster Bogen	Fresh	B	3	3	3	0	0	2	0	2	3	0	1	1	3	0	0	0	3	3	3	2
Elbe	Hahnöfer Sand	Fresh	B	3	3	1	0	1	2	0	2	2	1	1	1	1	0	0	0	2	2	2	1
Elbe	Spadenlander Spitze	Fresh	B	3	3	3	0	0	2	0	2	3	0	1	1	3	0	0	0	3	2	2	2
Elbe	Reed settlement Hake	Fresh	B	3	2	3	0	0	2	0	2	3	-1	1	1	3	0	0	0	2	2	2	2
Elbe	METHA	Fresh	B	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1
Elbe	Managing Reiherstieg	Fresh	P	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1
Schelde	Lippenbroek	Fresh	HB	3	3	3	0	0	2	0	2	3	0	1	1	3	0	0	0	3	2	2	2
Schelde	Groynes Waarde	Meso	B	2	1	1	0	0	1	0	1	1	1	1	1	0	0	0	0	1	1	1	1
Schelde	Ketenisse wetland	Meso	B	2	2	1	0	0	1	0	1	1	1	1	1	1	0	0	0	1	2	1	1
Schelde	Paddebeek wetland	Fresh	B	3	3	3	0	0	2	0	2	3	0	1	1	3	0	0	0	3	2	2	2
Schelde	Paardenschor wetlanc	Meso	B	3	3	2	0	0	2	0	2	2	2	2	1	0	0	0	0	3	3	2	2
Schelde	Heusden LO wetland	Fresh	B	3	3	3	0	0	2	0	2	3	0	1	1	3	0	0	0	3	2	2	2
Schelde	Sediment relocation K	Meso	H	1	1	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	1
Schelde	Walsoorden 2004	Meso	B	1	0	1	-1	0	1	-1	1	1	2	0	1	0	0	0	0	0	0	0	0
Schelde	Walsoorden 2006	Meso	B	0	0	1	-1	0	0	-3	1	0	1	0	0	0	-2	-3	1	0	0	0	0
Schelde	Sandbars 2010	Poly	B	1	0	1	-2	0	1	-3	2	1	3	0	1	0	-2	-3	1	0	0	0	0
Schelde	Fish pond	Meso	B	3	3	1	2	1	1	0	2	1	3	0	1	0	0	0	1	2	2	2	2
Weser	Tegeler Plate	Oligo	B	3	3	2	0	0	2	0	3	3	2	2	2	3	0	0	1	3	3	3	2
Weser	Shallow water area Rö	Fresh	HB	3	3	3	1	0	2	1	2	2	0	1	1	2	0	1	0	2	2	2	2
Weser	Vorder- und Hinterwe	Fresh	HB	3	3	2	1	0	1	1	1	2	0	0	1	1	1	1	0	2	2	2	2
Weser	Kleinensieler Plate	Fresh	B	3	3	3	0	0	2	0	2	2	0	1	1	2	0	0	0	2	2	2	2
Weser	Cappel-Süder-Neufel	Poly	B	3	3	3	1	0	3	0	3	3	1	2	1	1	0	0	0	3	3	3	3
Weser	Werderland	Poly	B	3	3	3	1	0	3	0	3	3	2	1	1	1	0	0	0	3	3	3	3
Humber	Alkborough SM	Meso	HB	3	2	2	0	0	2	0	2	2	1	1	1	1	0	0	0	2	2	2	2
Humber	PHS SM	Poly	B	3	3	3	1	0	3	0	2	3	1	1	1	1	0	0	0	2	2	2	3
Humber	MudBug SM		B	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Humber	Choweder Ness ABP n	Meso	B	2	2	1	0	0	1	0	1	1	2	1	1	0	0	0	0	2	2	1	1
Humber	sluice at Doigs Creek at Grimsby		B	2	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	2	1
Humber	Welwick		B	3	2	2	0	0	2	0	2	2	1	1	1	0	0	0	0	2	1	2	2
Humber	Beacon Lagoon		B	1	1	1	0	0	1	0	0	1	0	1	0	0	0	0	0	1	1	1	1

Targeted ES indicated by orange boxes. Habitat services (S); provisioning s. (P); regulating s. (R), cultural s. (C)

Analysis results

Measure effects regarding WFD aims

Measure category	Percentage of pressures positively affected by measure (%)
Hydrology/Morphology	21
Biology/Ecology	67
Physical/Chemical Quality	14

Indication of measures with very positive and positive effects on main pressures of the TIDE estuaries (classification by measure categories)

Analysis results

Measure effects regarding Natura 2000 aims

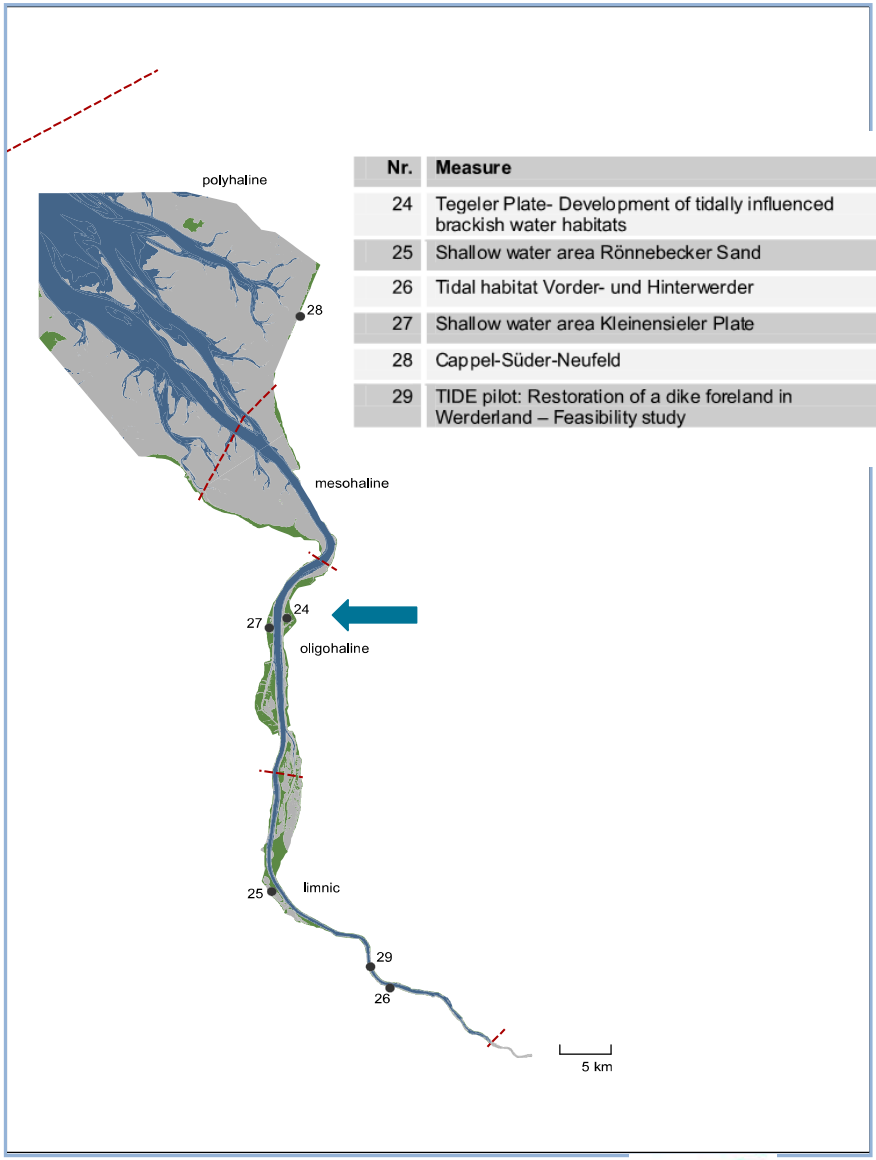
Measure category	Percentage of conservation objectives positively or very positively affected by measure (%)
Hydrology/Morphology	16
Biology/Ecology	78
Physical/Chemical Quality	37

Indication of measures with very positive and positive effects on main pressures of the TIDE estuaries (classification by measure categories)

Tidal River Development

Example Tegeler Plate

Measure Category: Biology/Ecology
Estuary: Weser
Salinity zone: oligohaline
Area: 210 ha
Measure status: implemented
Responsible: bremenports GmbH und Co. KG
Legislat. driver: Compensation measure (port extens.)



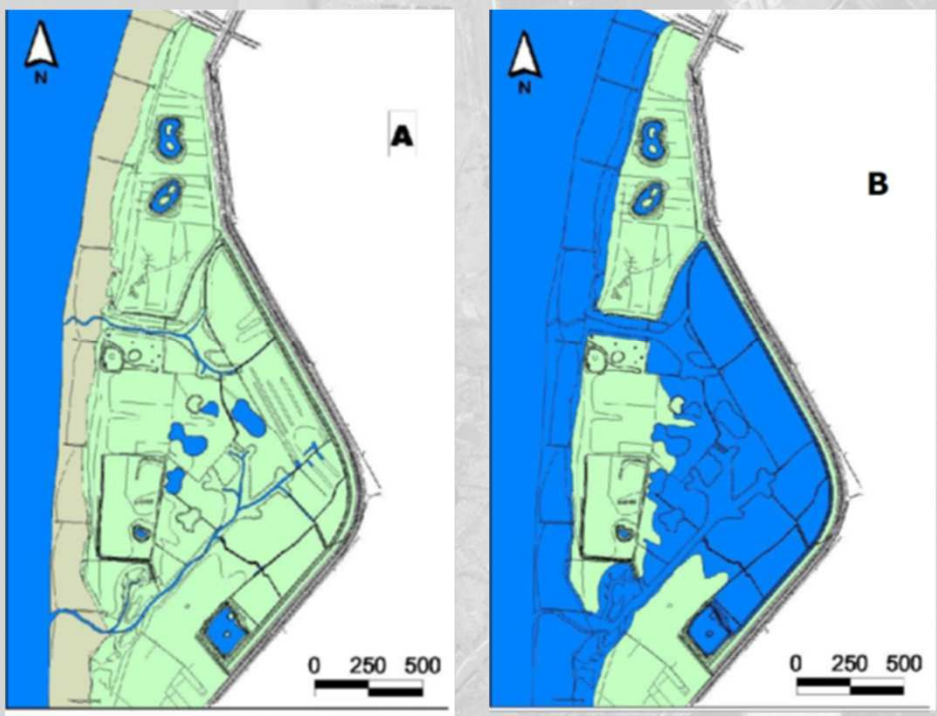
Nr.	Measure
24	Tegeler Plate- Development of tidally influenced brackish water habitats
25	Shallow water area Rönnebecker Sand
26	Tidal habitat Vorder- und Hinterwerder
27	Shallow water area Kleinensieler Plate
28	Cappel-Süder-Neufeld
29	TIDE pilot: Restoration of a dike foreland in Werderland – Feasibility study

Tidal River Development

Example Tegeler Plate

Development targets:

- Tidally influenced habitats (mudflat and shallow water areas, creeks, reed) with species rich vegetation and fauna
- Specific water regime conditions as well as soil formation and sedimentation processes
- Improvement of the natural scenery

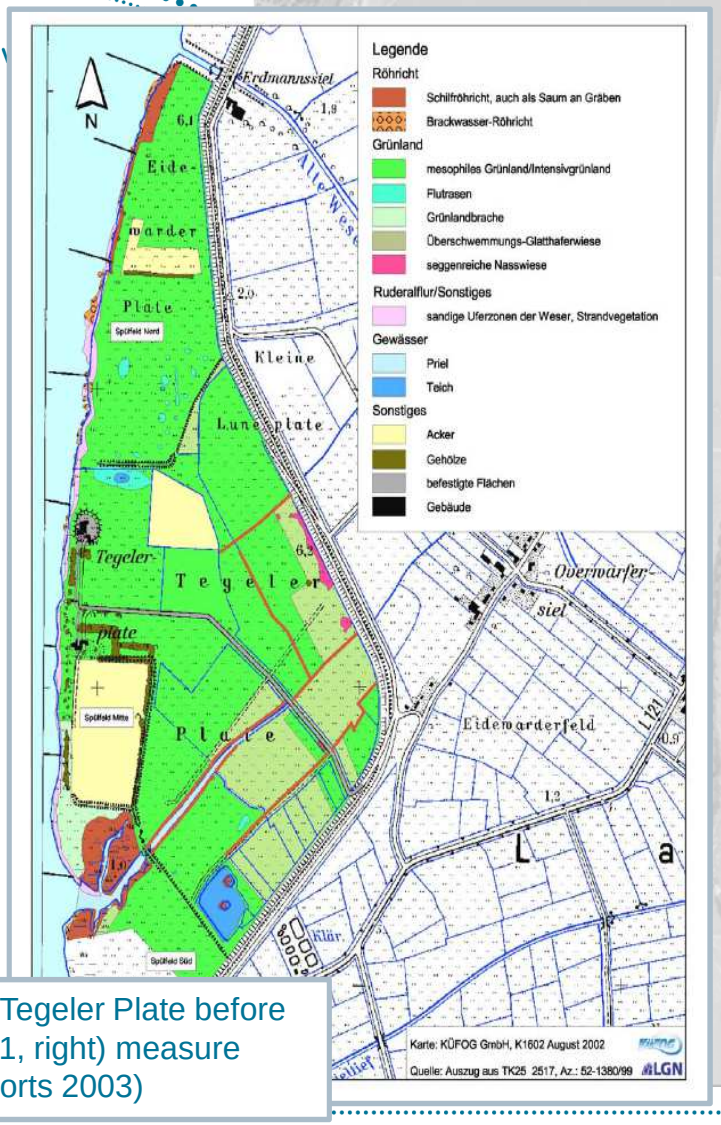


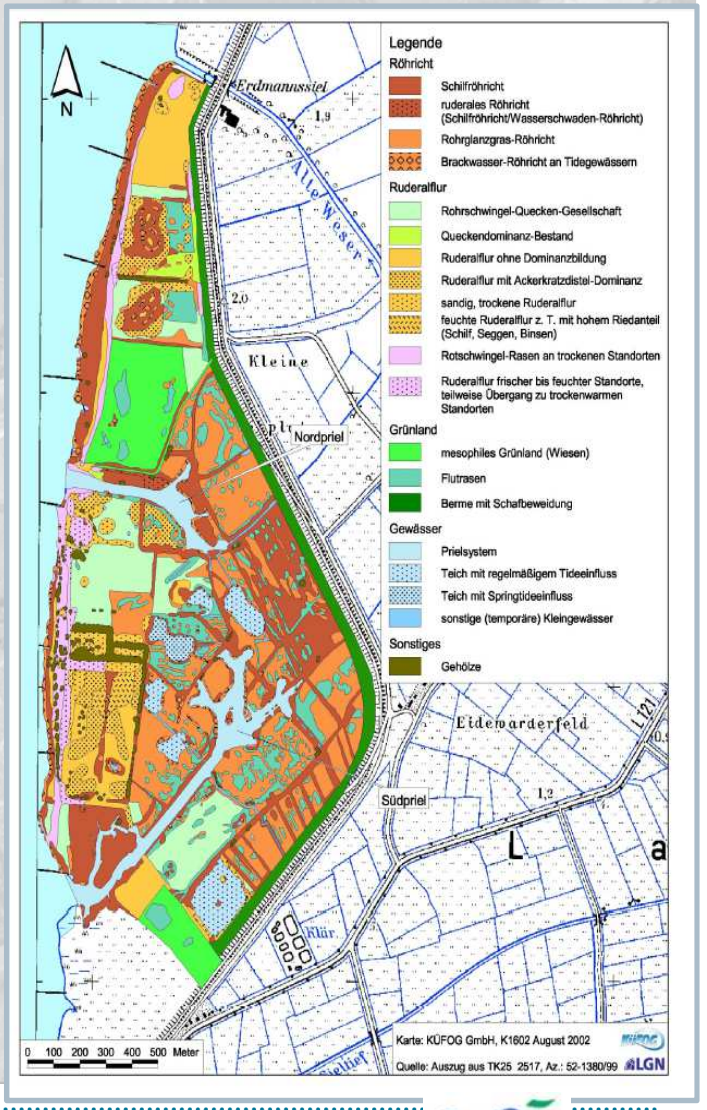
Different water levels on the Tegeler Plate (tidal low water (A); spring tide high water (B));
source: BREMENPORTS 2010

Tidal River Developme

Example Tegeler Plate

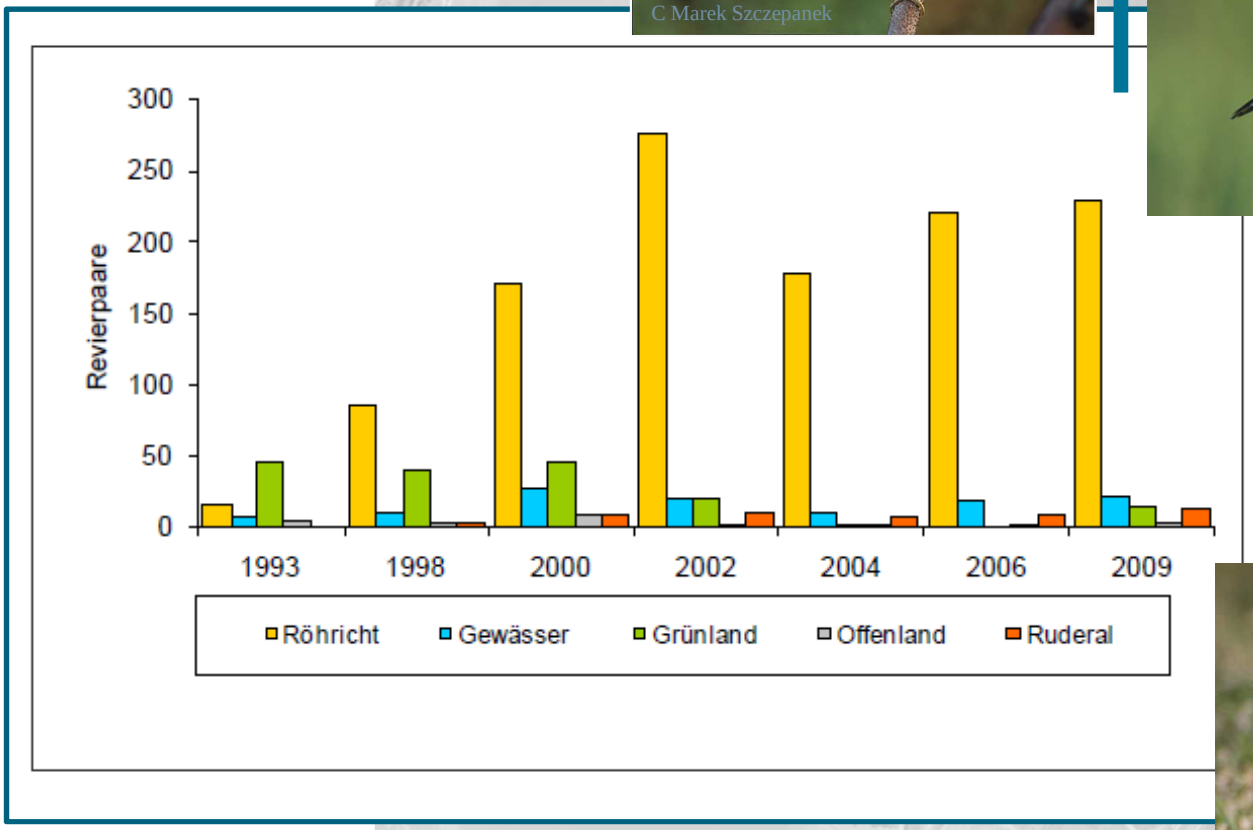
Example Tegeler Plate

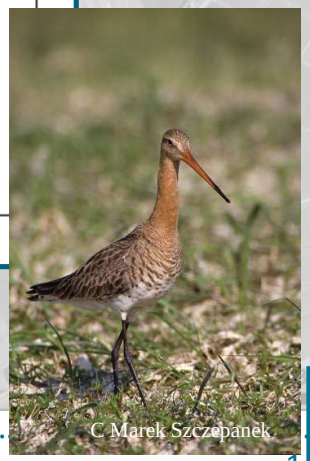




Structure diversity on the Tegeler Plate before (1993, left) and after (2001, right) measure implementation (bremenports 2003)

Tidal River Development





Development of breeding birds guilds (overall number of couples) in the project area 1993 – 2009 (bremenports/KÜFOG 2010)

Example Tegeler Plate

Tidal River Dev

Example Tegeler Plate

Monitoring:

- Structure of the project area
- Sediment distribution and attributes
- Water levels and basic hydrological parameters
- Vegetation
- Breeding and migrant birds
- Fish fauna
- Terrestrial invertebrate fauna
- Aquatic benthic fauna

Degree of target achievement

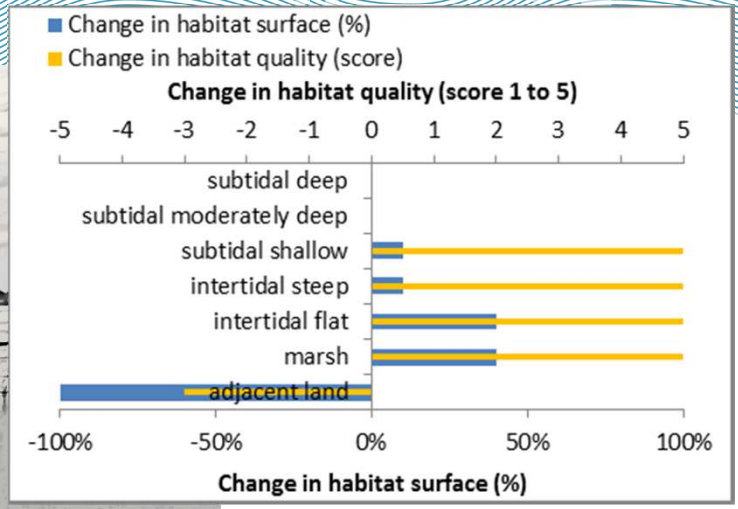
Management adaptations

Effects of Galloway activity: open water and ground areas, increased structure diversity (bremenports/KÜFOG 2010)

Tidal River Devel

Example Tegeler Plate

Impact on ecosystem services



- Surface and quality habitat change after measure implementation (fig. above)
- (1) Expected impact on ES supply in the measure site and (2) expected impact on different beneficiaries, each as a consequence of the measure (tables below)

Tegeler Plate- Development of tidally influenced brackish water habitats

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	2
R3	Water quality regulation: transport of polutants and excess nutriënts	0
R4	Water quantity regulation: drainage of river water	0
	Erosion and sedimentation regulation by biological mediation	2
	Water quantity regulation: transportation	0
	Water quantity regulation: landscape maintenance	3
	Climate regulation: Carbon sequestration and burial	3
	Water quantity regulation: dissipation of tidal and river energy	2
	Regulation extreme events or disturbance: Wave reduction	2
	Regulation extreme events or disturbance: Water current reduction	2
	Regulation extreme events or disturbance: Flood water storage	3
	Water for industrial use	0
	Water for navigation	0
	Food: Animals	1
	Aesthetic information	3
	Inspiration for culture, art and design	3
	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

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.

Tidal River Development

Example Tegeler Plate

Synergistic effects & conflicts regarding WFD aims

Indi-cator¤	Code¤	Main·pressures·**oligohaline**·zone·Weser¤	Effect?¤					Description¤
			--¤	-¤	0¤	+¤	++¤	
S.I.¤	-¤	Habitat·loss·and·degradation·during·the·last·100·years::Subtidal¤	¤	¤	¤	X¤	¤	As·a·result·of·measure·implementation,·additional·subtidal·areas·were·created.·¤
S.I.¤	1.1¤	Habitat·loss·and·degradation·during·the·last·100·years::Intertidal¤	¤	¤	¤	¤	X¤	As·a·result·of·measure·implementation,·additional·intertidal·areas·were·created.¤
S.I.¤	1.4/·1.5¤	Gross·change·in·morphology/hydrographic·regime·during·the·last·about·100·years¤	¤	¤	¤	X¤	¤	Natural·erosion·and·sedimentation·processes·were·promoted.¤
D.I.¤	1.3¤	Land·claim·during·the·last·about·100·years¤	¤	¤	¤	¤	X¤	Due·to·measure·implementation,·the·tidal·influence·on·the·project·area·was·increased·and·the·Tegeler·Plate—formerly·used·for·agricultural·purposes·-·was·nearly·completely·left·to·natural·succession.¤
D.I.¤	¶ 2.6¤	Capital·dredging¤	¤	¤	X¤	¤	¤	There·are·no·direct·effects·to·be·stated,·but·measure·generally·contributes·to·mitigating·the·negative·effects·of·capital·dredging.¤
D.I.¤	2.4¤	Maintenance·dredging¤	¤	¤	¤	X¤	¤	Due·to·measure·implementation,·the·Tegeler·Plate·provides·additional·sedimentation·area.·As·a·consequence,·this·may·lead·by·trend·to·less·maintenance·effort·in·the·river·Weser.·¤

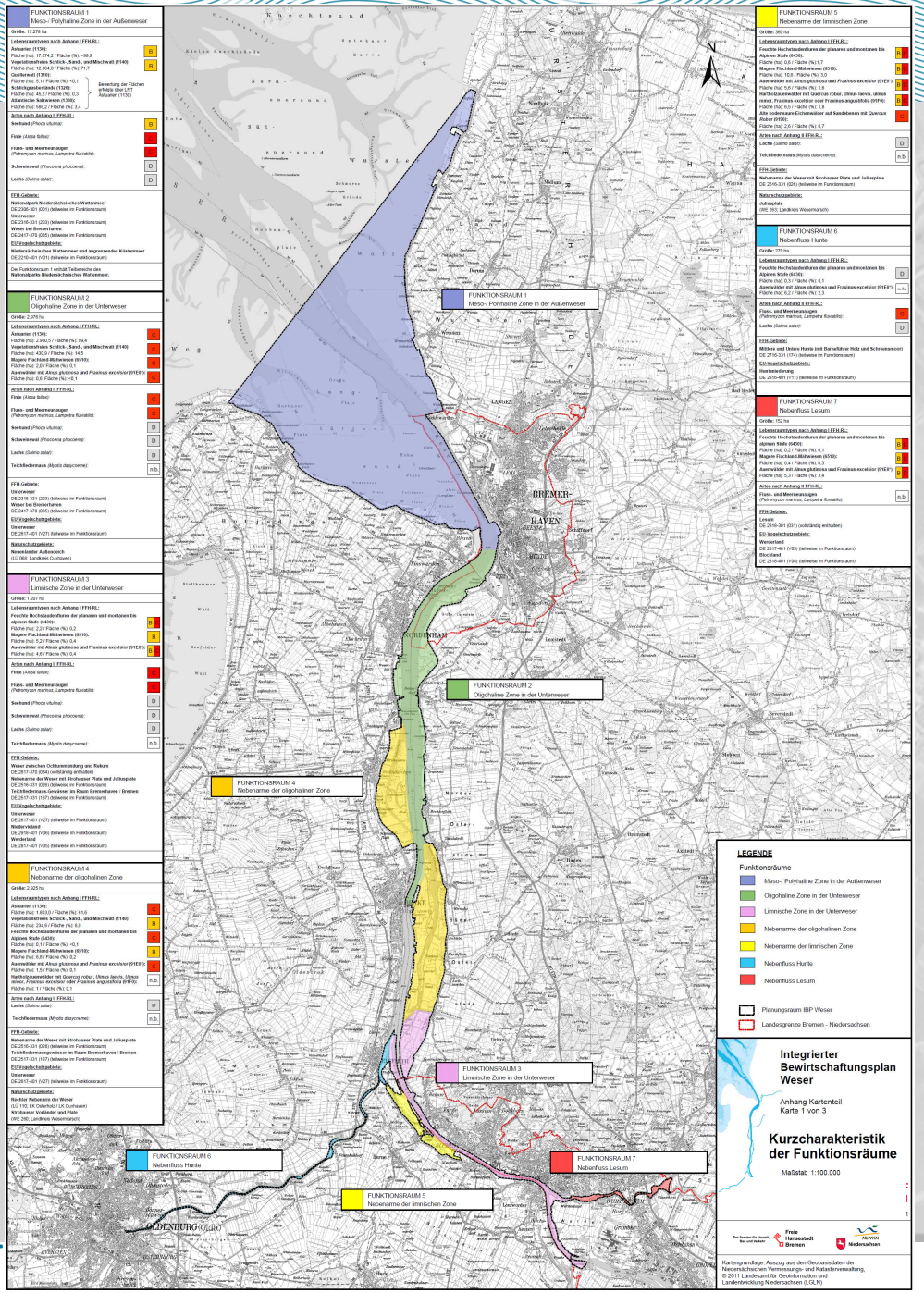
S.I.·=·state·indicator;·¶
D.I.·=·driver·indicator¶

Measure effects on main pressures of the oligohaline zone of the Weser estuary

Tidal River Development

Example Tegeler Plate

Synergistic effects & conflicts regarding Natura 2000 aims



Results of the Integrated Management Plan Weser (NLWKN; SUBV (2012): **IBP** – **I**ntegrierter **B**ewirtschaftungs**p**lan Weser für Niedersachsen und Bremen)

Tidal River Development

Example Tegeler Plate

Synergistic effects & conflicts regarding Natura 2000 aims

Specifications for entire investigation area of IBP Weser	Effect of measure 24 on conservation objectives?		
	positive effect	no effect	negative effect
Conservation and development of specific functions and processes of estuaries and (tidal) floodplains to reach favourable abiotic conditions and typical hydromorphological structures			
Conservation and development of favourable water structures and water bed dynamics	++		
Development of evenly distributed and reduced current energy and tidal parameters	+		
Conservation and development of favourable gradients of specific aspects regarding estuaries and (tidal) floodplains (e.g. salinity, sediments,	++		

Operational area 2: Oligohaline zone in the lower Weser (Weser-km 40 - 65)

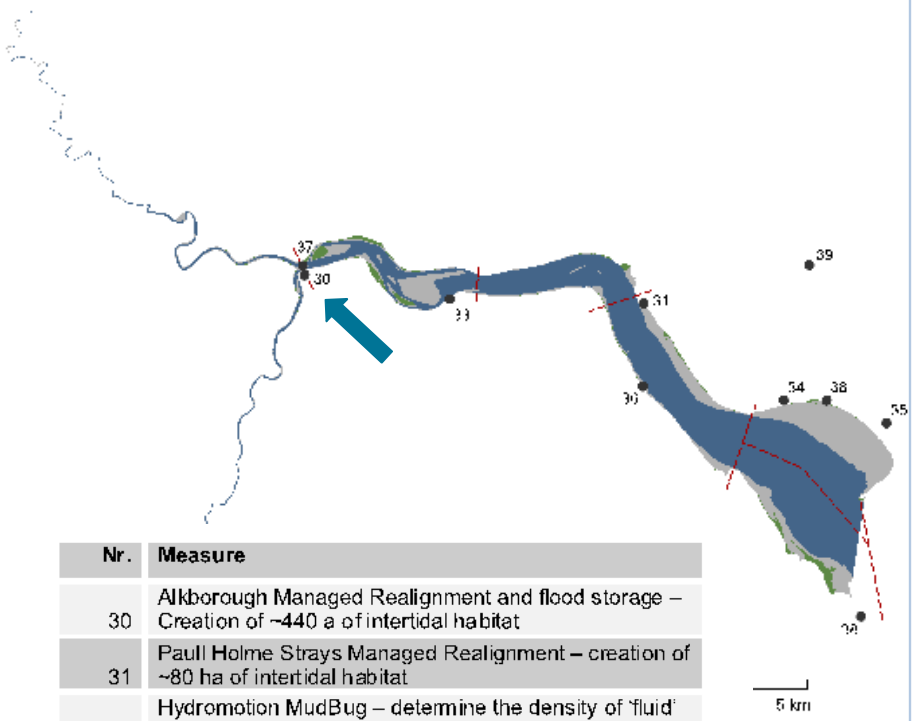
Specifications for operational area 2	Effect of measure 24 on conservation objectives?			Short explanation
	positive effect	no effect	negative effect	
Conservation and development of specific estuarine habitats and (tidal) floodplains and their dynamic changes				
Development, enlargement and upgrade of shallow water zones with moderate current climate	+			Subtidal shallow water areas were created on the Tegeler Plate.
Development of passable shore structures	++			Due to measure implementation, tidal influence on the project area was considerably increased and about 100 ha of additional

- Natura 2000-objectives with specifications for entire investigation area of the Integrated Management Plan Weser (IBP Weser) (*extraction of 13 objectives*; table above)
- Natura 2000-objectives with specifications for operational area 2 (*extraction of 11 o.*; table below)

Tidal River Development

Example Alkborough

Measure Category: Hydrology/Morphology
Estuary: Humber
Salinity zone: oligohaline
Area: 440 ha
Measure status: implemented
Responsible: Environment Agency (UK)
Driver: Humber Flood Risk Management Strategy, Natura 2000



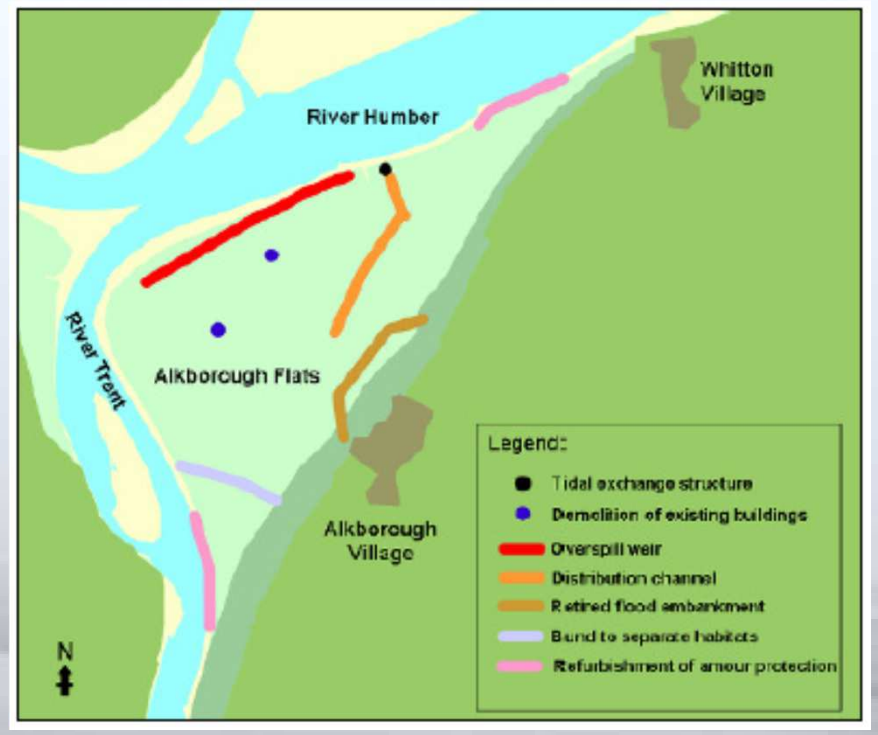
Nr.	Measure
30	Alkborough Managed Realignment and flood storage – Creation of ~440 a of intertidal habitat
31	Paull Holme Strays Managed Realignment – creation of ~80 ha of intertidal habitat
32	Hydromotion MudBug – determine the density of 'fluid' mud to determine the depth of the navigable channel (1250 kg/m³)
33	Creation of ~13 ha of intertidal habitat at Chowder Ness
34	Creation of ~54 ha of intertidal habitat at Welwick
35	Kilnsea Wetlands
36	South Humber Gateway Roosting Mitigation
37	Training walls Trentfalls
38	Donna Nook and Skeffling
39	Turnstall Realignment

Tidal River Development

Example Alkborough

Development targets:

- Flood defence (reducing high tide levels in the upper estuary – primary aim)
- Creation of new intertidal habitats to offset those lost through coastal squeeze within the estuary and due to flood defence works



General arrangement of the work

Tidal River Deve

Example Alkborough

Example Alkborough

Alkborough & Walcot

Welcome
The history of Alkborough & Walcot
History continued
Parish Council
Parish Council continued
Parish Plan
Alkborough Flats Project
Flats Project Continued
Neighbourhood Watch
Women's Institute

t Continued

Download our monthly wildlife reports by cli

July '07	August '07	September '07
December '07	January '08	February '08
May '08	June '08	July '08
October '08	November '08	December '08
March '09	April '09	May '09
August '09	September '09	October '09
January '10	February '10	March '10
June '10	July '10	August '10

Alkborough Flats Monthly Wildlife Report February 2013

February was certainly one of the quietest months for a long time on the Flats with a seemingly static bird list not being enhanced even during spells of cold weather that can bring in scarce geese and wildfowl. Temperatures were generally below average and there were several short spells of hard frosts that left the mudflats frozen over and reduced the number of waders and wildfowl.
There were five **Mute Swans** on the 1st then four for the rest of the month comprising two pairs that may well be settling into breeding territories. No wild swans were noted and even the numerous Greylag Geese only occurred in small numbers but there were 130 **Canada Geese** on the 12th and 715 **Barnacle Geese** had returned

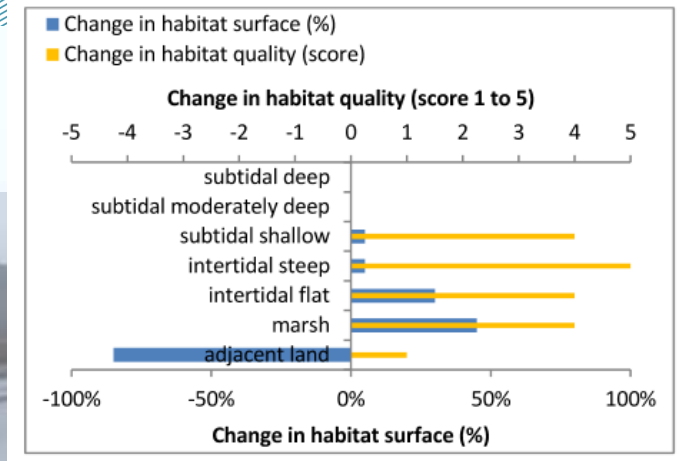
to Whitton Sand by the 24th. It was a slightly better period for **Shelduck** with a steady increase from 126 on the 7th to 213 on the 12th and the peak of 287 on the 22nd.

displaying over the wood by the maze.
The impressive winter flocks of **Golden Plover** fell away after 3500 on 1st with up to 2300 through to mid month after which there were around 500 on some days. **Lapwing** followed the same pattern with 2600 on the 1st then up to 900 regularly. The count of 600 **Dunlin** on the 1st was the highest count of the month but there was a fairly regular presence, when the site was not frozen, with counts totalling 376 on the 12th and 170 on the 22nd. Just a single **Ruff** was noted for most of the month after the record January count but there were nine on the 17th and two from 18th – 21st suggesting the start of early spring movements. A small flock of nine **Common Snipe** were feeding together out in the open on the southern

Example Alkborough

Tidal River Develop

Example Alkborough



Impact on ecosystem services

Alkborough Managed Realignment and flood storage – Creation of ~440 a of intertidal habitat

Cat.	Ecosystem Service	Score
S	"Biodiversity"	3
R1	Erosion and sedimentation regulation by water bodies	2
R2	Water quality regulation: reduction of excess loads coming from the catchment	2
R3	Water quality regulation: transport of polutants and excess nutriënts	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	2
R9	Water quantity regulation: dissipation of tidal and river energy	1
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	1
P1	Water for industrial use	0
P2	Water for navigation	0
P3	Food: Animals	0
C1	Aesthetic information	2
C2	Inspiration for culture, art and design	2
C3	Information for cognitive development	2
C4	Opportunities for recreation & tourism	2

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

- Surface and quality habitat change after measure implementation (fig. above)
- (1) Expected impact on ES supply in the measure site and (2) expected impact on different beneficiaries, each as a consequence of the measure (tables below)

Example Alkborough

Synergistic effects & conflicts regarding Natura 2000 aims

Synergistic effects & conflicts regarding WFD aims

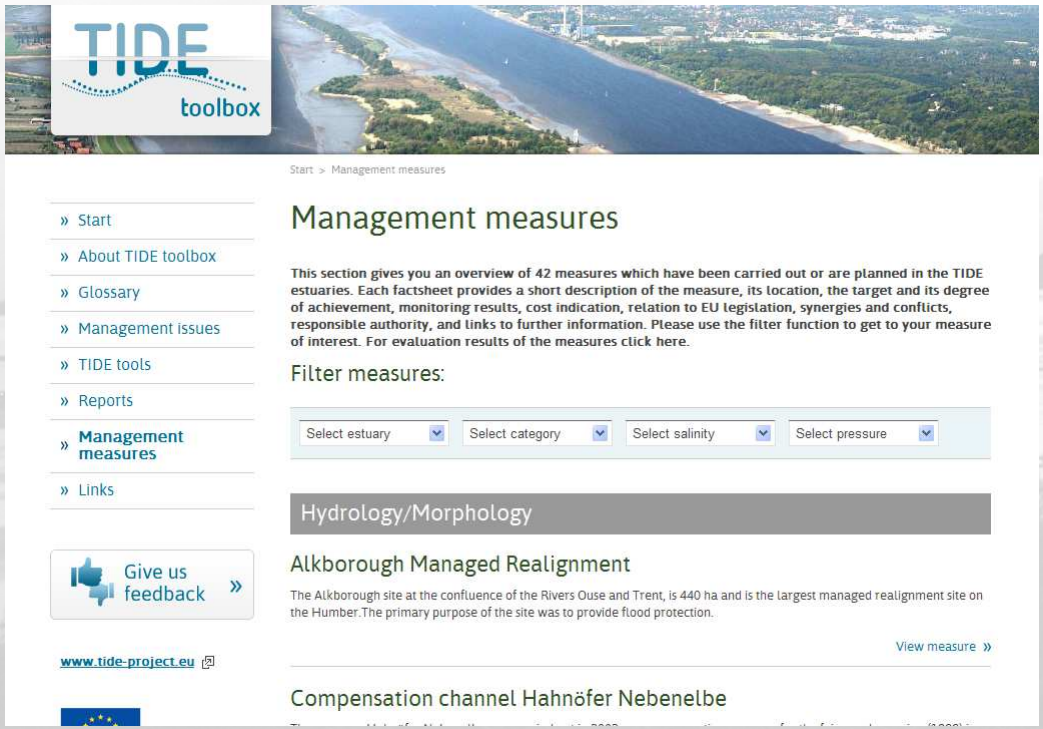
Indicator	code	Main pressures **oligohaline** zone Humber	Effect? --	-	0	+	++	Description
S.I.	1.4	Gross change in morphology during the land 100 years.					X	The land was originally reclaimed from the estuary; the creation of the site effectively restores the balance.
S.I.	3.1/3.2	Decrease of water and sediment chemical quality				X		

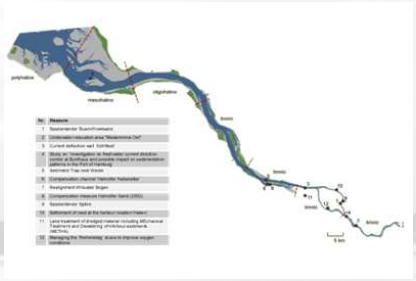
S.I. = state indicator;
D.I. = driver indicator

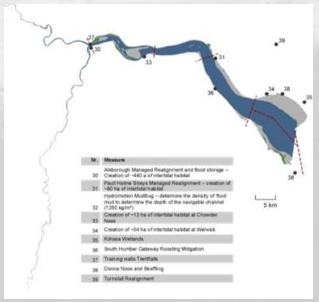
Conservation objectives (Humber)	**Specification**	**Effect?** --	-	0	+	++	**Short explanation**
Protected Habitats: Estuary	Intertidal wetland (brackish)					X	Newly created intertidal habitat in Internationally Designated Nature Conservation Site.

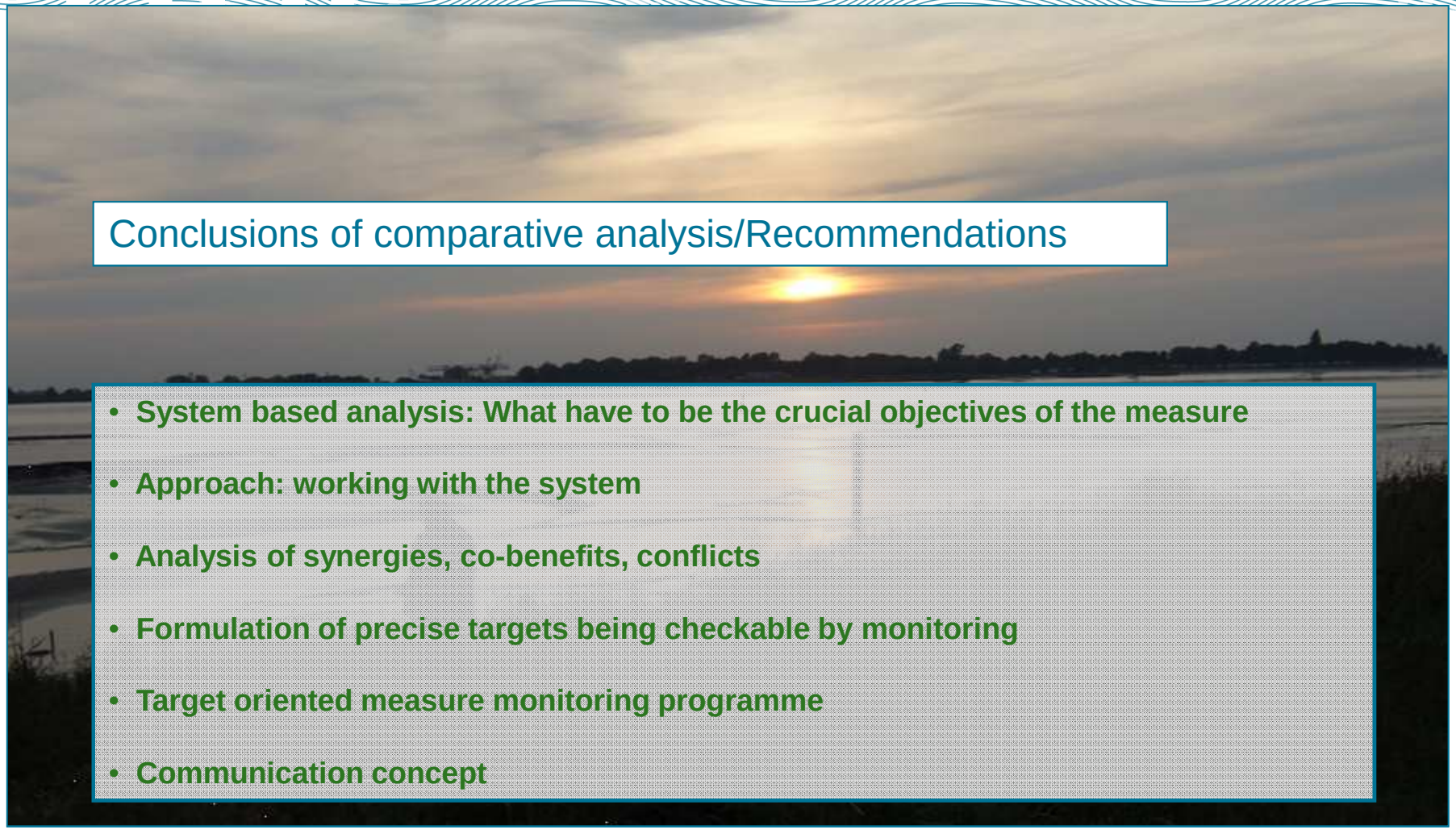
Measure effects on main pressures (WFD, table above) and on conservation objectives (table below) of the oligohaline zone of the Humber estuary

Examples: measure database







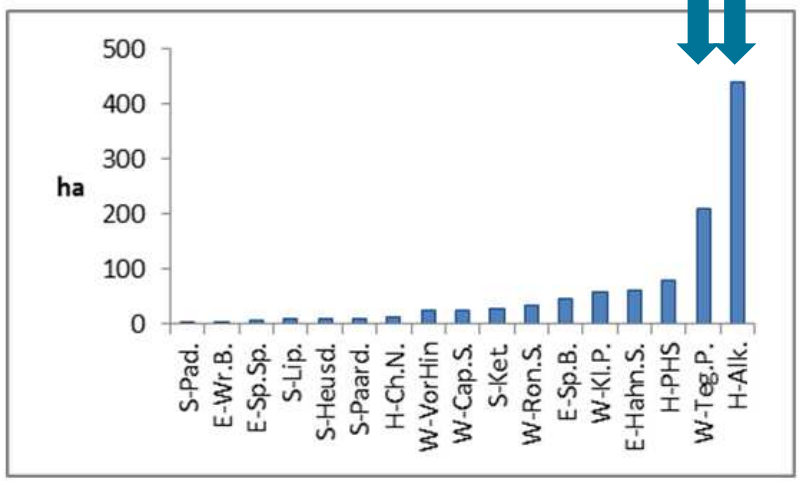


Conclusions of comparative analysis/Recommendations

- **System based analysis: What have to be the crucial objectives of the measure**
- **Approach: working with the system**
- **Analysis of synergies, co-benefits, conflicts**
- **Formulation of precise targets being checkable by monitoring**
- **Target oriented measure monitoring programme**
- **Communication concept**

Backlog demand

Aspects: measure size, development targets



Average size of 17 Managed Realignment Measures (MRMs) analysed within TIDE.
Arrows: Tegeler Plate, Alkborough

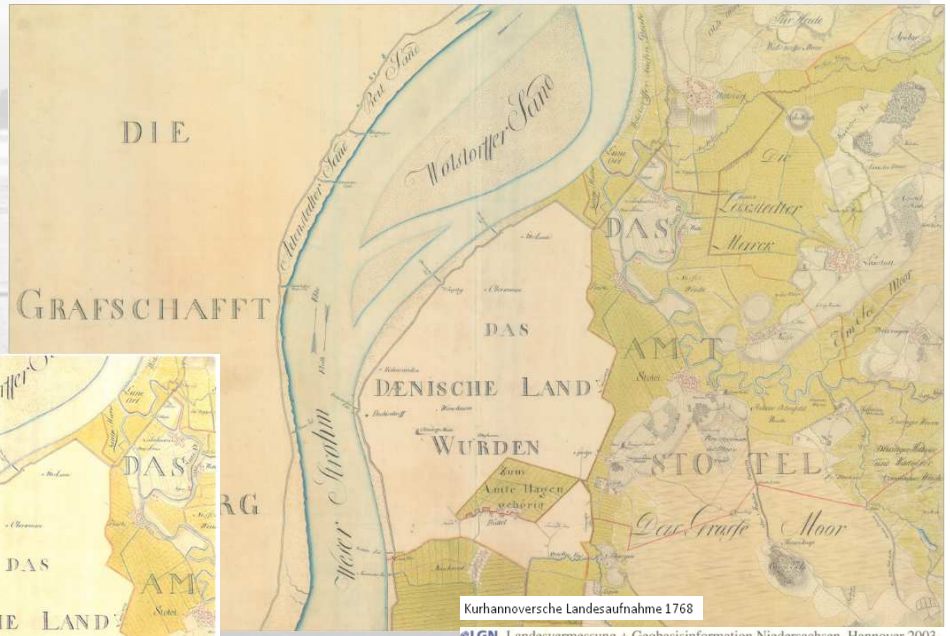
Measure category	TIDE estuary				Total (%)
	Weser	Elbe	Humber	Scheldt	
Biology/Ecology	06	06	08	07	27 (64)
Hydrology/Morphology	-	05	02	05	12 (29)
Physical/Chemical Quality	-	03	-	-	03 (07)
Total	06	14	10	12	**42* (100)**

*Measures not assignable to one single measure category are listed multiply. This refers to 3 of 39 measures.

Number of measure examples collected - assigned to measure category and TIDE estuary.
3 examples refer to the categories Biology/Ecology **and** Hydrology/Morphology

Backlog demand

Aspects: driver of measures, functional references



- Lower Weser south of Bremerhaven/oligohaline zone 2009 (1,fig. above) and 1768 (2, fig. below)
- Position of the measure Tegeler Plate (small fig.)

Backlog demand

… tidal range

… heavily increased sedimentation rates in shallow water

… dredging volumes

… climate change

…

… demand for more effort on measure development and implementation in estuaries with regard to these (and other) crucial points

Thank you