



Challenges and Visions for the Elbe Estuary
from a User`s Perspective
SedNet Conference 2009/Oct/9

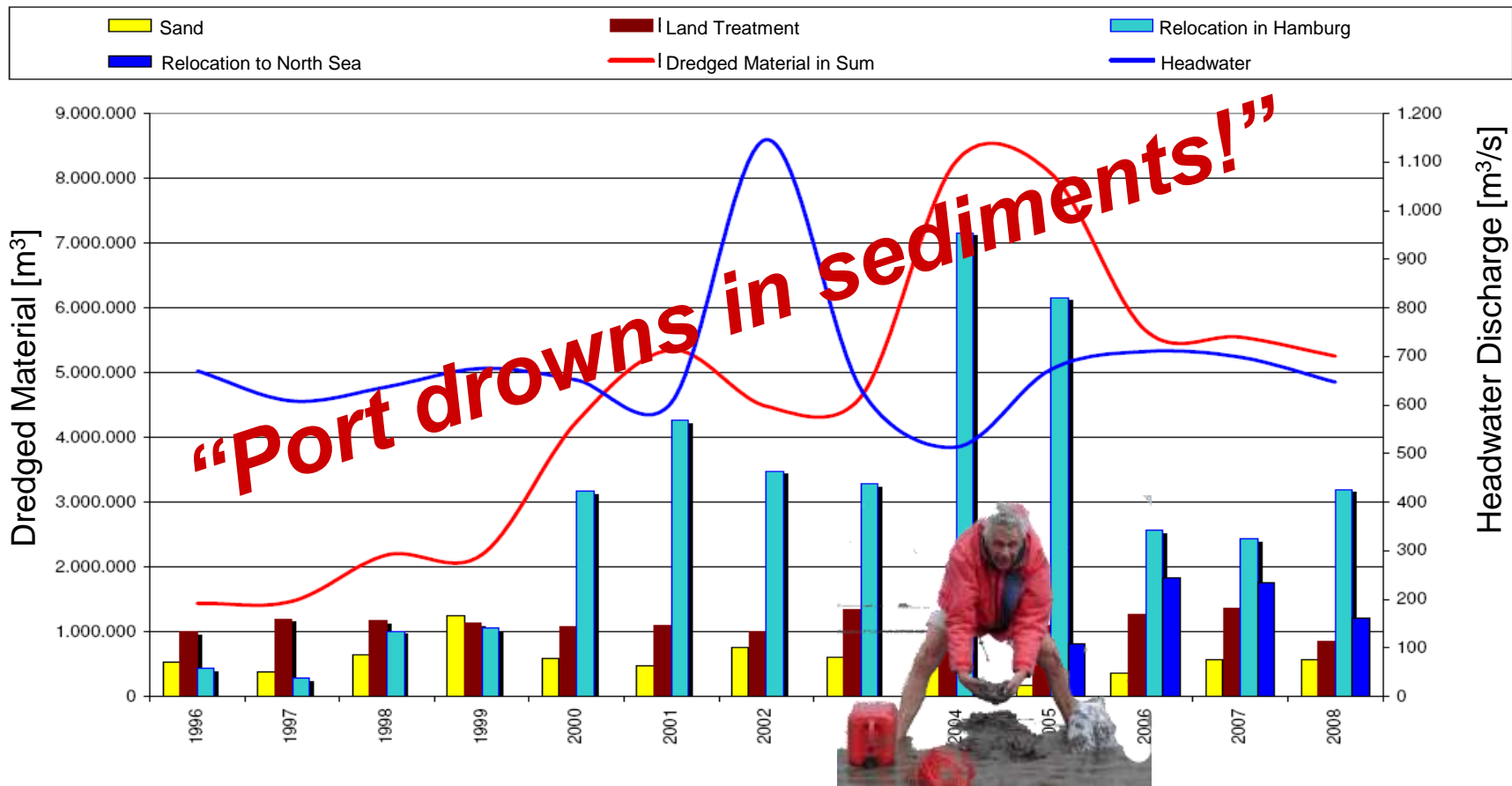
Heinz Glindemann, Hamburg Port Authority

Dredged Material Hamburg

HPA H1

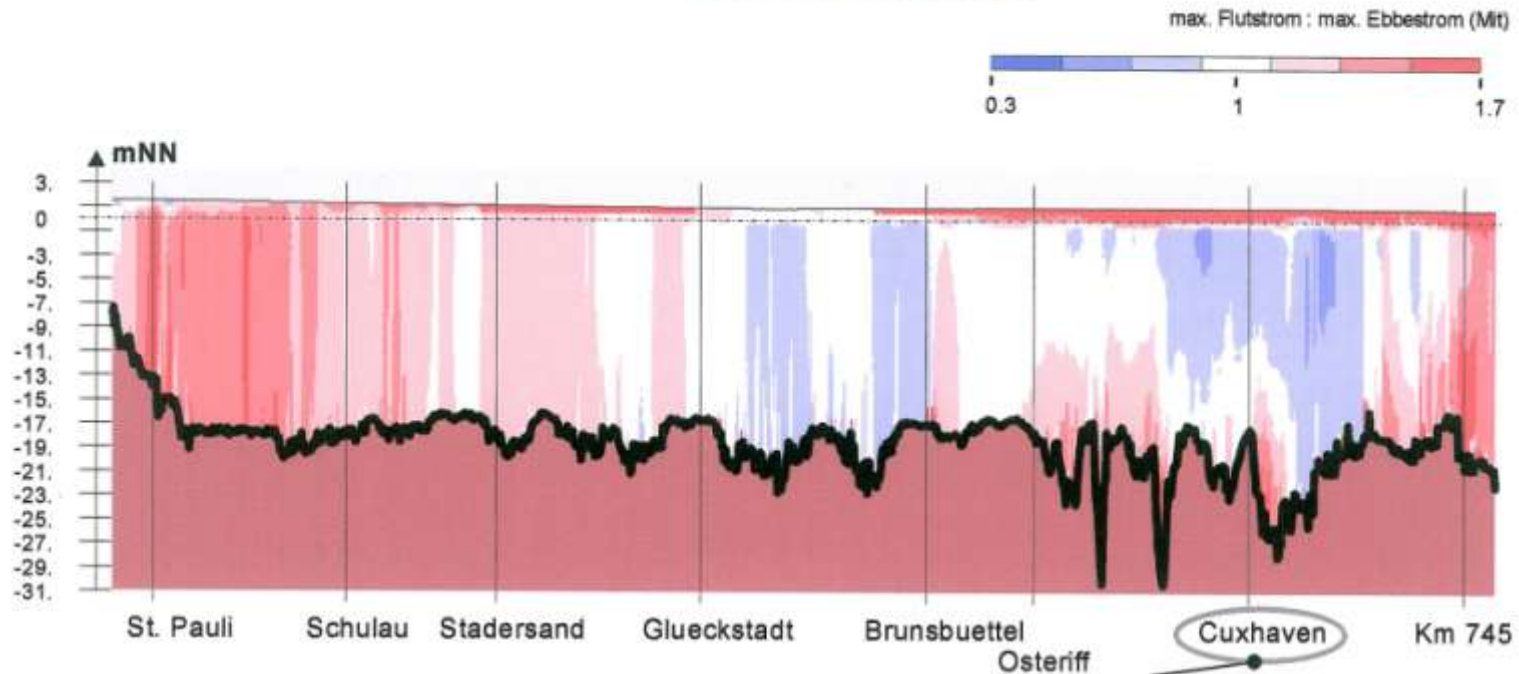
Development of Dredged Material within the Port and the River Elbe in Hamburg 1996 - 2008

13.02.2009



3D-Simulation: Flood-/Ebb current Dominance

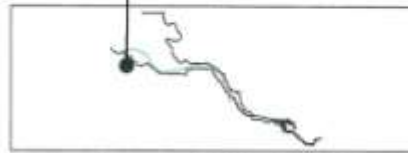
3D Simulation



Zeitraum : 11.05.2002-17:30 bis 26.05.2002-00:00

0 12.50 25.00 km

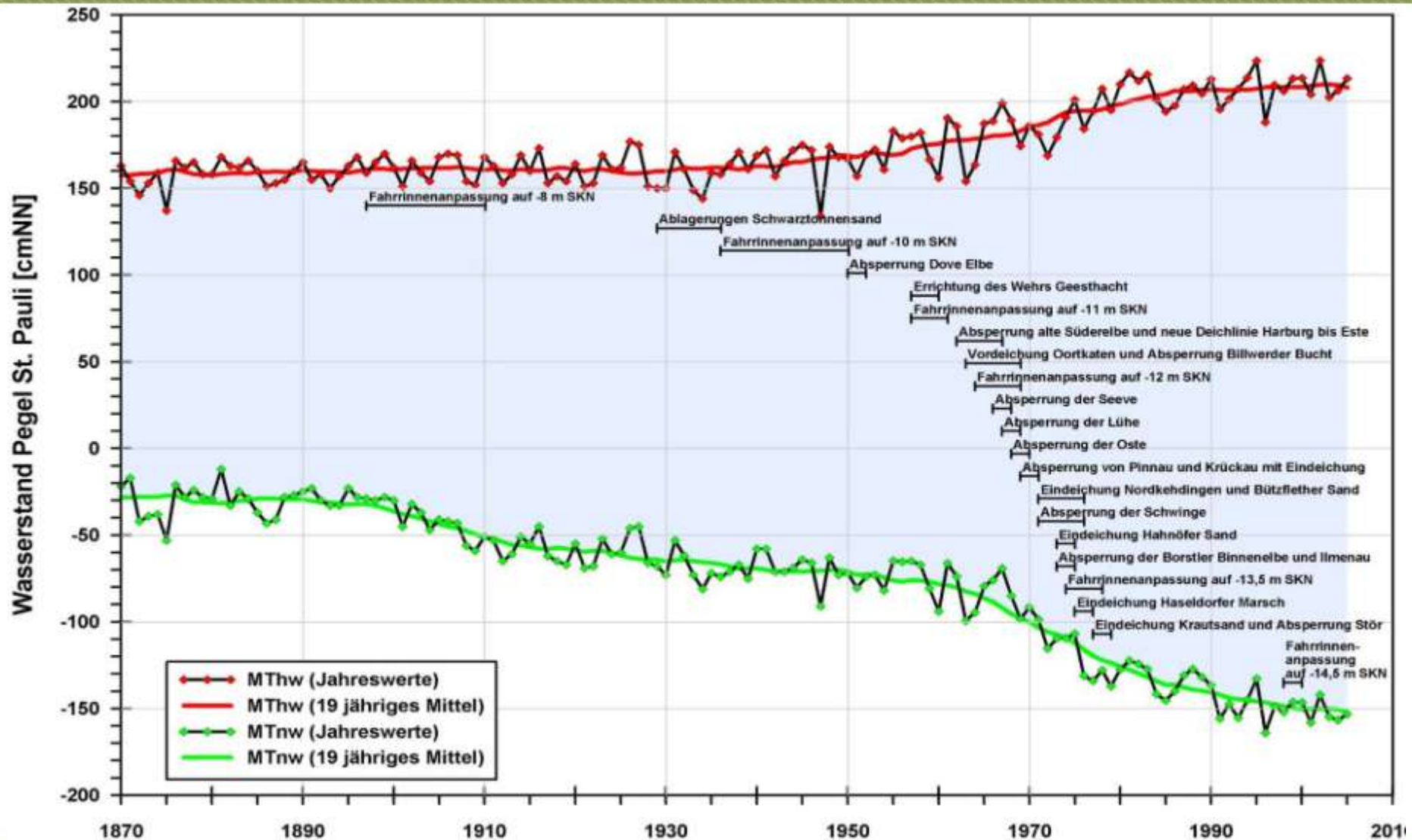
Uebershoehung : 1200,0-fach



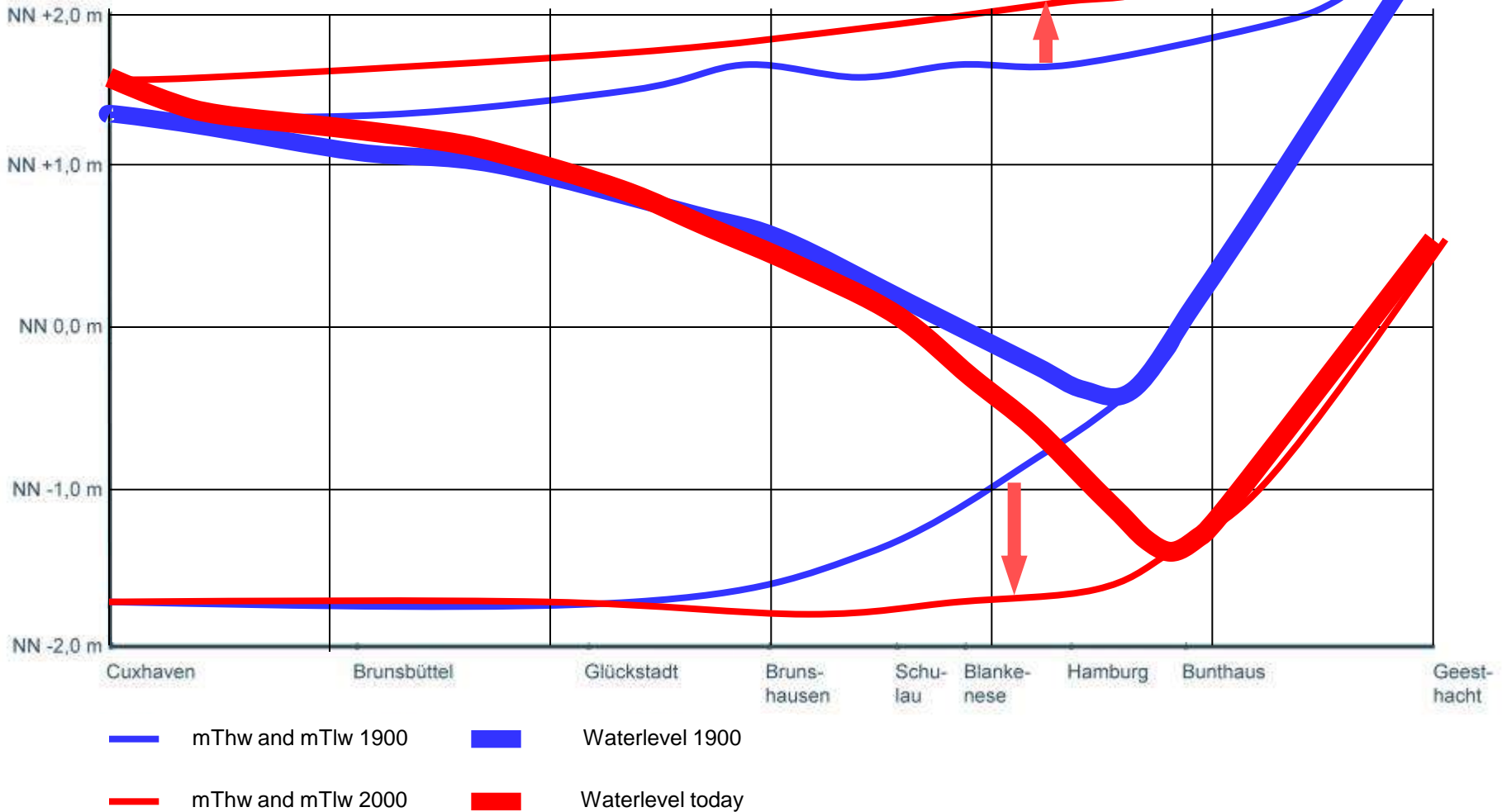
Profil : Laengsprofil Tideelbe TRASSE



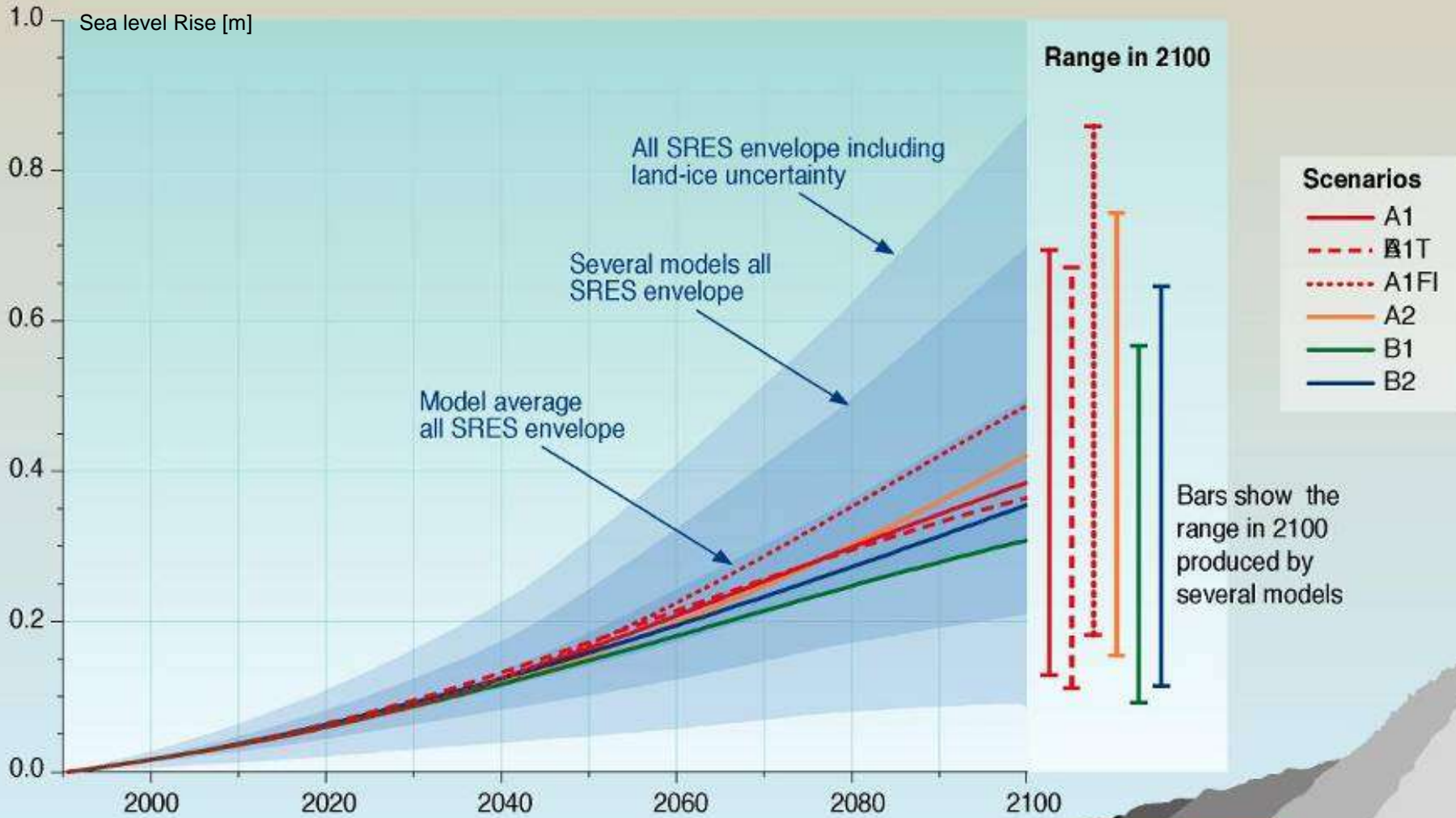
Hydrodynamic Changes



Changing Water Level over the past 100 Years

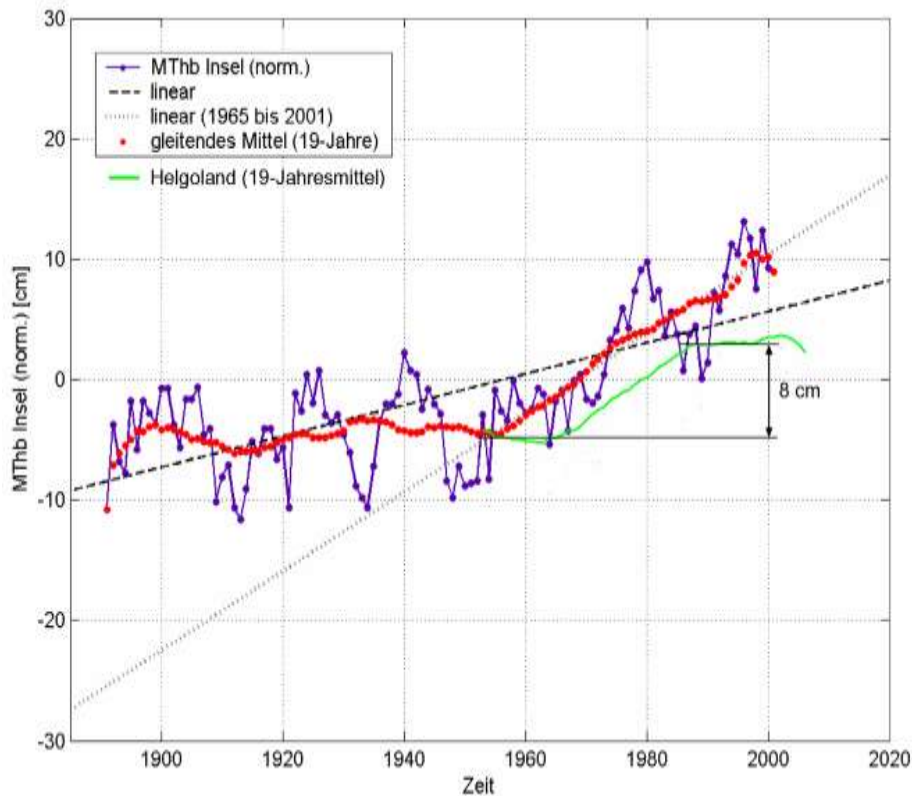


Sea Level Rise

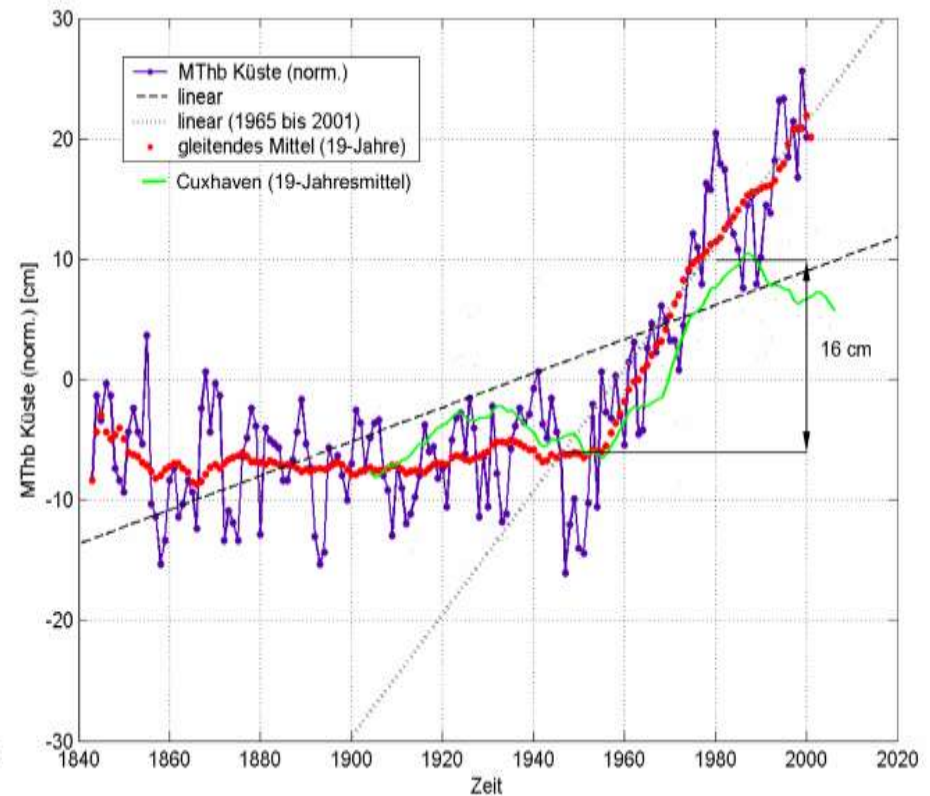


Changes in Tidal Amplitude

Changes in Tidal Amplitude at Helgoland and Cuxhaven between 1947 and 2000 (Jensen, fwu)



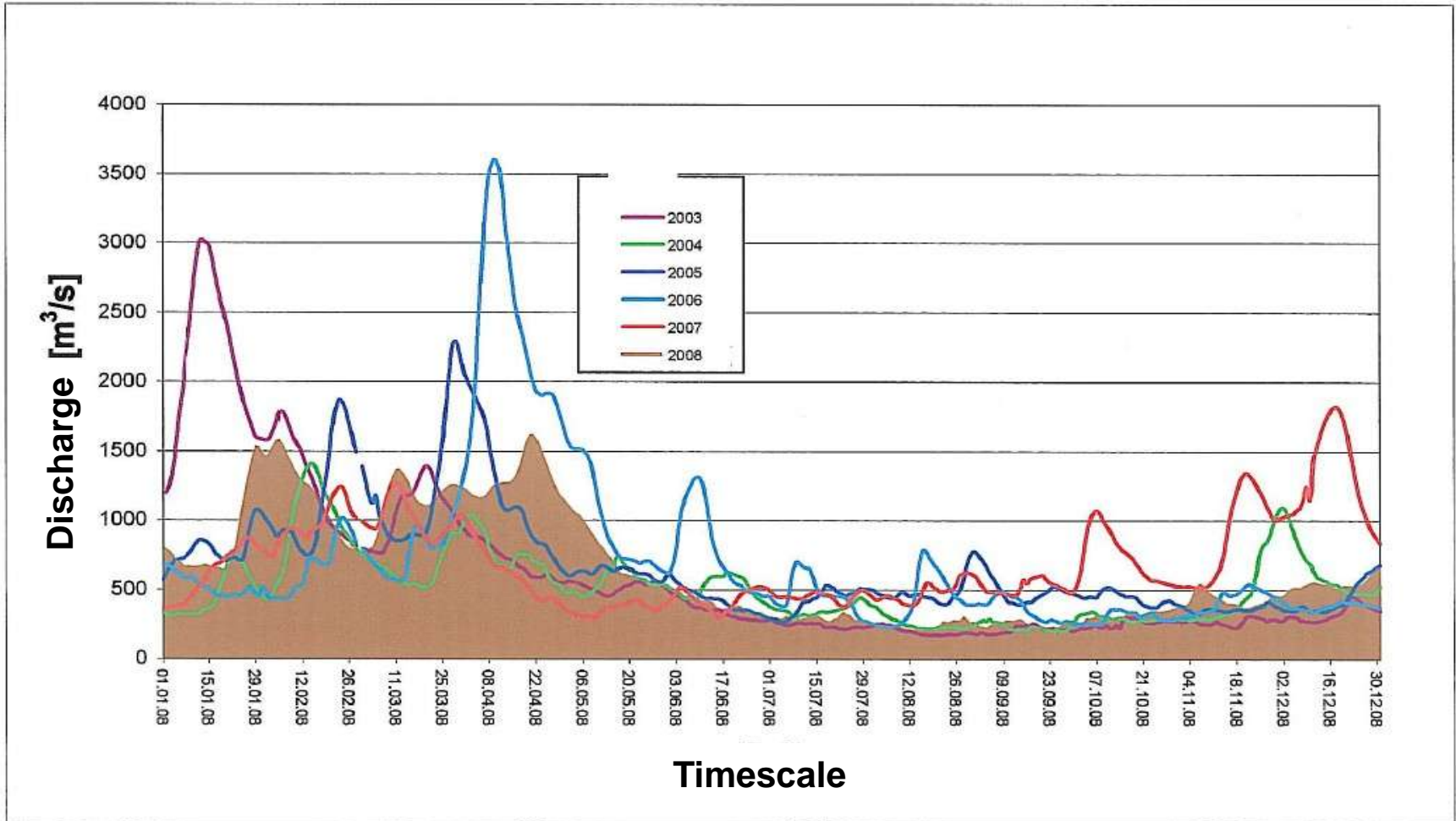
Helgoland* —
 Island —



Cuxhaven* —
 Coast —

* ergänzt d. Strotmann, HPA

Headwater Discharge



TH231-1
05.01.09
24300308.xls

The Port of Hamburg

- 2nd in Europe (TEU)
- 250.000 Jobs
- 9.9 Mio. TEU in 2007
- Forecast of 18 Mio. TEU in 2015
- Fairwaydepth 12,50/13,50m
- Deepening proposed to 14,5m

HPA-Tasks:

- **Maintenance of Port Infrastructure and Waterways in Hamburg**
- **Ensuring competitiveness for the Future**

Multiple Uses



Nature Protection

Traffic and Economy

Flood Risk Management



Tourism

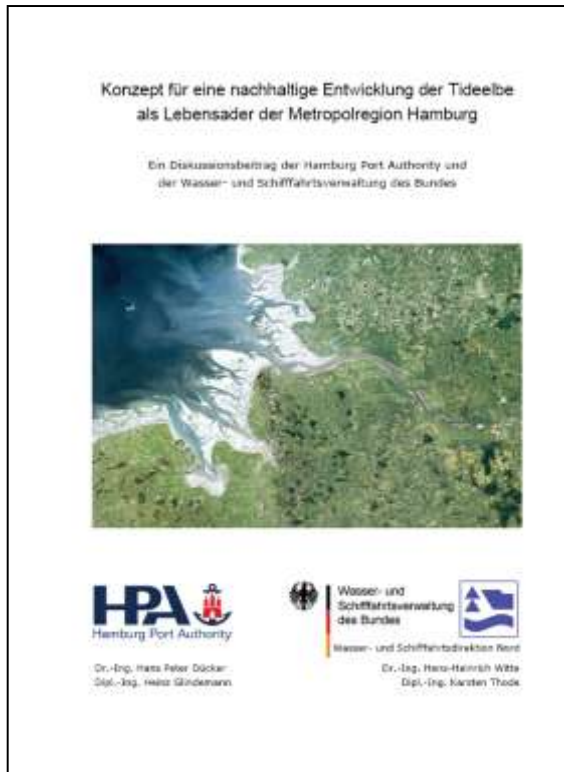


Fishery

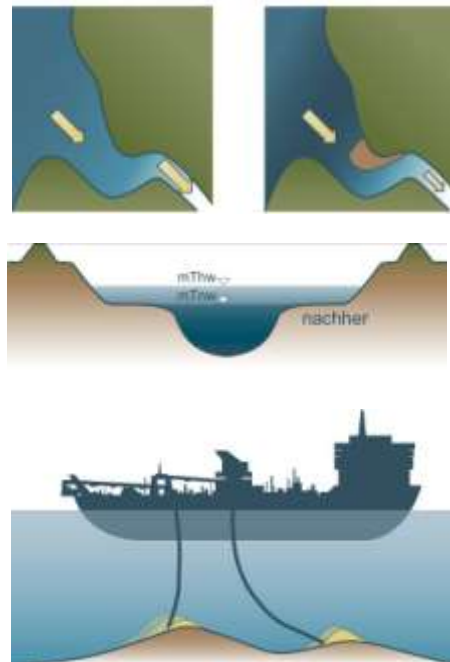
Competent Authorities



2006: Cornerstones of the Concept for the Tidal River Elbe

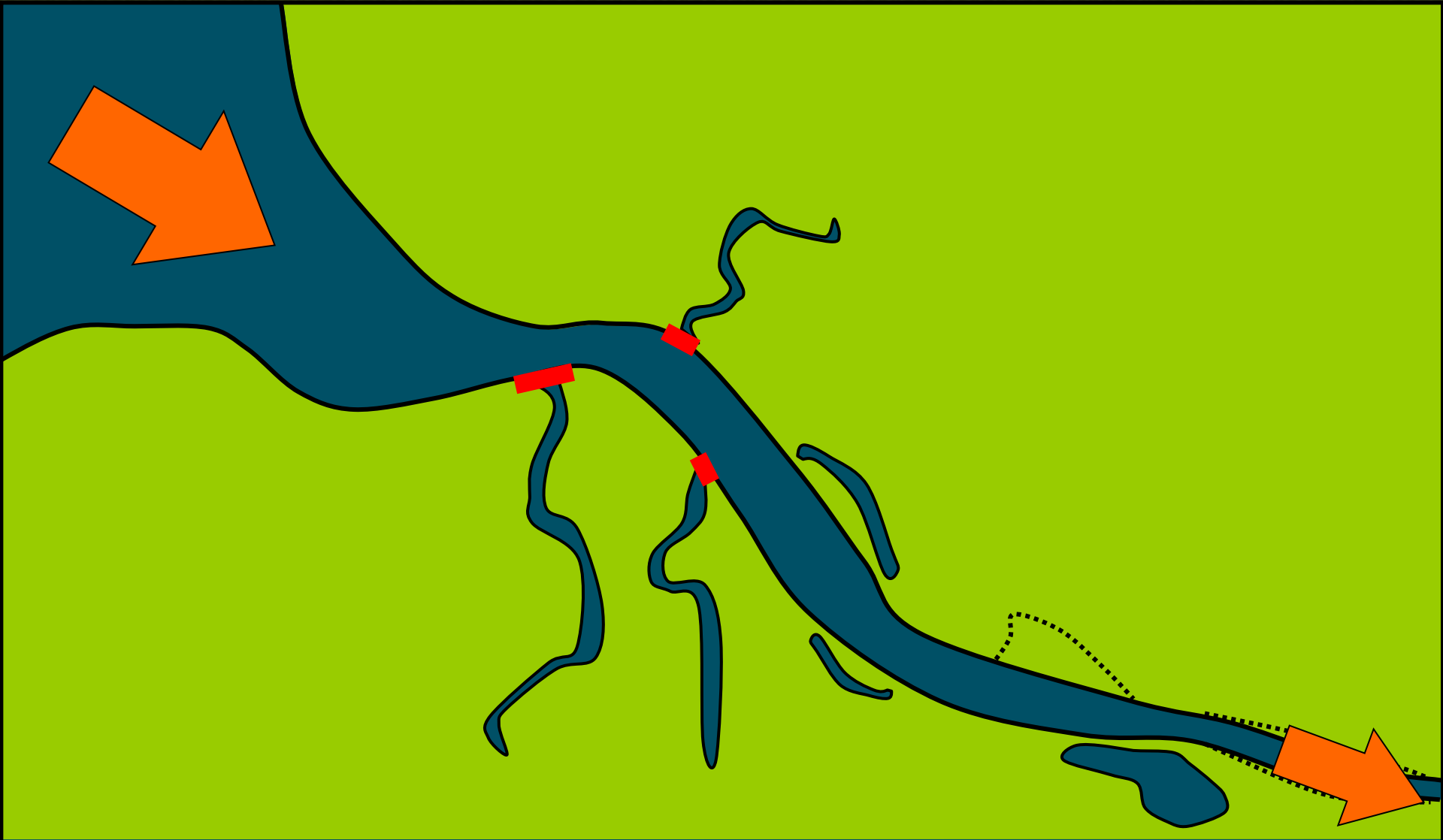


Three Cornerstones for a future action plan:

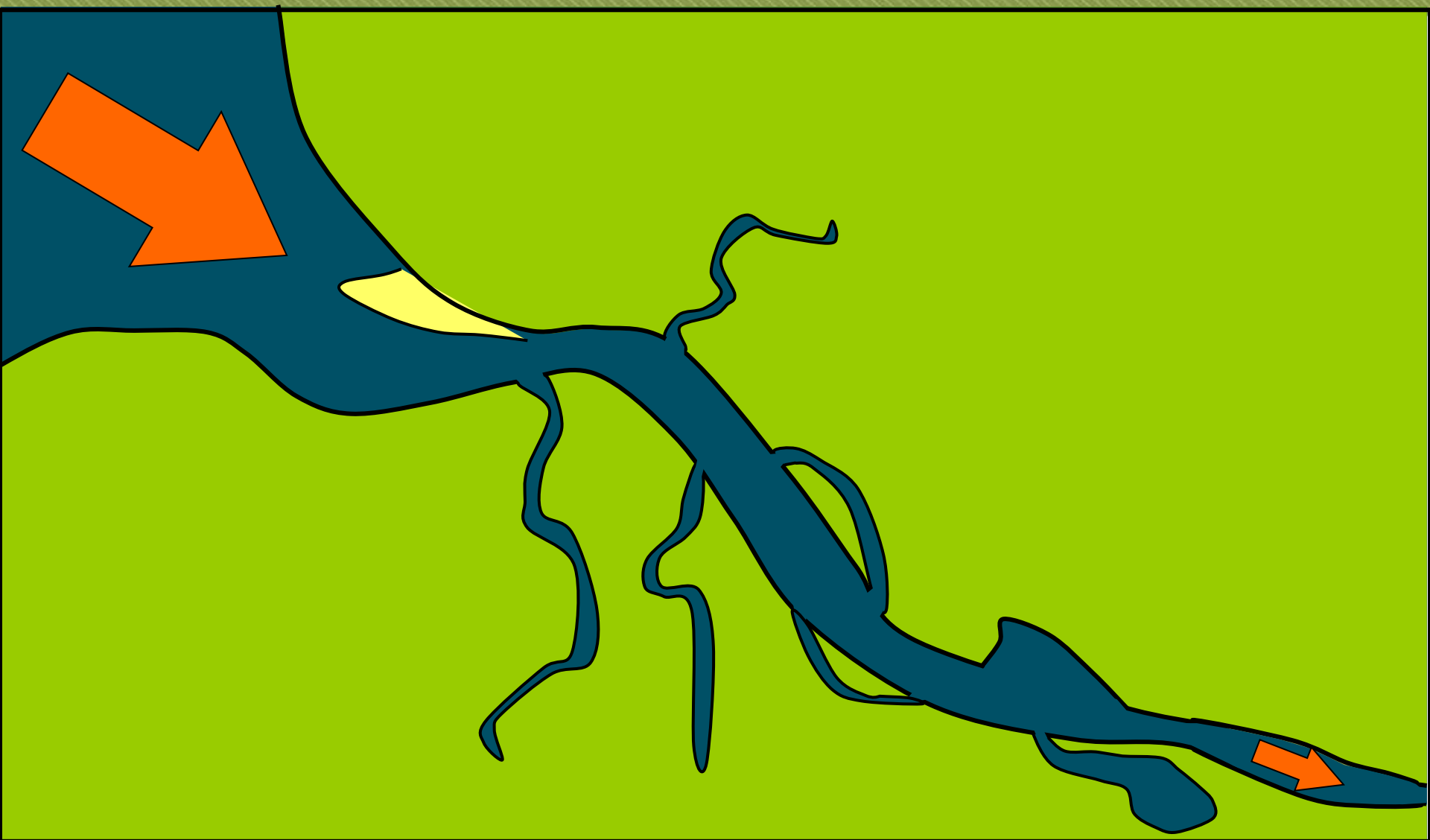


1. **Attenuation of the Tidal Energy through River Engineering in the Mouth of the Estuary,**
2. **More Room for the River (Tidal Volume) between Glückstadt and Geesthacht**
3. **Optimisation of the Sediment-management considering the whole System of the Elbe**

Tidal Elbe Today



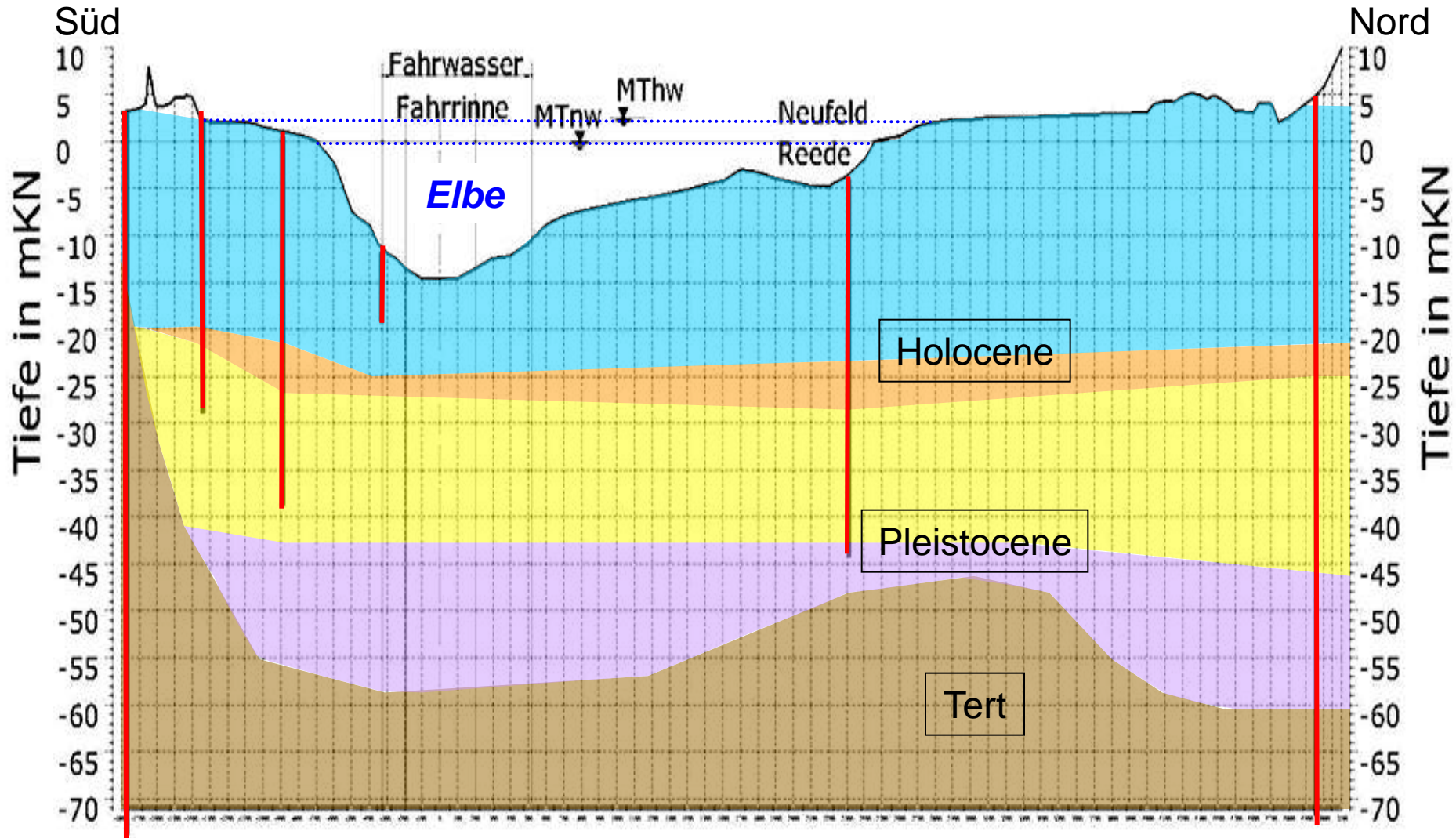
Tidal Elbe tomorrow



New Sand-Banks within the Mouth

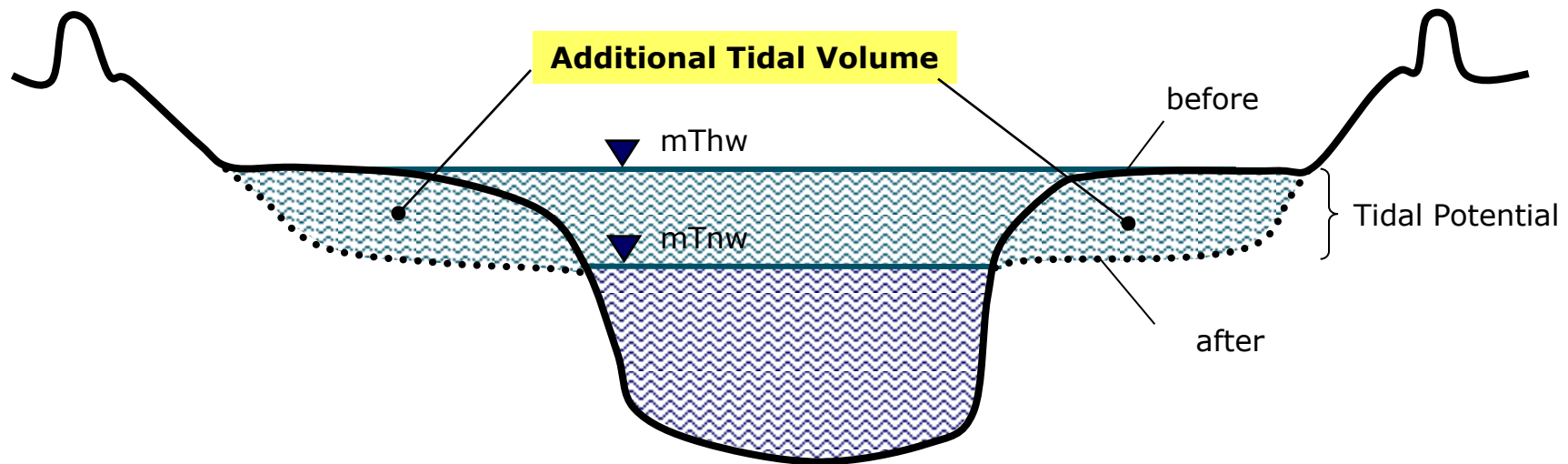


Geological Model of the Mouth



Moderation of the Tidal Range

- **Shallow Water = *Tidal Volume* = Volume between High Tide and Low Tide**
 - **Best Effect around Hamburg**
 - **1 Mio m³ Tidal Volume = 1cm Raising of Tidal Low Water**
 - **Delayed Discharge and High Friction wanted (Spongeeffect)**



Pilot Project Spadenlander Busch / Kreettsand



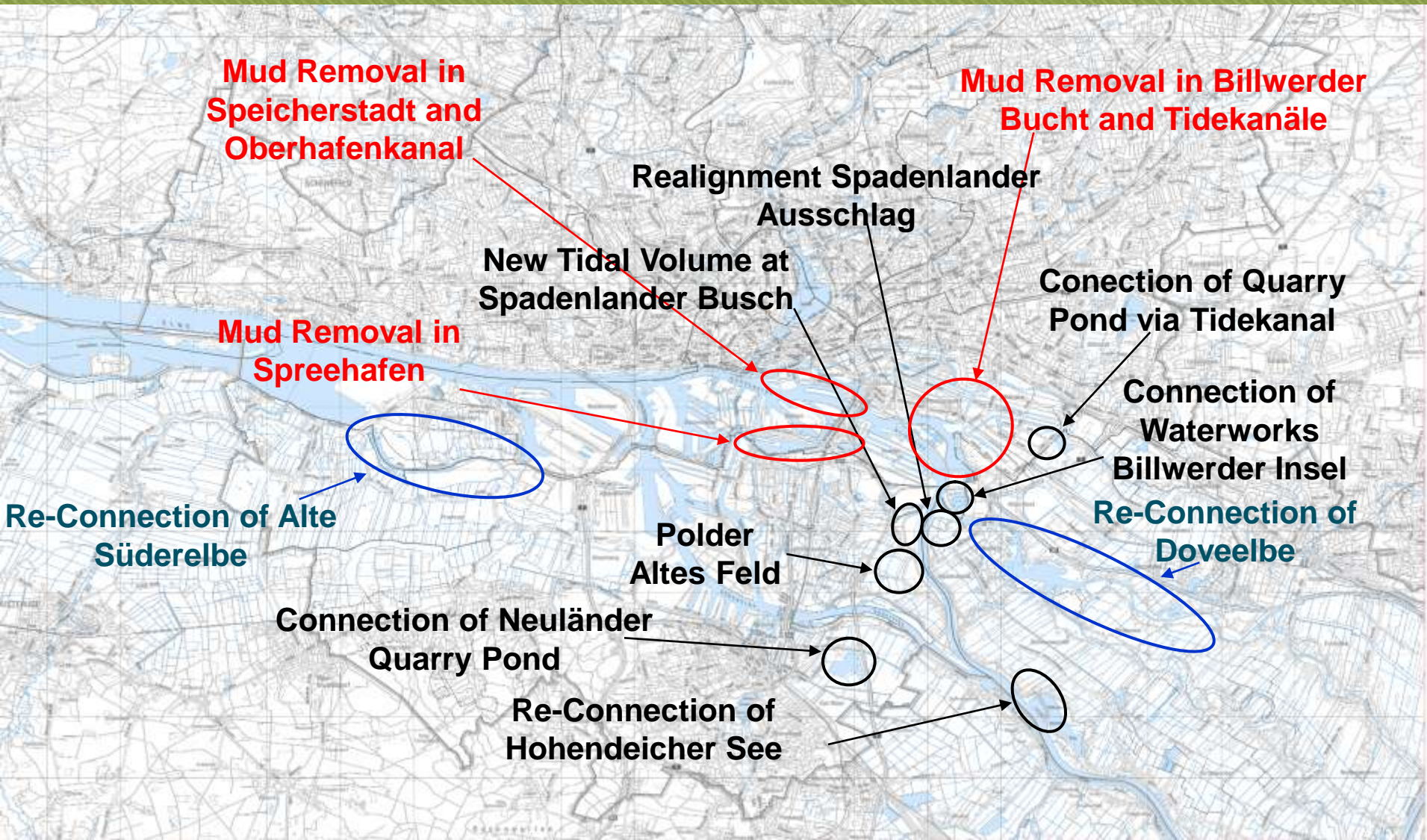
- former flushing field
- Approx. 42 ha
- realigned since 1999
- mean surface level +5,50 mNN

Pilot Project Spadenlander Busch / Kreettsand



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- Approx. 42 ha
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Scenarios for new Tidal Areas in Hamburg



Adapted Relocation Strategy



www.dredgers.nl



Integrierted Management Plan Elbe Estuary

- 2008 – 2010
- Steering by Natura2000-Steering Group
- Working Group and Consultants
- Stakeholder in Planing Groups
- Integrating of Sediment Management by WSV und HPA
- www.natura2000-unterelbe.de

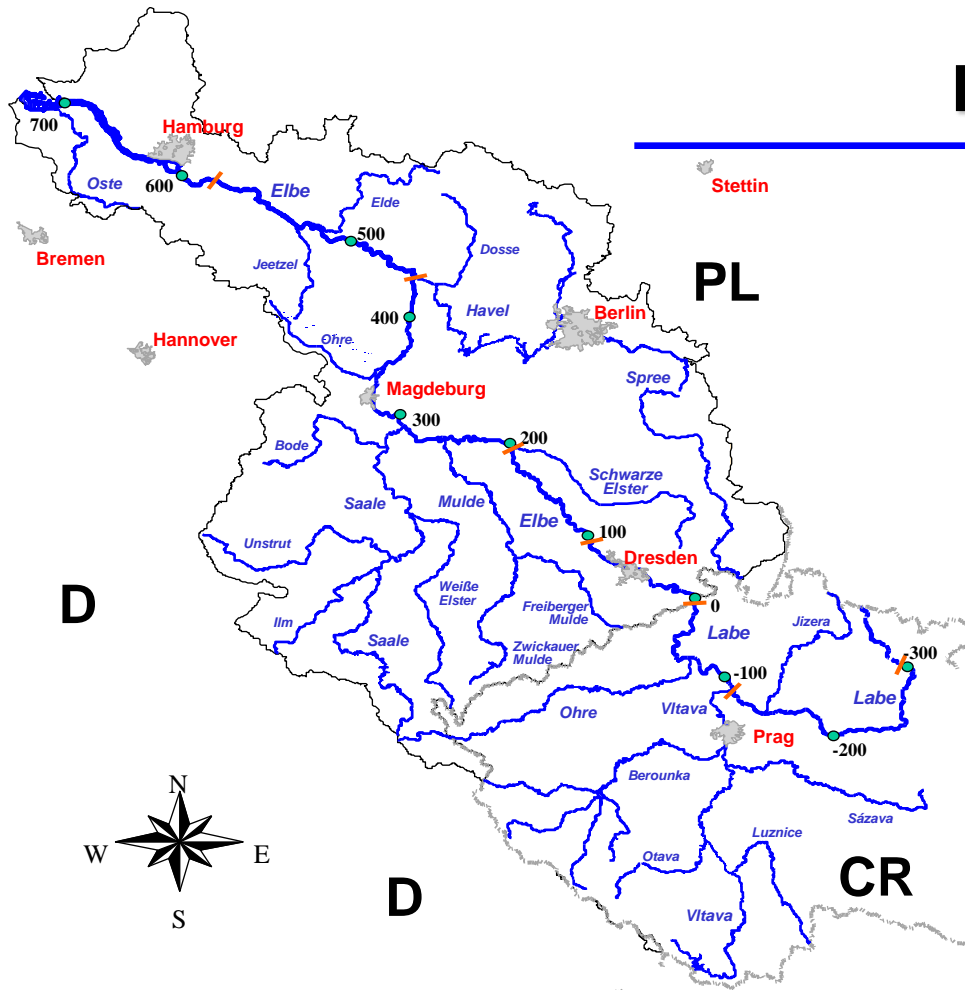


**Integrierted
Managementplan
Elbe Estuary**



River Elbe still is not clean enough!

Elbe catchment

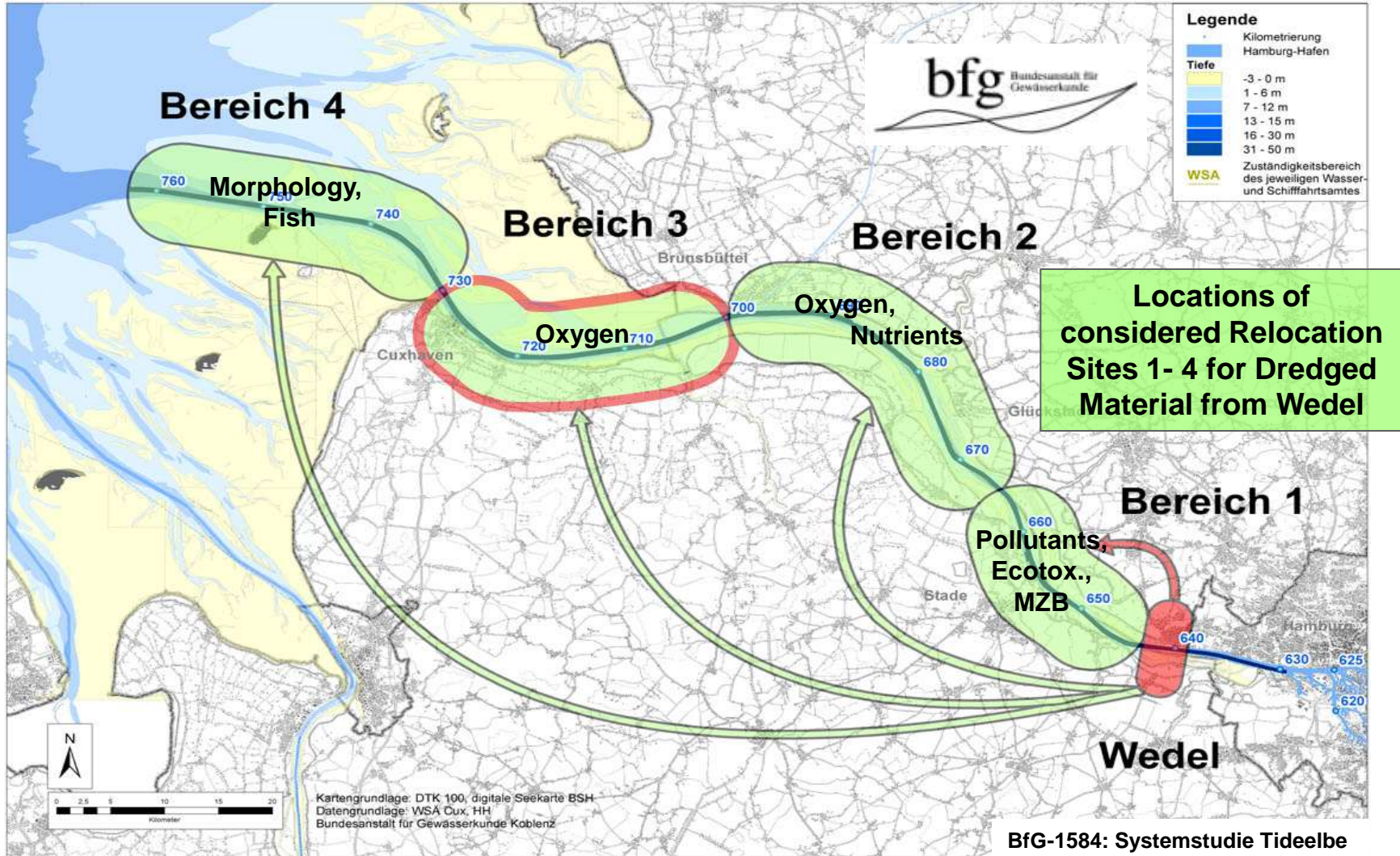


- Study on Sediment contamination in Elbe Catchment (BIS, 2005)
- Study on Pollutants (BIS, 2007)

Sedimentmanagement in the Context of European WFD and Marine Protection

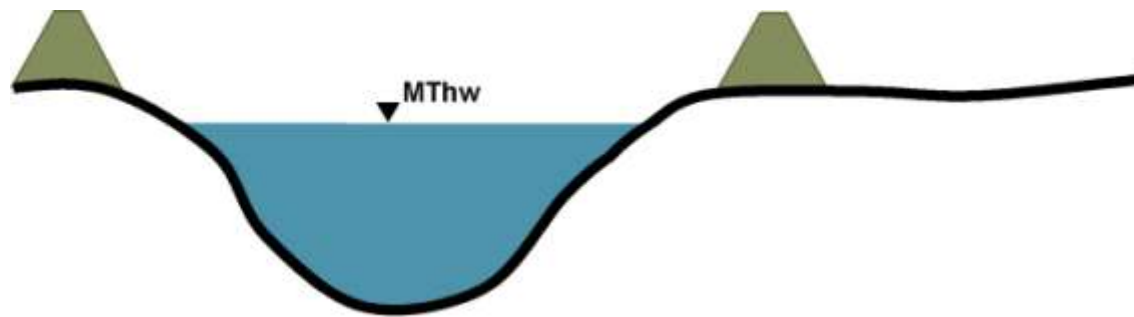
Rene Schwartz, TUHH

Relocation Strategy

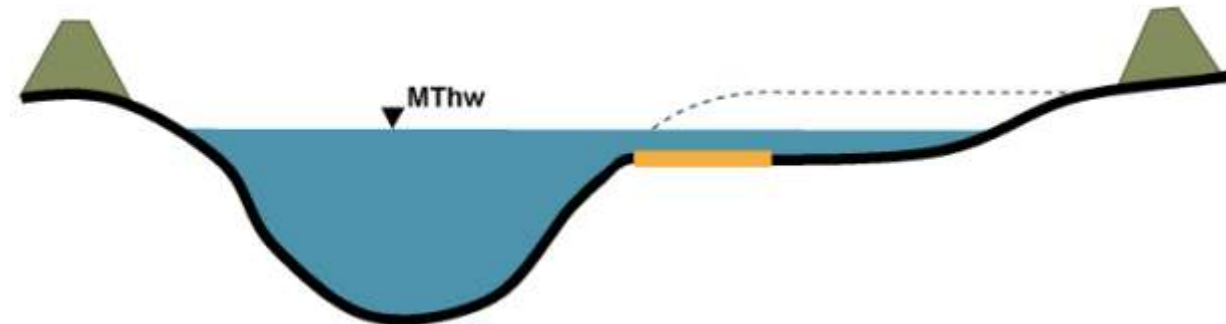


Climate Change: River Engineering and Flood Risk Management

1. Normal Tide



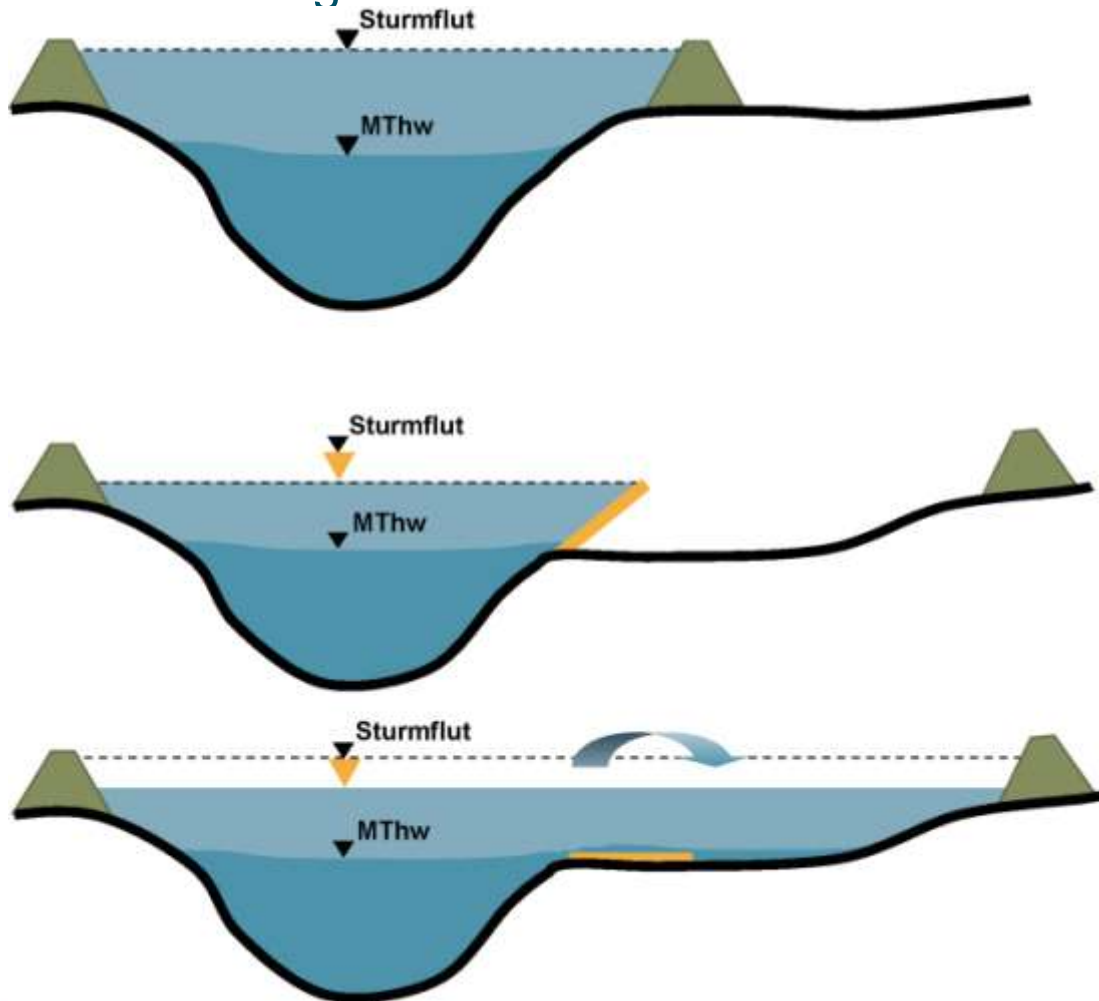
Current Situation



With additional Tidal Area
And submerged Shutter at
normal Tide

Climate Change: River Engineering and Flood Risk Management

2. Storm Surge



Today

In Future?

Storm Surge Polder:
Shutter is raised until shortly before the Peak of the Surge

Storm Surge Polder:
Shutter is lowered shortly bevor Peak of the Surge

Scenarios for the next 100 Years



**Principal sketch:
Haseldorfer Marsch**

Storm Surge Polder: Scenario Haseldorfer Marsch

Planungsrandbedingungen

- Deichrückverlegung nach Variante E (Entwurf durch Krabe, exemplarisch)
- Länge der Rückdeichung: 5,9 km
- Deichbauvolumen: 1,5 Mio. m³
- neue Ästuarfläche: 439 ha
- mittlere GOK: NN +2,0 m (MThw)
- eingeschlossene zusammenhängende Wasserfläche: etwa 55 ha

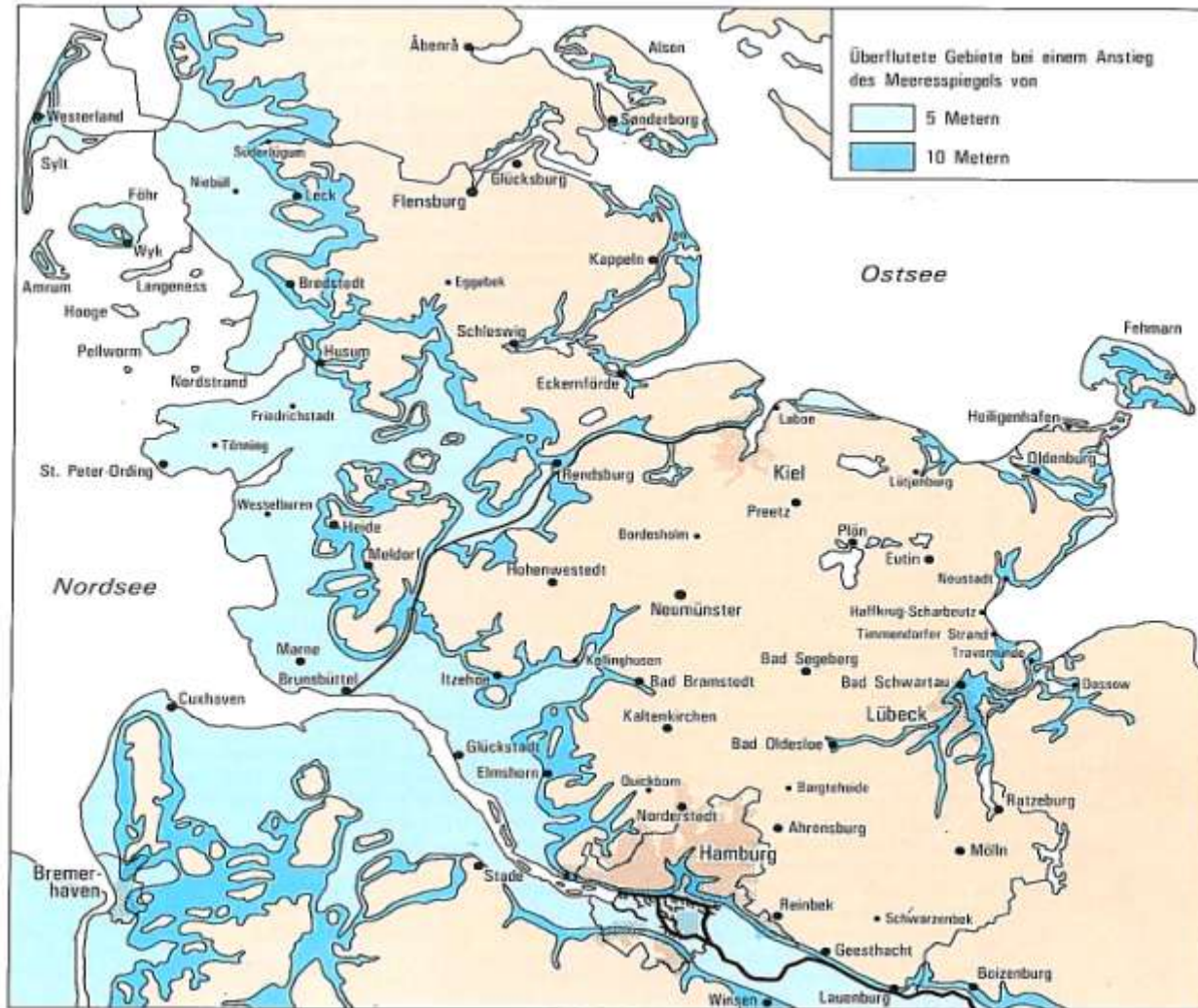


Sturmflutbauwerk Venedig:
Modelluntersuchungen durch WL | Deift Hydraulics, 1988-1992

IMS-Study:

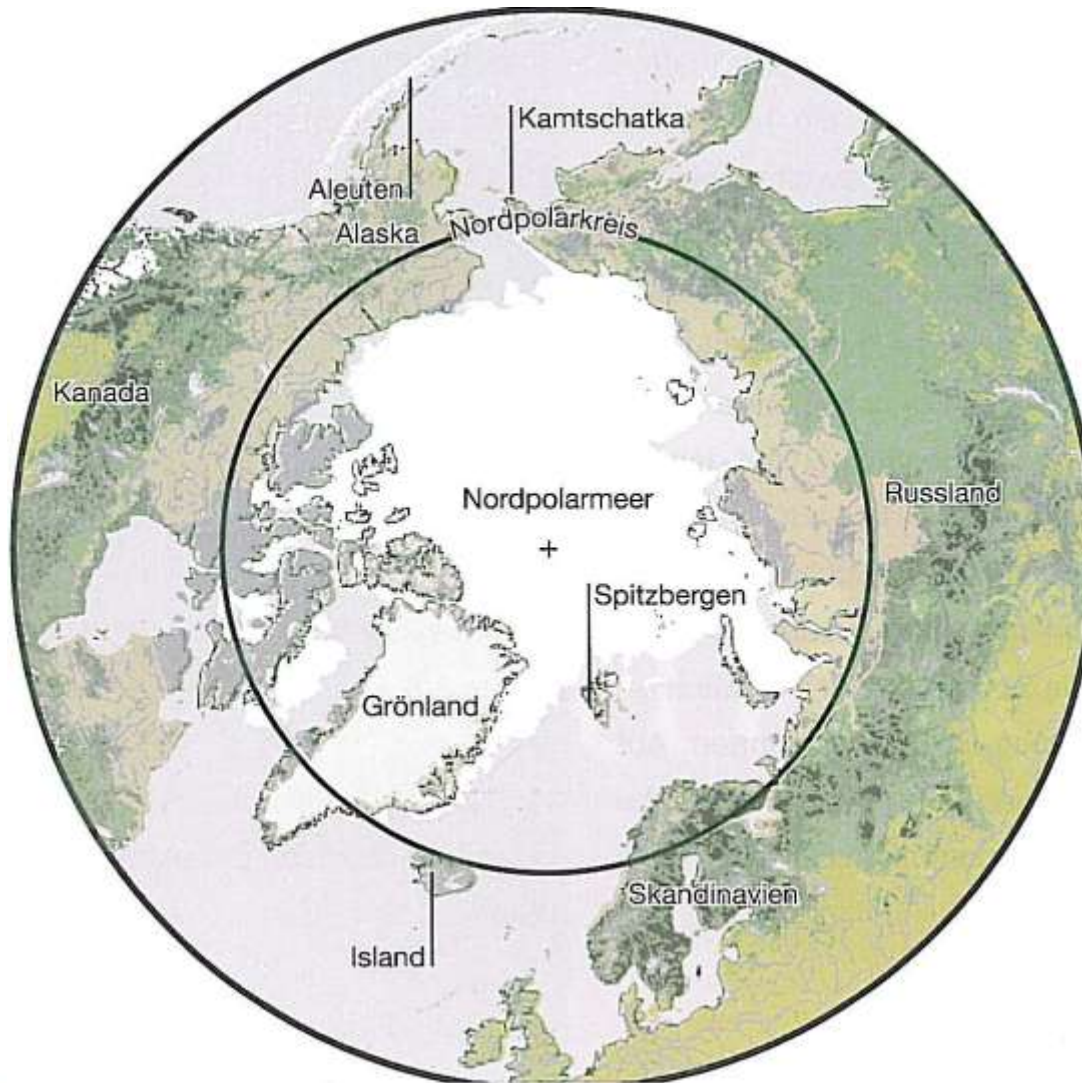
- *The storm surge polder has an area of 570 ha and a volume of **27 Mio. m³**. The flooding begins three hours before surge maximum.*
- *This will reduce the surge for about 10 cm in Hamburg.*

Theoretically Flooded Areas for 5 and 10 m Sea Level Rise



Überflutungsgefährdete Gebiete in Schleswig-Holstein (nach: GEO special Nr. 2/1982)

Moderation of the Tide by Polar Ice?



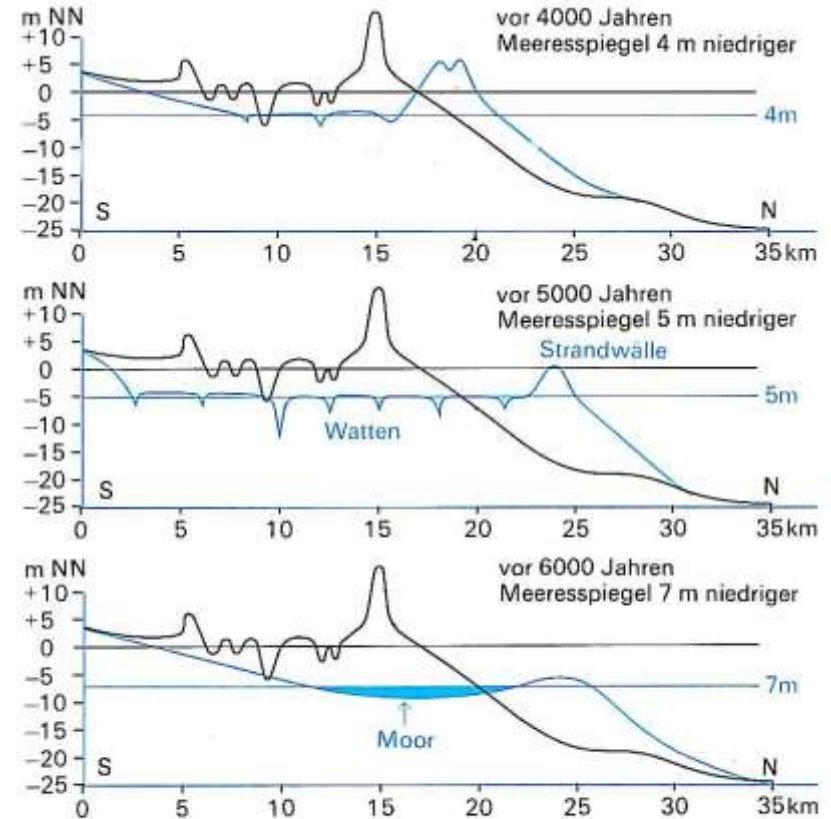
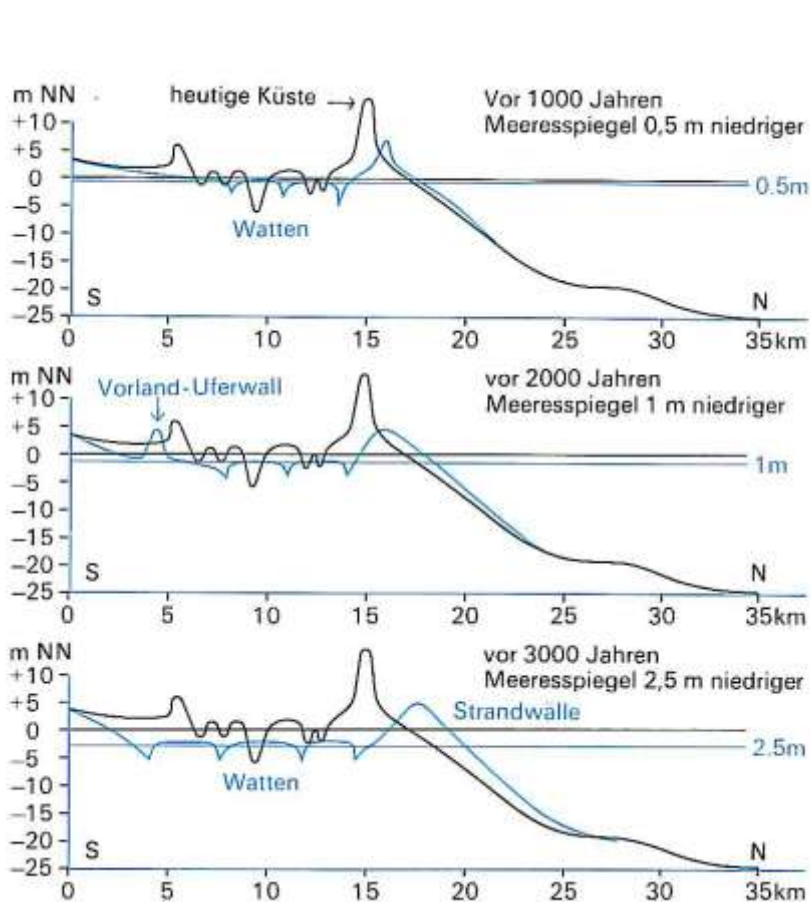
Scenarios 2200

WELCHE SCENARIEN SIND REALISTISCH?



Profiles of the German West Coast

Tendencies of the last 6000 Years


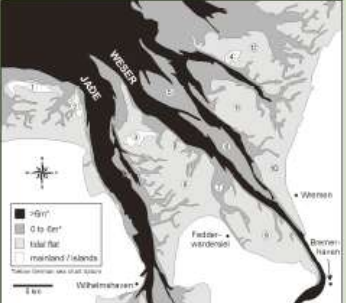




34 *Querprofile zum Aufbau der Wattenküste (Schema). Aus den beiden unteren Profilen geht das Vorhandensein von Torfschichten und Wattedimenten seewärts der heutigen Küstenlinie hervor.*

© Landelijke Vereniging tot Behoud van de Wattenzee 1976

International Exchange (Interreg IVB)



Elbe / DE	Weser / DE	Humber / GB	Schelde / NL - BE
<p>Port of Hamburg Length: 141 km</p>	<p>Port of Bremerhaven Length: 40 km</p>	<p>Ports of Hull, Immingham, Grimsby and Goole Length: 121 km</p>	<p>Port of Antwerp Length: 160 km</p>
	 <p>Legend: -> river -> 0 to 6m -> tidal flat -> island / flats</p> <p>Islands: 1. Wangerooge, 2. Minster Oog, 3. Alte Mellum, 4. Hoher Hochtand, sand bars, 5. Tegeler Plate, 6. Robergsater Idemay, 7. Festschwerter Priest Idemay, 8. Hohevelg Idemay, 9. Langsiedemay, 10. Wunster Watt, 11. Eversand, 12. Hesevort</p>	 <p>Legend: -> Large Tidal estuary -> Big Urban Port -> Coastal Urban settlement -> End of Tidal estuary</p>	



www.tide-project.eu

Tidal Elbe River in the www



der uns bewegt
TIDEELBE
Der Strom,

- ▶ dynamisch
- ▶ verbindet
- ▶ rechtlich
- ▶ interaktiv



- Startseite
- Aktuelles
- Über uns
- Downloads
- Kontakt



TIDEELBE - dynamisch

Historische Entwicklung und zukünftige Szenarien - mehr zu Sedimentmanagement und Strombau.

▶ weiter



TIDEELBE - verbindet

Als Lebensader der Region übernimmt die Tideelbe eine Vielzahl von Funktionen. Hier finden Sie alle Links...

▶ weiter



TIDEELBE - rechtlich

Alles über Schutzgebiete und rechtliche Grundlagen für die zukünftige Entwicklung der Tideelbe.

▶ weiter



TIDEELBE - interaktiv

Glossar, Wissenstest, Umfragestatistiken, Lehrmaterial und unser Bilderarchiv.

▶ weiter

Suchbegriff:

TIDEELBE - news

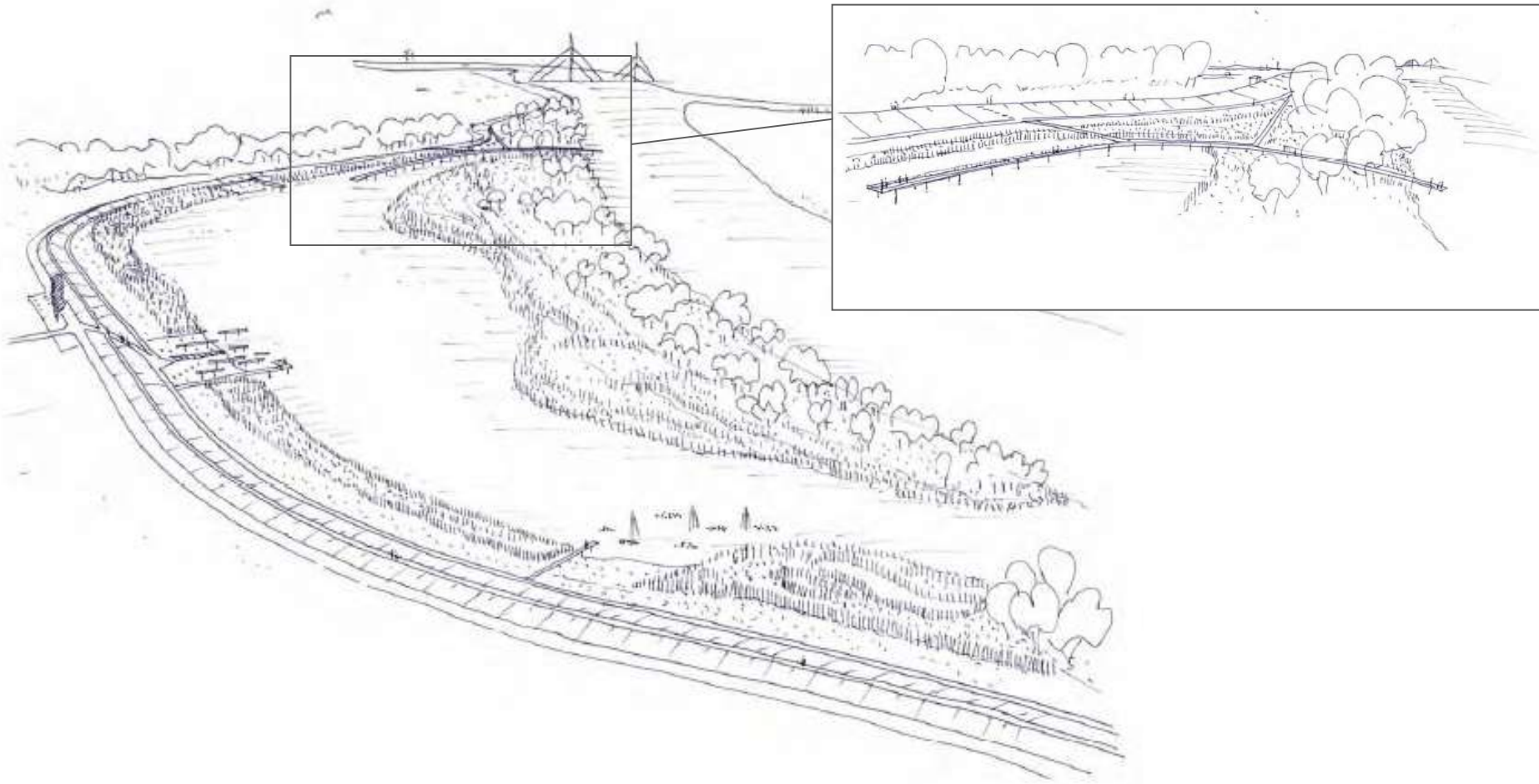
30.04.2008
Die neue Tideelbe-Website geht online.

▶ weiter

30.04.2008
Tideelbe Symposium in Hamburg

▶ weiter

Pilot Project Spadenlander Busch / Kreettsand



TIDEERLEBNIS im TIDEPARK KREETSAND



Thank You for Your Attention!

