TIDE FACTS

Tidal River Development

The Weser River Estuary

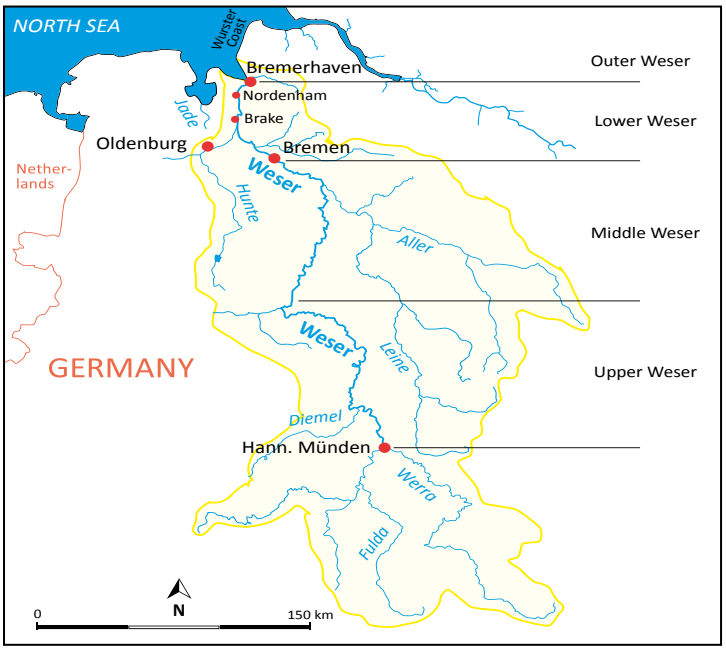
TIDE is an EU project which seeks to make integrated management and planning a reality in the estuaries of the Elbe, Scheldt, Humber and Weser rivers. It is partly funded by the INTERREG IV B North Sea Region Programme.

GEOGRAPHY OF THE REGION

With a length of 477 km the Weser River is the longest river in northwest Germany. It originates at the confluence of the Fulda and Werra rivers in Hann. Münden, 116 m above sea level. It flows through the Federal State of Lower Saxony, reaching the historic Hanseatic League port city of Bremen before widening into the Outer Weser about 65 km north at Bremerhaven. The roughly 130 km long estuary is strongly influenced by the tide.

The catchment area of the Werra, Fulda and Weser covers a total of 49,000 km², including areas belonging to the Federal States of Lower Saxony, Hesse, North Rhine-Westphalia, Thuringia, Saxony-Anhalt, Bremen and Bavaria.

The upper section of the river runs through the Lower Saxony region of the Weser Hills. In its lower and tidal section, below Bremen, the river flows through marshes, bogs and "Geest", a slightly raised landscape of sand and gravel soils with shrubby vegetation that occurs only in the plains of Northern Germany, Northern Netherlands and Denmark.



PORTS AND ECONOMY

The German poet Rudolf Alexander Schröder once wrote: "In Bremen, life and shipping are one and the same". This citation underlines the importance of the ports of Bremen and Bremerhaven for the region and the whole of Germany. More than 174,000 jobs in Germany and 86,000 in the Federal State of Bremen depend on the cargo handling and logistic services performed in these ports.

The so-called twin ports of Bremen and Bremerhaven constitute the second largest port complex in Germany. With regard to container turnover, Bremerhaven ranks as fourth largest in Europe.

View over container terminal 4 at the port of Bremerhaven

The twin ports of Bremen and Bremerhaven function as universal ports where containers, automobiles, oversized and bulk cargo are handled. The port of Bremerhaven, only 32 nautical miles from the open sea, specialises in handling container ships, car carriers and temperature-controlled fruit ships. The terminals of the port of Bremen, 65 km further south and thereby the most southern German seaport, concentrate mainly on general and heavy-lift cargo and on the handling of bulk commodities.

Brake and Nordenham, two ports situated at the lower end of the Weser in Lower Saxony, also play a prominent role in the shipment of bulk cargo. Brake is the largest port to handle the entry of animal feed into Germany.

Turnover at the Ports of Bremen and Bremerhaven				
	1980	1990	2000	2009
Total ocean cargo handled (in million tons)	27	30.2	44.8	63.1
Ocean traffic in containers (million 'Twenty-foot Equivalent Units')	0.6	1.2	2.8	4.6
Cars (in millions)	0.3	0.7	1.1	1.2
Incoming ocean-going ships (in 1000s)	10.4	9.5	9.5	7.5

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THE MANY USES OF THE ESTUARY

Large parts of the outer and lower Weser region are still dominated by relatively sparsely populated, agriculturally-used marshland. Today, the landscape created by the Weser river through the dynamic of the tides is mainly used as grassland for pasture, as it is too wet for the cultivation of grains. For centuries, the management of these areas has always been heavily based on the influence of the tides. Since the construction of dikes led to the lowering of the hinterlands, a complex moat system was developed (already in place in the 12th century), allowing for their drainage.

The Weser marshes are one of the largest farming areas in Germany, dominated by dairy and meat cattle. In summer, sheep can also be seen grazing on the grasslands behind and on the dikes.

The Weser is also used for fisheries although the catches, as in all German coastal regions and rivers, have been declining for decades. Only about a dozen major and part time commercial fishing boats still operate – in addition to many anglers – in the outer and lower Weser. Fishermen primarily catch codfish, flatfish, smelt, eel and shrimp. Particularly important for the fishery was the eel, known as "breadfish" to the Weser fishermen.

Tourism is an important source of revenue in the area. River, sea and coastline attract thousands of tourists and vacationers each year. New attractions such as Bremerhaven's new touristic complex "Havenwelten" have transformed the city into a maritime centre. Throughout the outer and lower Weser region there are numerous marinas, camping sites and holiday houses. For water sports enthusiasts a vast amount of creeks and canals link the Weser to other European waters. Many people also explore the Weser marshes by bicycle. The "Weser bike trail" is one of the most popular cycle routes in Germany with 150,000 cyclists each season.

In the Wesermarsch district, between Bremen and the river mouth, the tourism sector generated sales of around € 145 mil. in 2007, about 20% of the region's value added. Here, 2700 jobs directly depend on tourism.

A HISTORY OF HUMAN INTERFERENCE

As a result of its utilization for navigation and shipping activities, industry, agriculture, fishery and tourism, the natural landscape of the Weser estuary has been modified by humans for hundreds of years.

In addition, the need to provide measures for flood protection and coastal defence has also left a mark on the landscape. In order to prevent settlement and economic areas from flooding, dikes were first built on the lower reaches of the Weser River about 1000 AD. Major parts of the floodplain were thereby separated from the river and the original inundation area was considerably reduced.

Artificial embankments along a length of the outer Weser estuary

Since the end of the 19th century, overflow dams have been built to transform outer dike areas into agricultural land. Port facilities have been created and the river fairway has been deepened a number of times. As supporting measures, groynes and bank reinforcements have been built and maintenance dredging has been carried out.

These human interferences have resulted in a river system with only one channel, high tidal ranges and far-reaching changes in erosion, transport and deposit of sediments. For example, in Bremen the tidal range increased from about 30 cm to about 4.4 m today. These changes represent the starting point of several problems for habitats and wildlife. For instance, due to the higher tidal range, which brings increased current velocities, a large part of the shallow water zones of the Weser river disappeared in the course of the last century. These zones are of high ecological importance as they serve as spawning habitats and nursery grounds for fish and other aquatic organisms. They also contribute to buffering the tidal energy by providing additional space for the incoming flood wave.

Approximately 80% of the shallow water areas in the lower Weser, which originally totalled about 3200 ha, disappeared between 1900 and 1990 due to human interferences.

VALUABLE SPECIES AT RISK

Although human interference has led to some severe problems for habitats and wildlife, the tidal Weser still constitutes an area of outstanding ecological significance. The tide creates a mosaic of sand banks, mud flats, shallow water areas, salt marshes and tidal floodplain forests. These areas provide an important refuge for many animal and plant species in a landscape still heavily influenced by human use.

For example, the brackish grasslands of the Wurster coast are home to a unique feature of the Weser estuary: the Bulbous Foxtail grass *(Alopecurus bulbosus).* In Germany this grass is only found in this area. The Juliusplate, a nature protection marshland area located just downstream from Bremen, is characterized by large groups of the threatened Snake's Head Fritillary plant *(Fritillaria meleagris).*

Migrating fish species like the Twaite Shad (*Alosa fallax*) or the River Lamprey (*Lampetra fluviatilis)* and Sea Lamprey (*Petromyzon marinus*) use the largely continuous outer and lower Weser as a link between their spawning and breeding areas. Seals (*Phoca vitulina*) can be found resting on the sand banks of the outer Weser, while porpoises (*Phocoena phocoena*) search for food in the estuary waters. The Weser estuary also provides important habitat for many species of birds. For example, during its moulting period, the Pied Avocet (*Recurvirostra avosetta*) gathers strength in the shallow waters of the Weser before continuing its migration south in autumn.

Decades of human-induced changes to the estuary landscape have resulted in substantial impact to its habitats and its characteristic communities have been put at risk. The Twaite Shad, for example, is now critically endangered. The Snake's Head Fritillary has gradually lost most of its habitat due to diking and intensive agriculture and is now only found in a very limited number of places in Lower Saxony.

In light of these pressures, the state governments of Lower Saxony and Bremen have integrated the estuary and large parts of the tidal Weser into the European ecological network Natura 2000 under both the EU Habitats Directive and the Birds Directive.

More than 90% of the tidal Weser surface area and floodplains belong to the EU's NATURA 2000 network of protected areas!

Bulbous Foxtail

Snake's Head Fritillary

River Lamprey

Seal

Pied Avocet

Twaite Shad

MANAGEMENT PLANNING

The man-made changes in the estuarine ecosystem, the globalised competition of ports, the requirements of European directives and the growing challenge of climate change all point towards the need for responsible and sustainable action in the Weser estuary. An Integrated Management Plan (IMP) for the Weser estuary, currently under development, represents precisely such a strategy for action.

Based on the requirements of European directives, the Integrated Management Plan is used as a tool to harmonize the different uses of the estuary including the needs of shipping and ports, while achieving a favourable state of conservation for habitats and species.

Since the plan covers the whole estuarine ecosystem, close cooperation between the federal states of Lower Saxony and Bremen and the Federal Waterways and Shipping Administration (WSV) is exercised. The planning process is designed to encourage participation by all stakeholders. Interdisciplinary planning groups with representatives from administration, industry and associations have been set up for this purpose at the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN), as well as at the Bremen Senate for the Environment, City Development and Europe (SUBVE). The Plan seeks a negotiated agreement between all stakeholders regarding the preservation and consistent development of the ecological network NATURA 2000, also in consideration of the EU Water Framework Directive requirements. It is not legally binding but aimed at voluntary commitment of all stakeholders.

Meeting of the interdisciplinary group planning the Weser IMP

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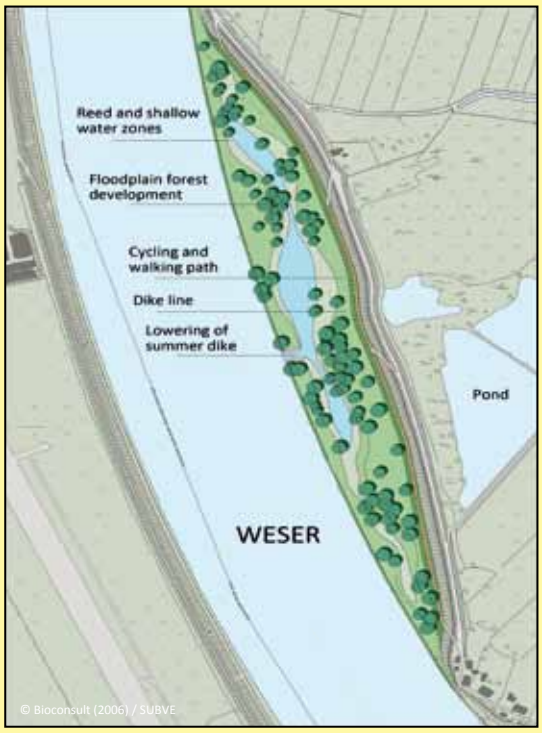
RECREATING LOST HABITATS

A balance between protection and use requirements is always difficult to achieve and effective management methods are in great demand. The challenges of the Weser estuary are shared by other estuaries in the North Sea Region. Against this background, the TIDE project offers opportunities to learn from experiences drawn at the estuaries of the Elbe (DE), Humber (UK) and Scheldt (BE/NE), in terms of understanding the ecosystem, improving governance and communication, sharing state-of-the-art strategies (for instance concerning sediment management) and developing enhanced practical methods. Some of the methods and measures developed and finetuned through the exchange with TIDE partners will be tested in the framework of various pilot projects to be planned and implemented within these four estuaries. In the Weser, several such projects will be tested on a pilot scale, including the renaturalization of a disturbed riverbank and the regeneration of hard substrate habitats in the outer Weser estuary.

Restoring Riverbanks

Before the Weser's riverbanks were modified for the benefit of agriculture, shipping and coastal protection, the undisturbed dynamics of the tidal river resulted in the formation of a range of different habitat types on the tidal floodplains. In addition to extensive reed beds, different types of floodplain forests existed. Today the tidal floodplains at the Weser can only be found on a small scale and the floodplain forests only in fragments.

This project refers to a 13 hectare area in the lower Weser near Bremen which is presently protected from flooding in summer by means of an overflow dam. Through the partial deconstruction of this dam, the development of tidal floodplain habitats such as forests, reed beds and freshwater mudflats will be enabled. By stopping agricultural use and reshaping the terrain, a new landscape with tidally influenced shallow water areas will be formed. In the course of time, this will lead to the development of natural floodplain habitats with specific animals and plants.



Restoration plans for the Werderland area of the Weser

Regenerating Lost Underwater Habitats

Sea anemones (*Metridium senile*), hydrozoans (*Hartlaubella* sp., *Obelia* sp.), blue mussels (*Mytilus edulis*) and barnacles (*Balanus improvisus*) live in association with hard substrates in the outer Weser estuary

Natural hard substrates, such as reefs constructed by bristle worms or mussel banks, are valuable components of the estuarine ecosystem. They provide habitats for many - some times also endangered - fish and invertebrate species and contribute substantially to the diversity of the system.

Nowadays, these natural underwater hard substrate communities are only found on a reduced scale, possibly as a result of anthropogenic pressures such as fishery, placement of dredged sediments and environmental changes due to hydraulic construction.

Both the protection of existing structures as well as the sustainable development of new hard substrate habitats in the outer Weser should come about as the result of a participative decision-making process. Since natural hard substrate habitats are rare, the placement of natural stones - for example boulders extracted during the course of hydraulic construction in the estuary - may promote settlement and colonization by marine life. The implementation of such type of measures could substantially contribute to achieving the objectives of the EU Water Framework and Birds and Habitats Directives.

In the frame of the TIDE project, NLWKN will identify areas suitable for protection and/or re-establishment of hard substrate habitats in the outer Weser estuary. Many aspects will have to be considered, including present and historical location of these habitats, current regime, stability of the area, sediment properties, and potential for colonisation. Current fishery practices must naturally also be taken into account. Once potential areas have been identified, suitable measures to create these habitats will be designed and, if possible, implemented.

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