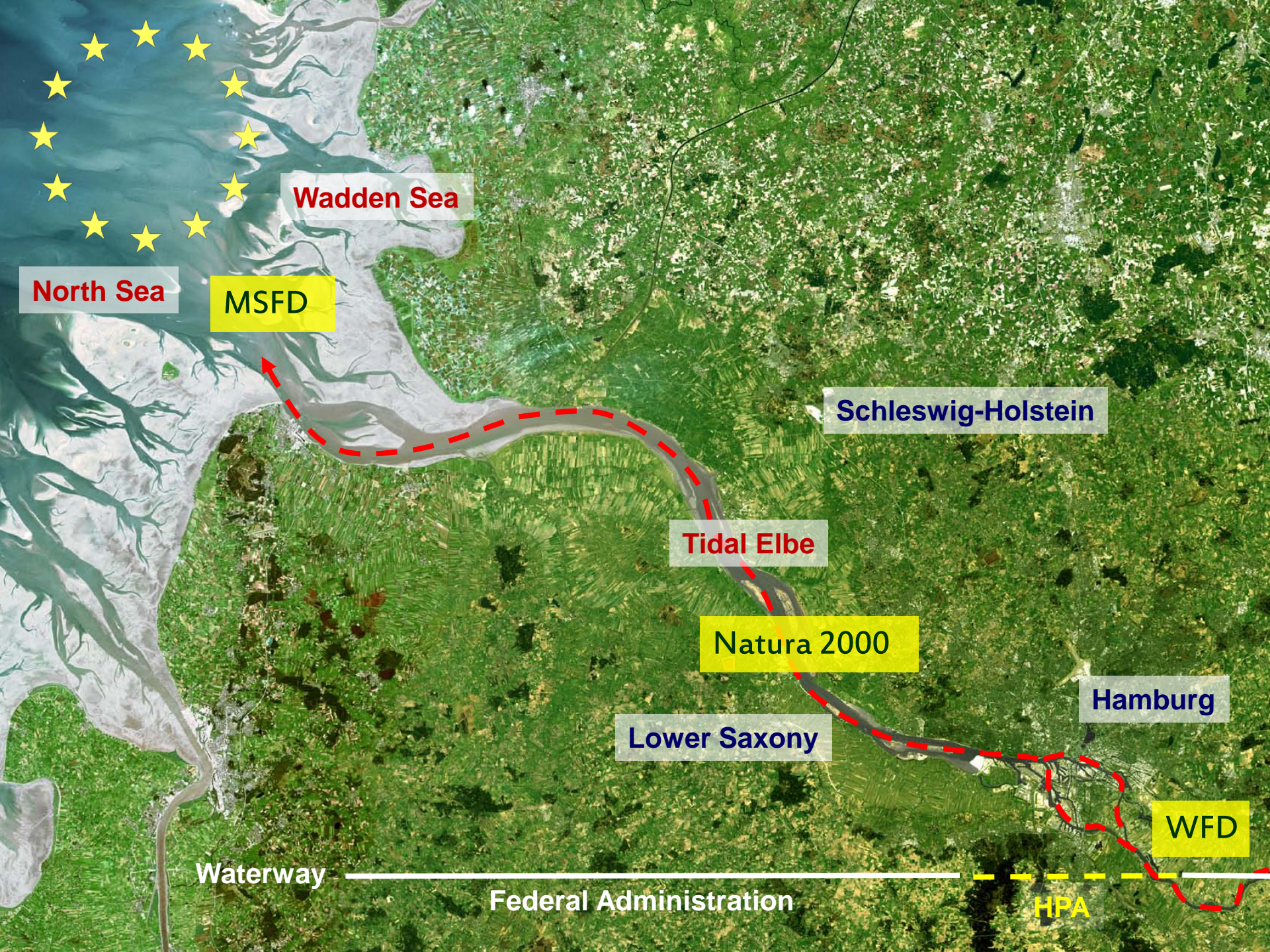




## The Tidal Elbe Concept – Sustaining the Tidal River Seaport of Hamburg

7<sup>th</sup> international SedNet event  
8. April 2011, Venice





North Sea

Wadden Sea

MSFD

Schleswig-Holstein

Tidal Elbe

Natura 2000

Lower Saxony

Hamburg





WFD

Waterway

Federal Administration

HPA

# Prologue: Inland-Seaport saves CO<sub>2</sub>

|                          |   | kg/TEU/km |
|--------------------------|---|-----------|
| Containership = 4800 TEU |   | 0,119     |
| Barge/Feeder = 400 TEU   |  | 0,477     |
| Train = 80 TEU           |  | 0,673     |
| Truck = 2 TEU            |  | 2,296     |

→ 130 km inland:  
679 t CO<sub>2</sub> saved/Containervessel \*!

\* compared to trucks



Waterway

Federal Administration

HPA

Hamburg

1

2

3

4

# 1 The Mouth



## 2 Kiel Canal and Brunsbüttel



### 3 Islands and Channels



# 4 The City and Port of Hamburg



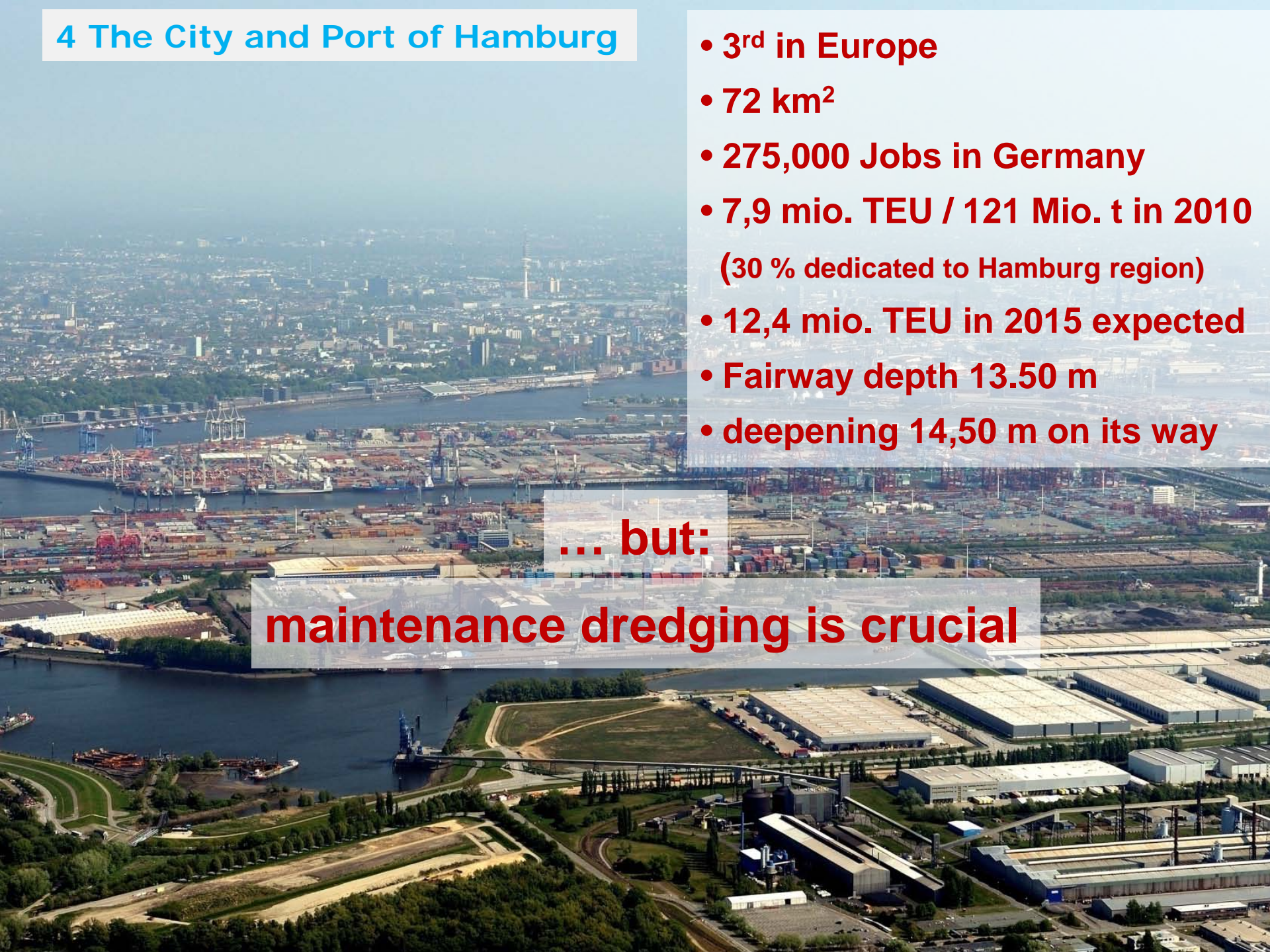


## 4 The City and Port of Hamburg

- **3<sup>rd</sup> in Europe**
- **72 km<sup>2</sup>**
- **275,000 Jobs in Germany**
- **7,9 mio. TEU / 121 Mio. t in 2010**  
(30 % dedicated to Hamburg region)
- **12,4 mio. TEU in 2015 expected**
- **Fairway depth 13.50 m**
- **deepening 14,50 m on its way**

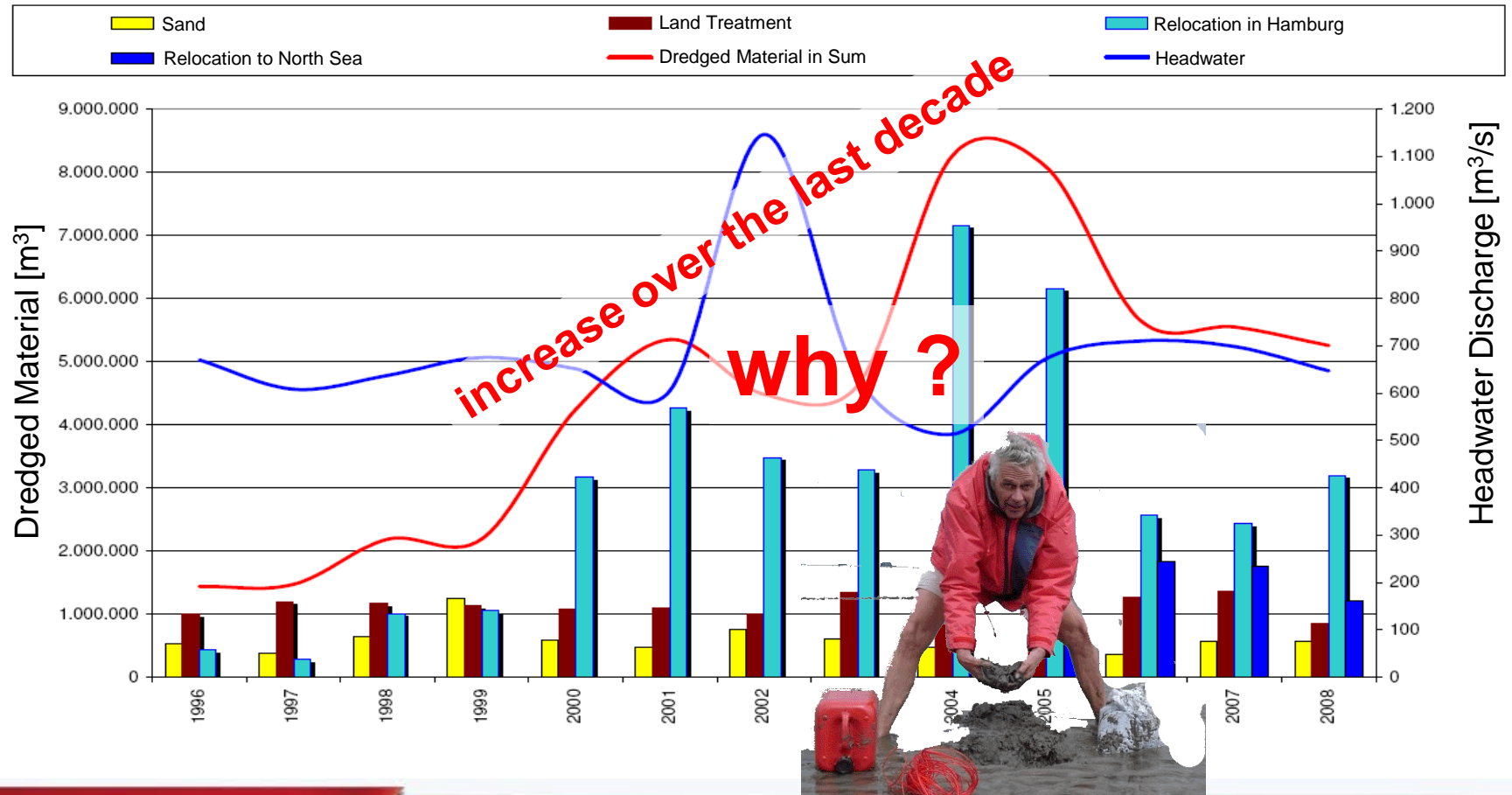
**... but:**

**maintenance dredging is crucial**

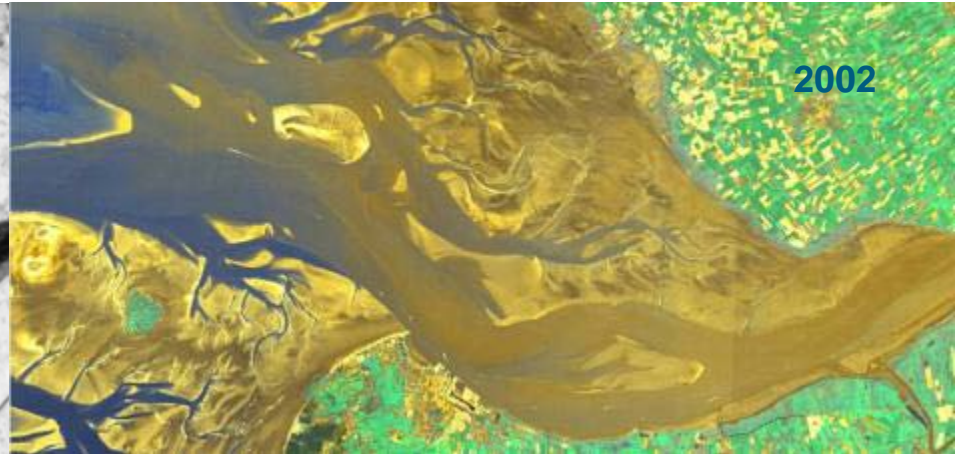
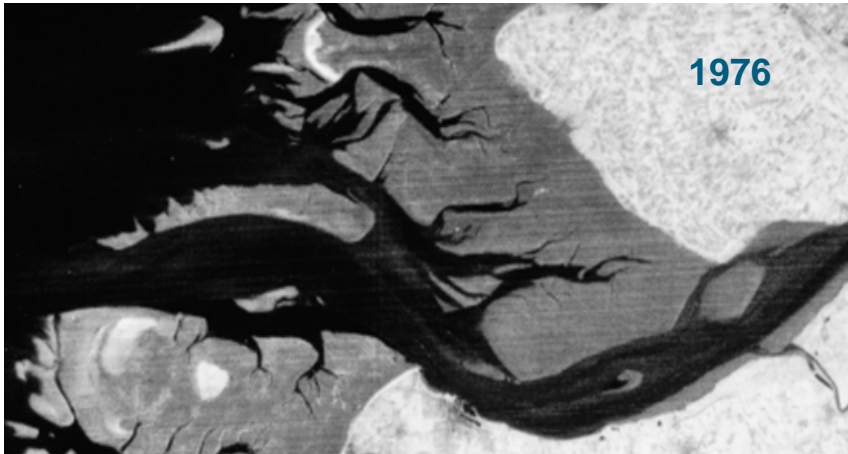


# Incentive: Dredging hit Maximum in 2004

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



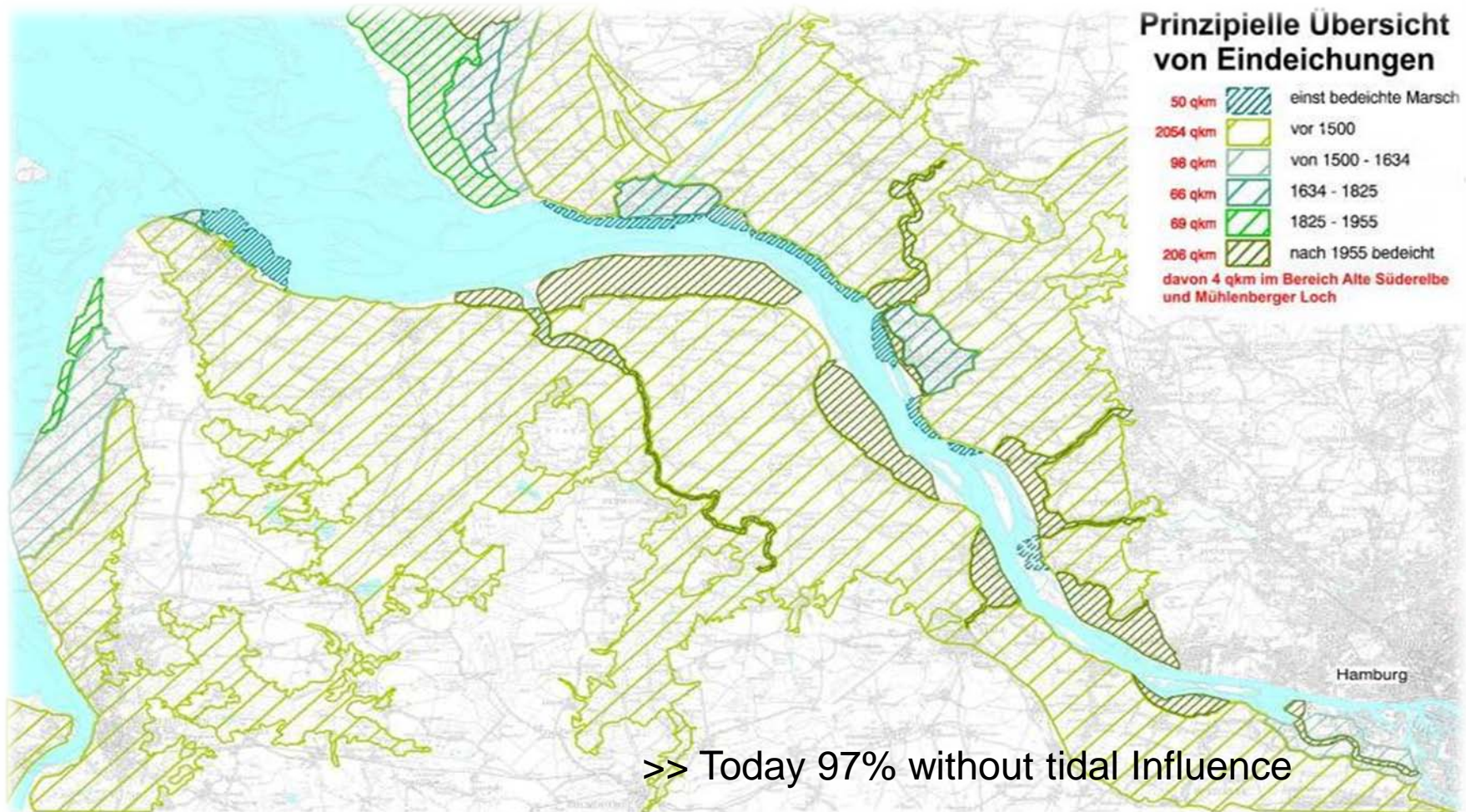
# Estuaries are changing...



**...and they are  
being changed**

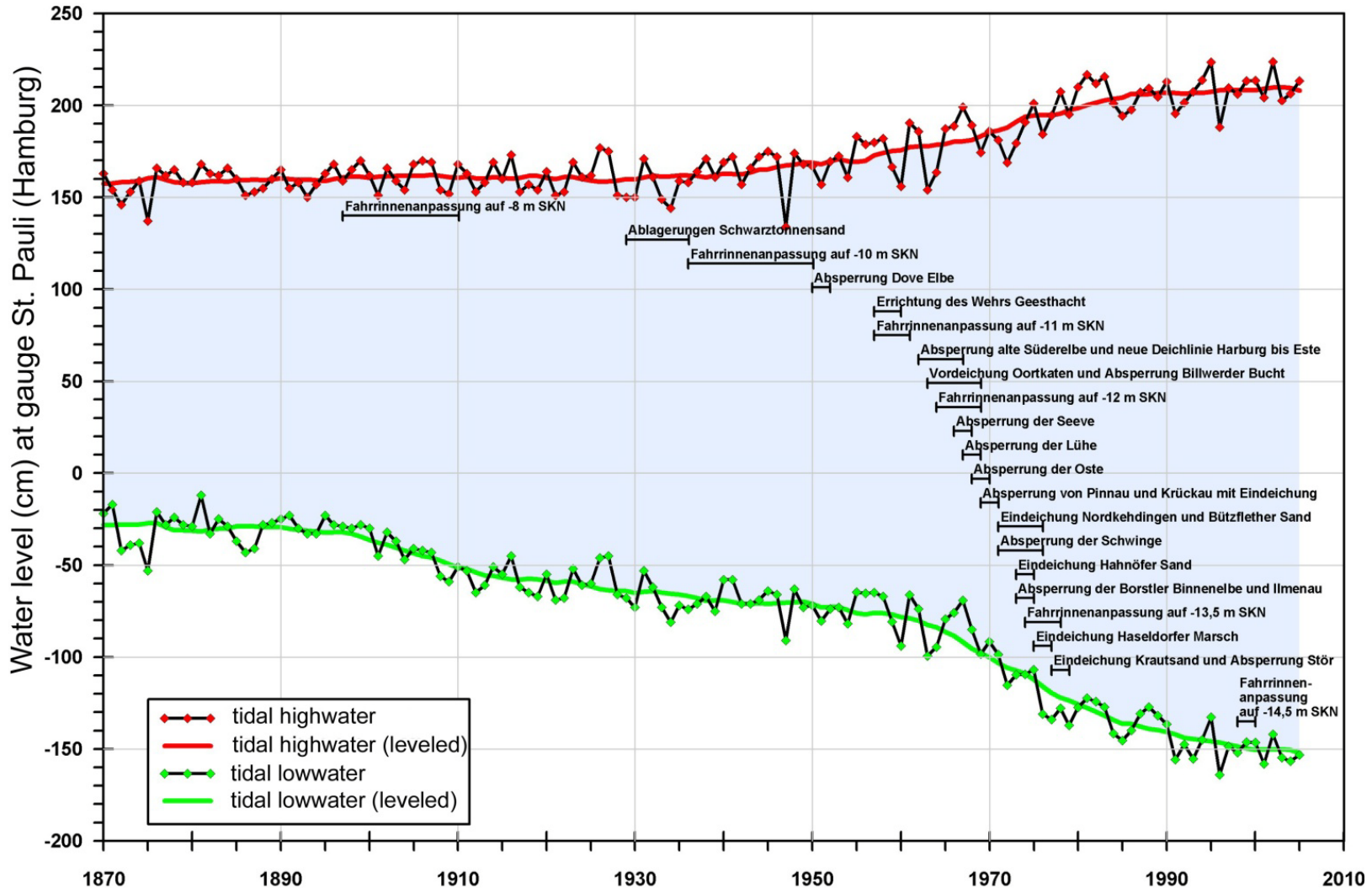


# Changing Estuary: Land Reclamation and Dykes

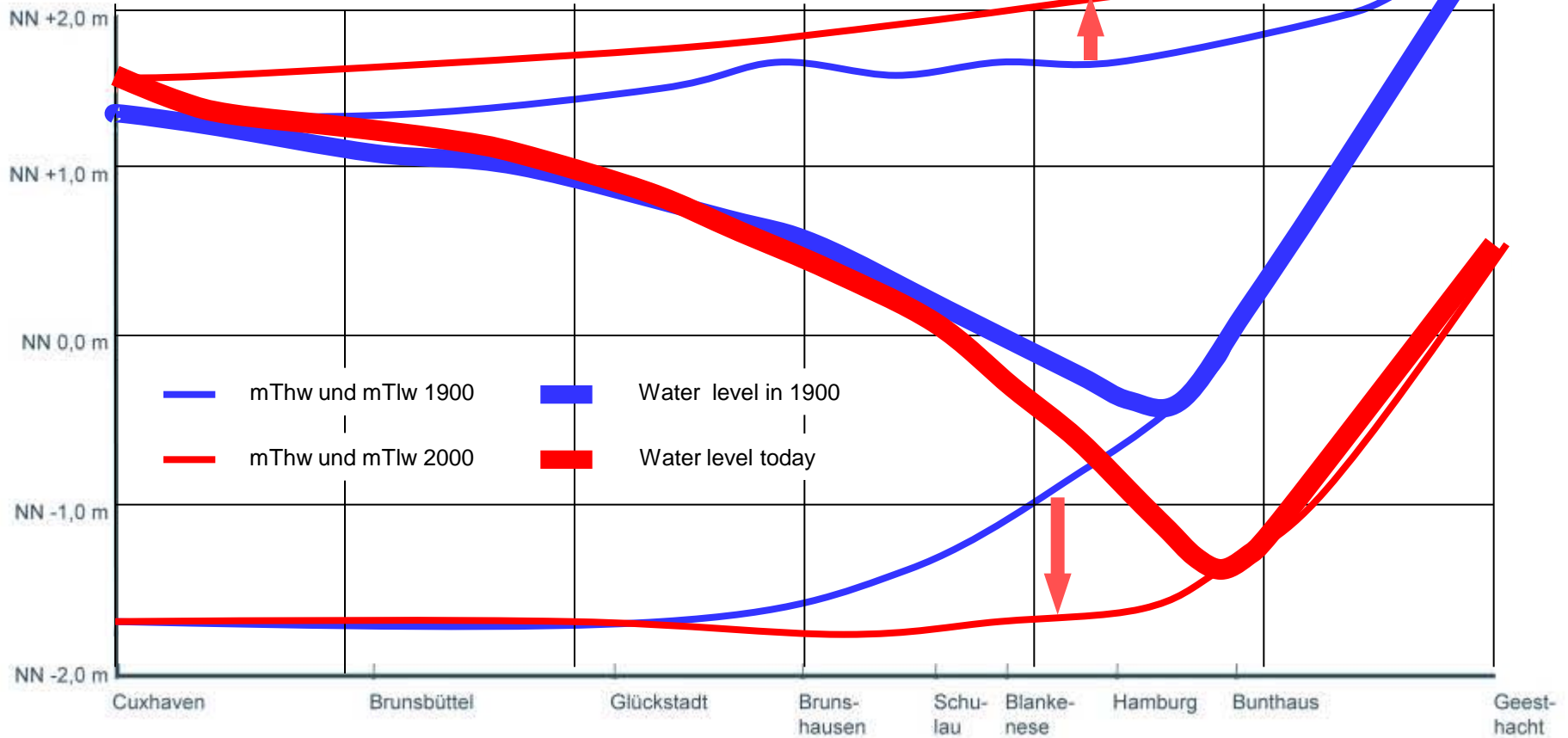


Herausgeber: Vermessungs- und Kartenstelle bei der Wasser- und Schifffahrtsdirektion Nord; Stand: 6/2006

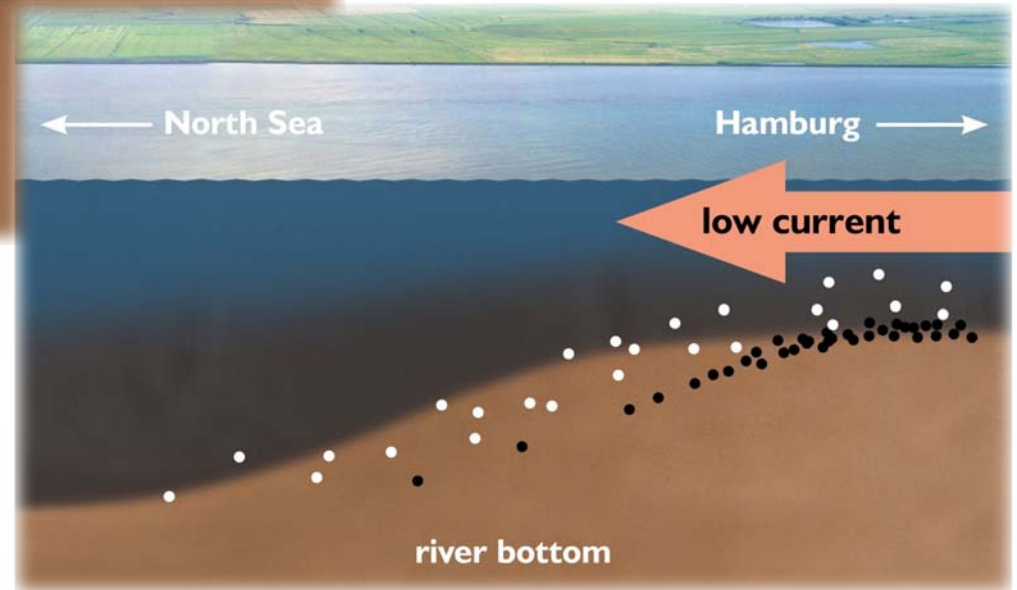
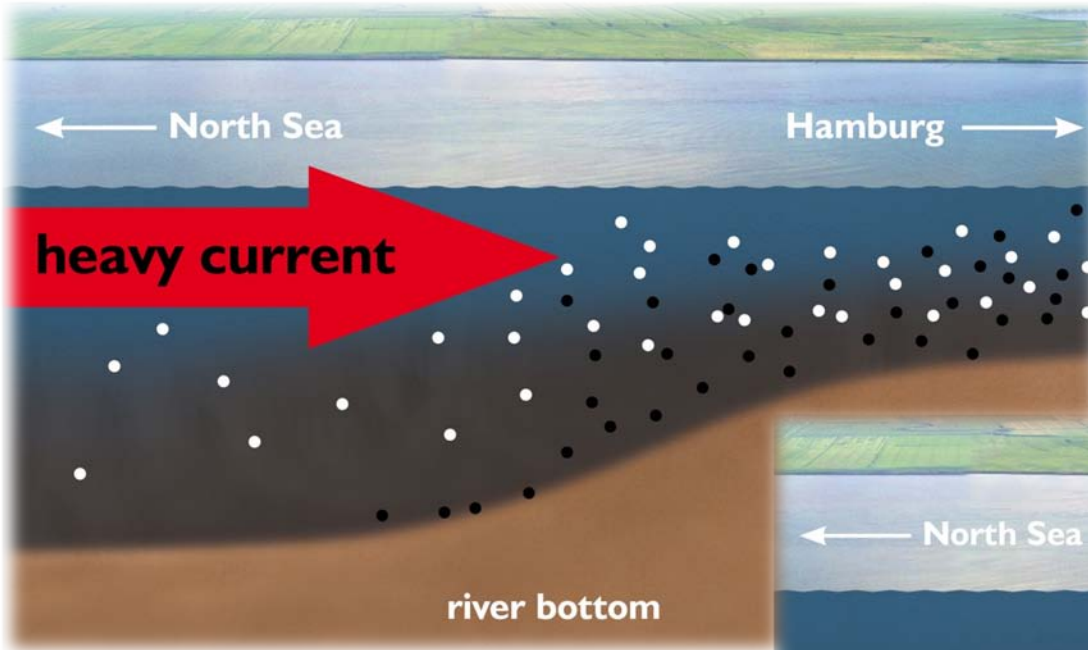
# Changing Estuary: Tidal Range and Measures



# Changing Estuary: Water Level 1900 - 2000



# Changing Estuary: Tidal Pumping



# Changing Estuary: Tidal Pumping



silting up of anabranches and embankments

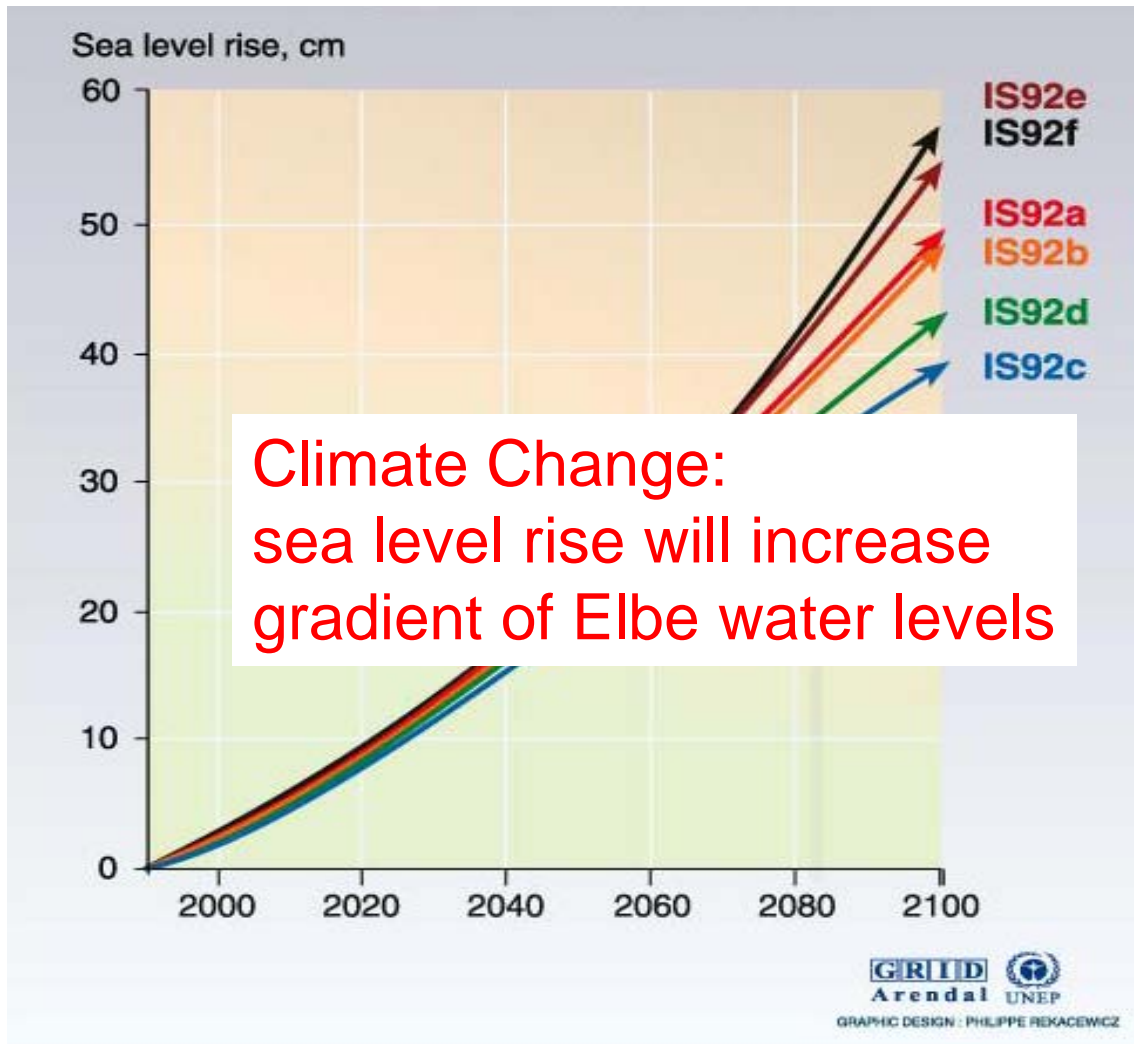


More sedimentation in Port and fairways



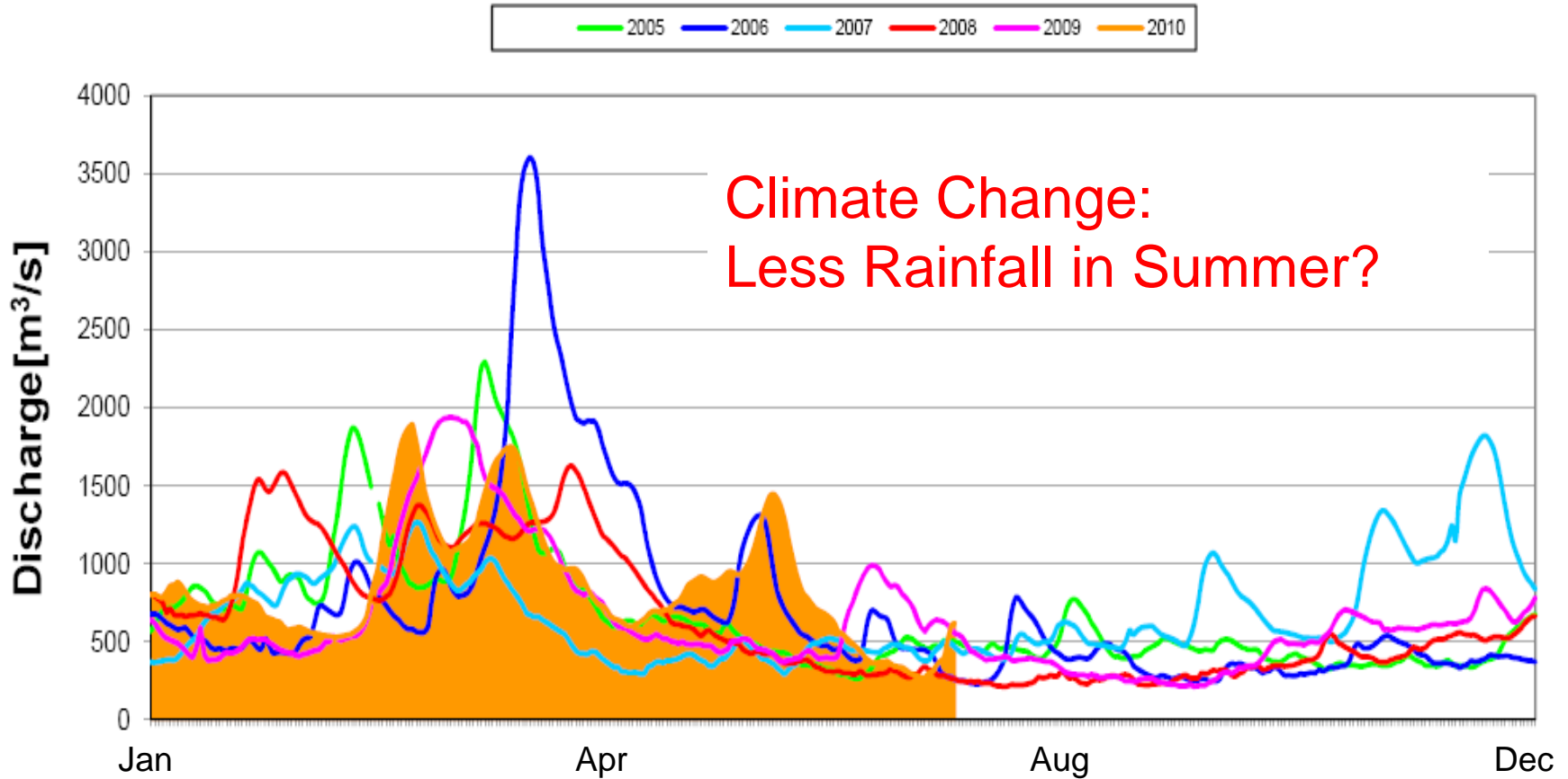


# Changing Estuary: Sea Level Rise Scenarios

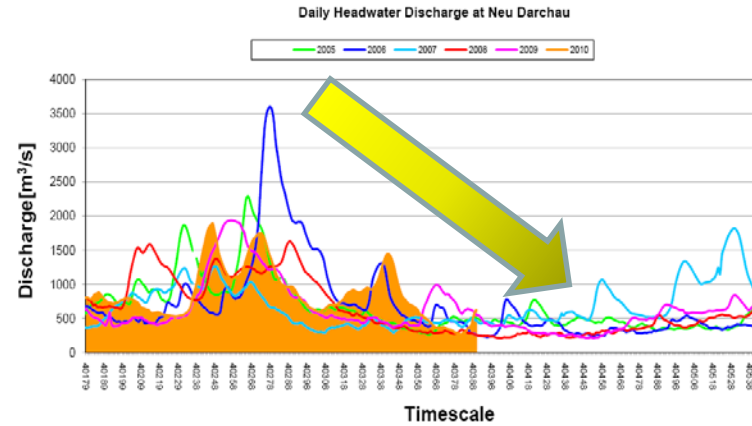
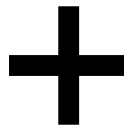
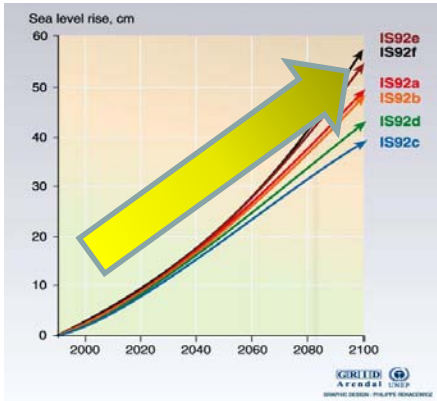


# Changing Estuary: Headwater Discharge

Daily Headwater Discharge at Neu Darchau



# Climate Change and Sediment Management

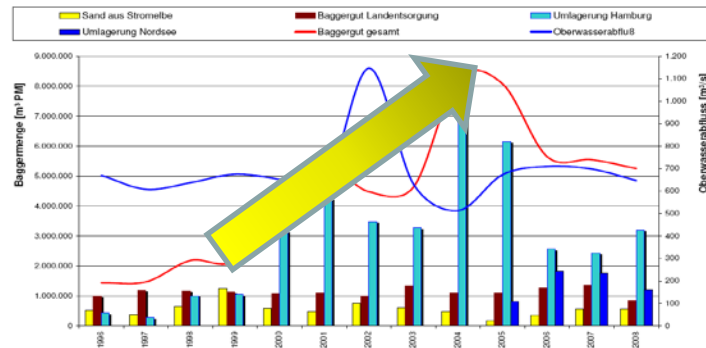


HPA H1

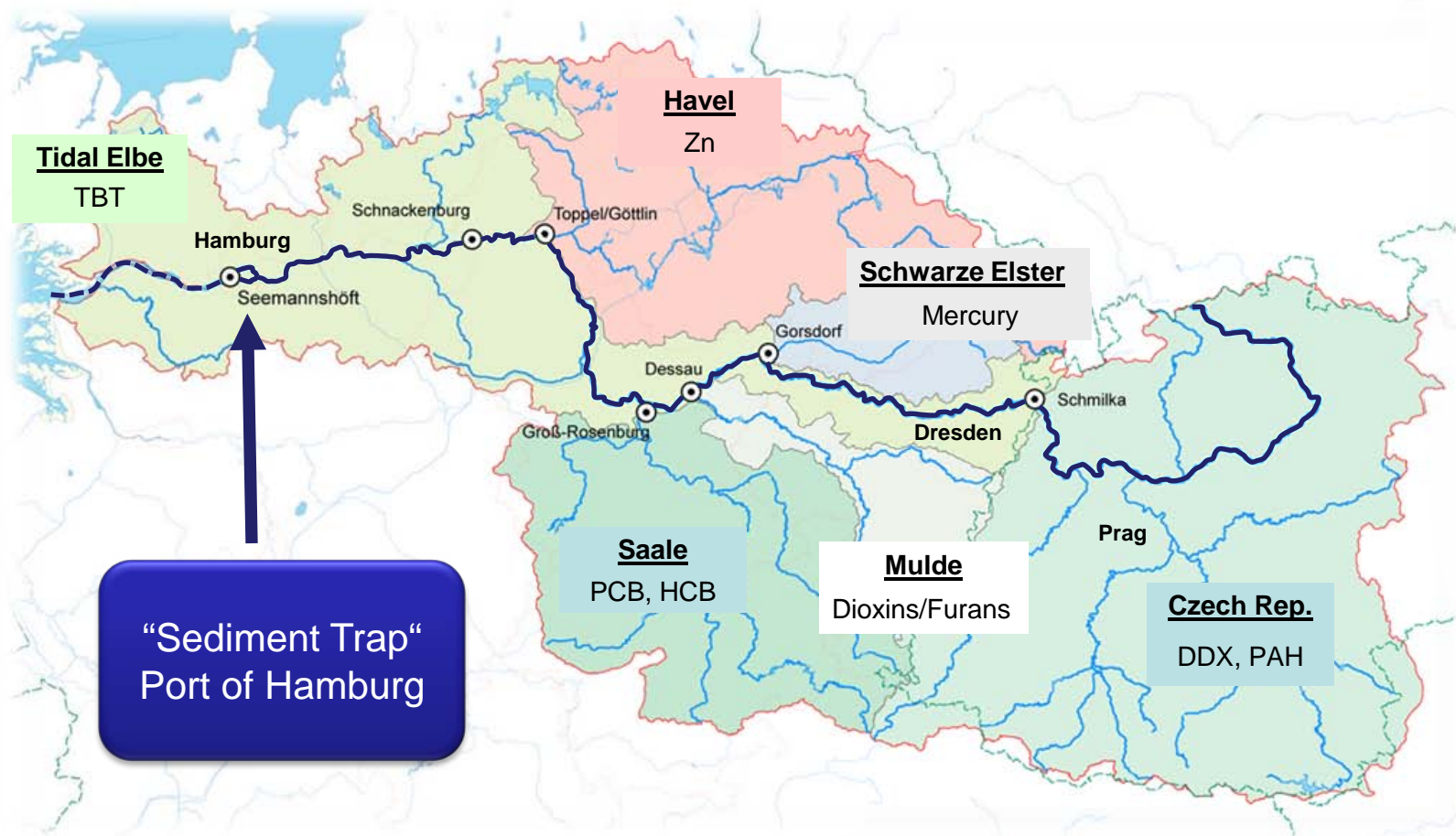
## Mengenentwicklung gebaggerter Schlick-Sedimente im Hafen und in der Stromelbe

13.02.2009

### Baggermengen 1996 bis 2008



# Historical Contamination: Sediment Trap Port of Hamburg



“Sediment Trap”  
Port of Hamburg

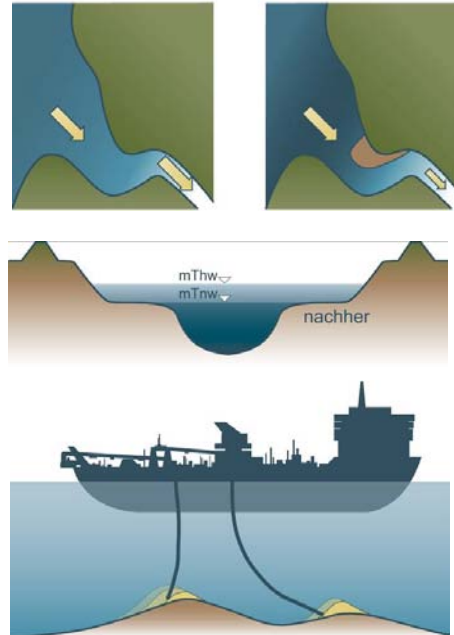
# Fixing the Estuary: The Tidal Elbe Concept

Concept for a sustainable development  
of the Tidal Elbe River as an artery  
of the metropolitan region Hamburg and beyond

A contribution for discussion by Hamburg Port Authority and  
the Federal Administration for Waterways and Navigation

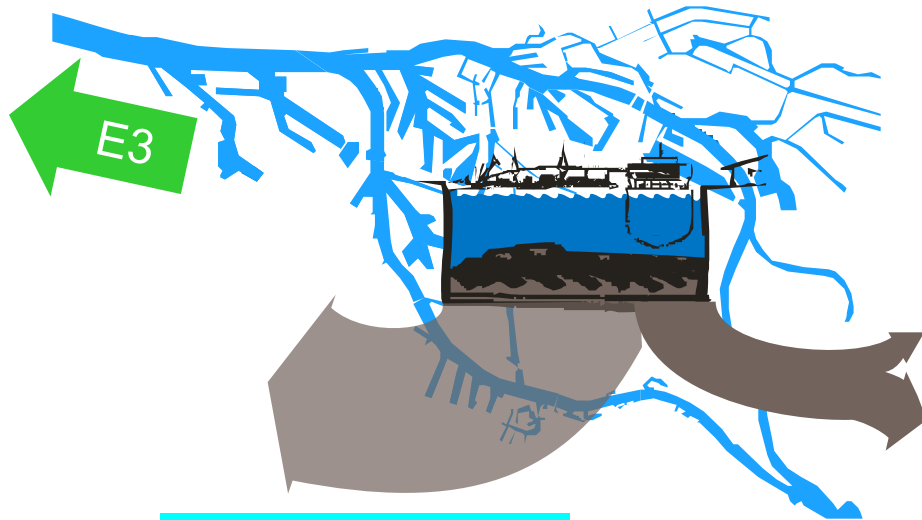


## Three Cornerstones for a Future Action Plan:

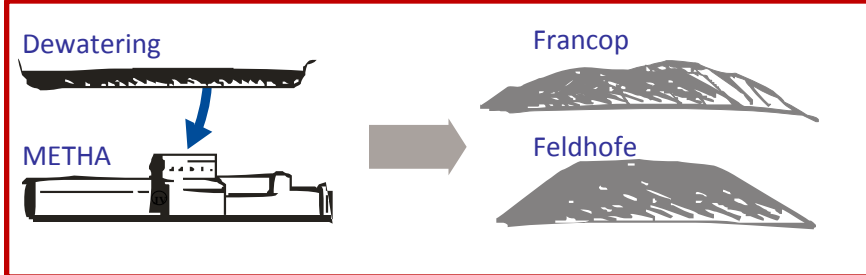


1. **Attenuation of the Tidal Energy through River Engineering in the Mouth of the Estuary,**
2. **More Room for the River (Tidal Volume) in the upper Part**
3. **Optimisation of the Sediment-management considering the whole System of the Elbe**

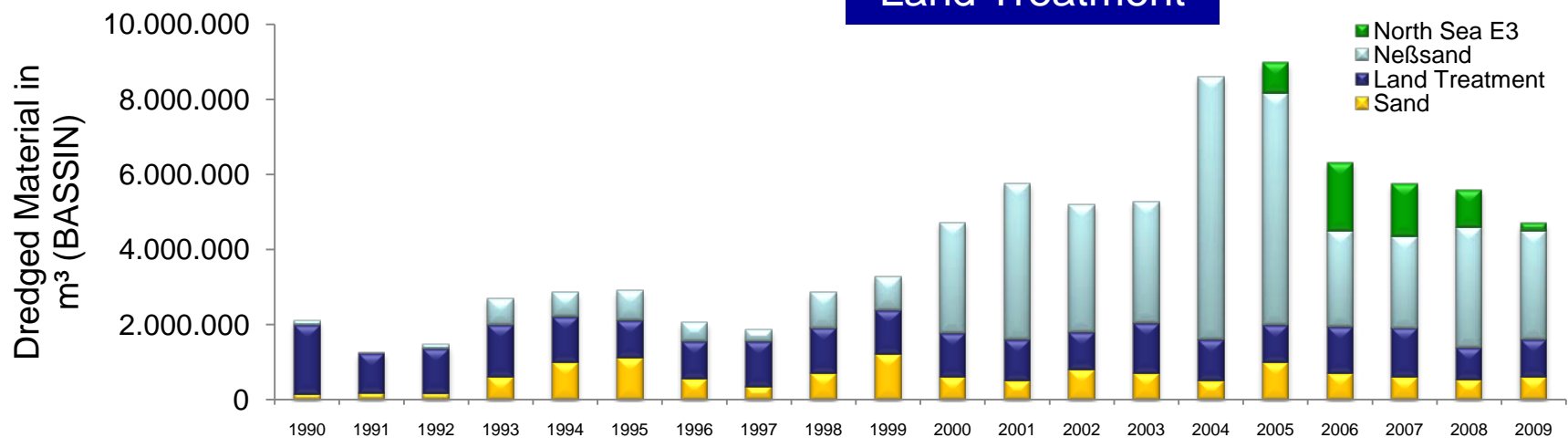
### 3) Sediment Management: Port of Hamburg



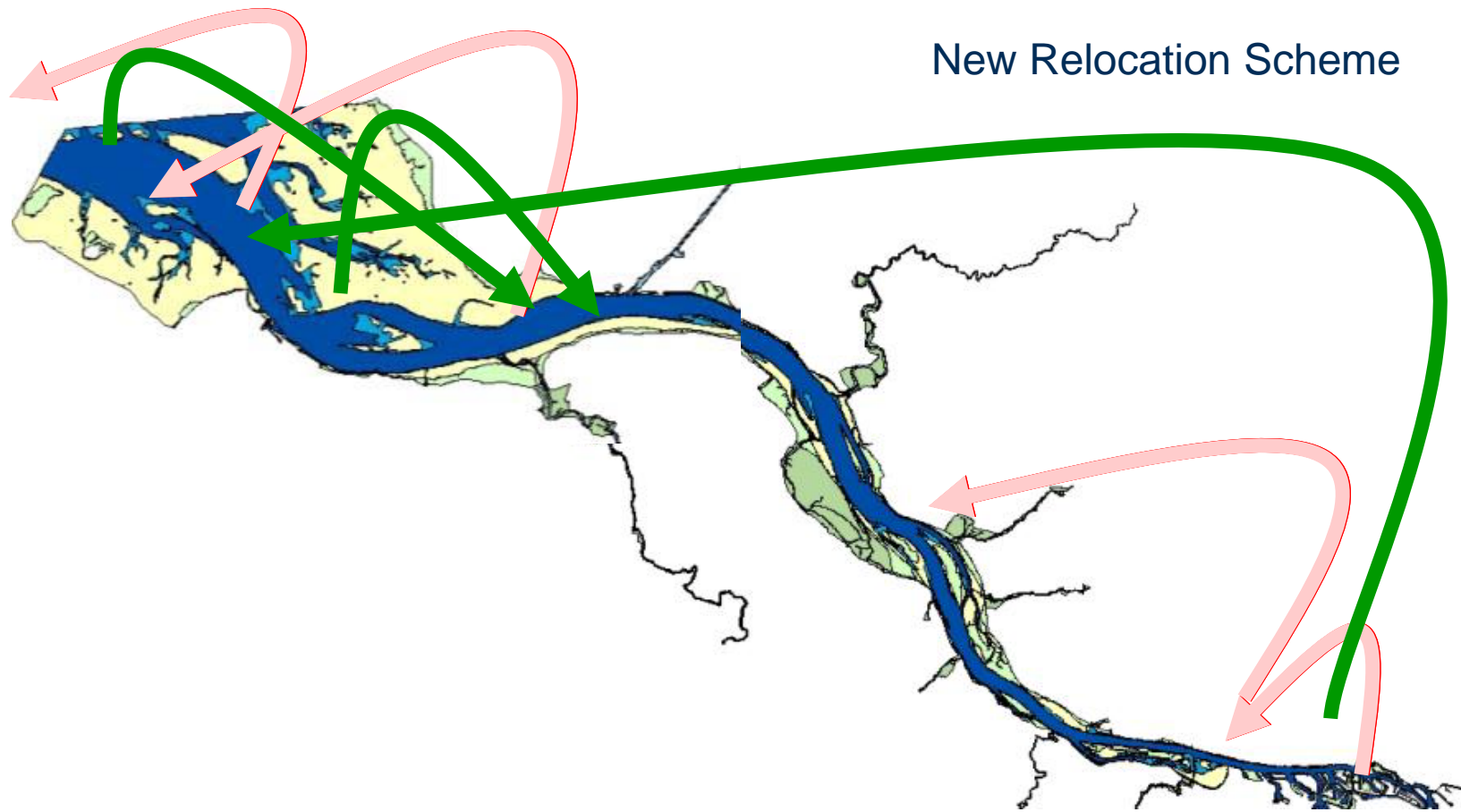
Relocation



Land Treatment

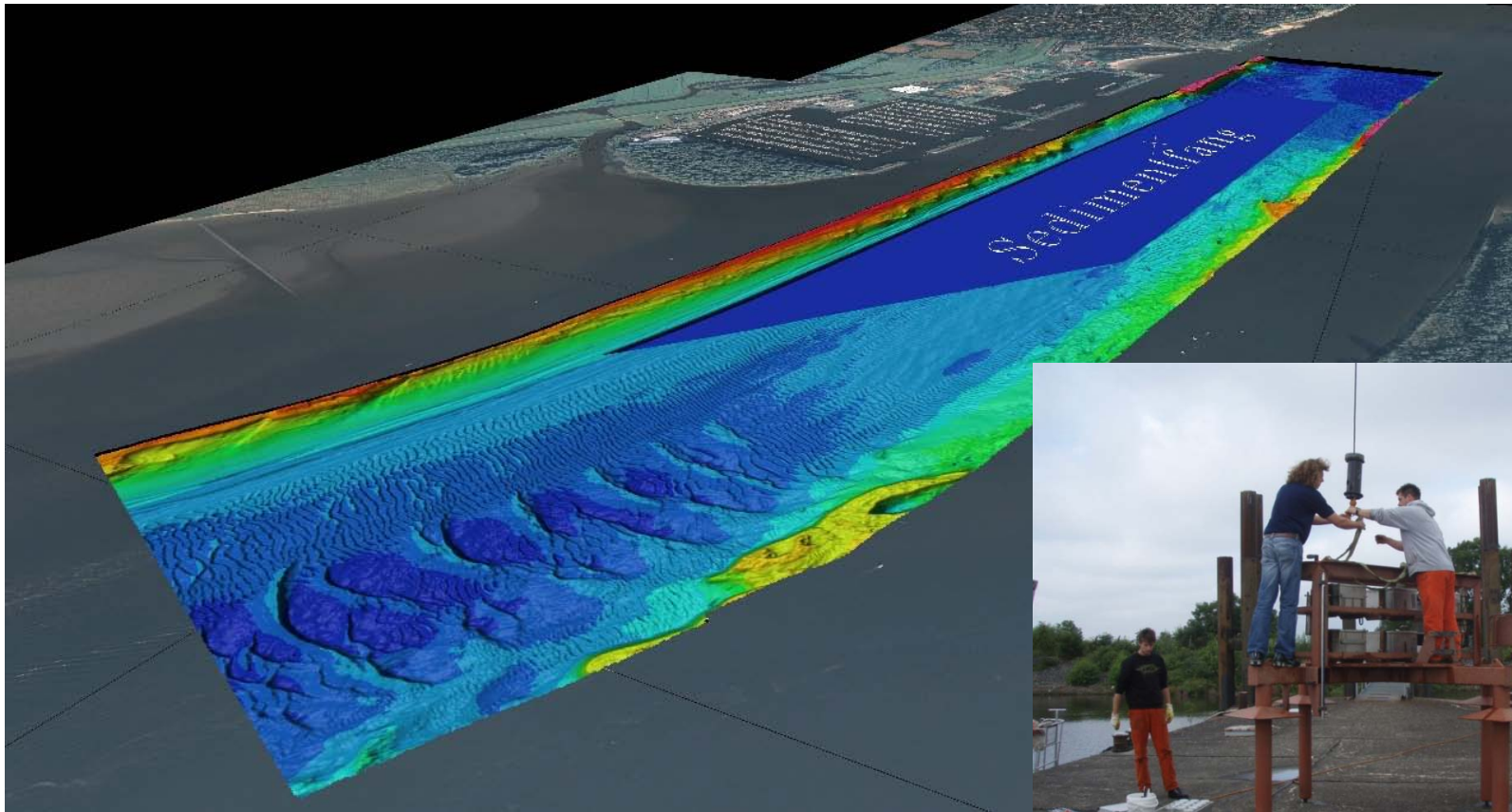


### 3) Sediment Management: New Strategy



### 3) Sediment Management: Catching Sediments

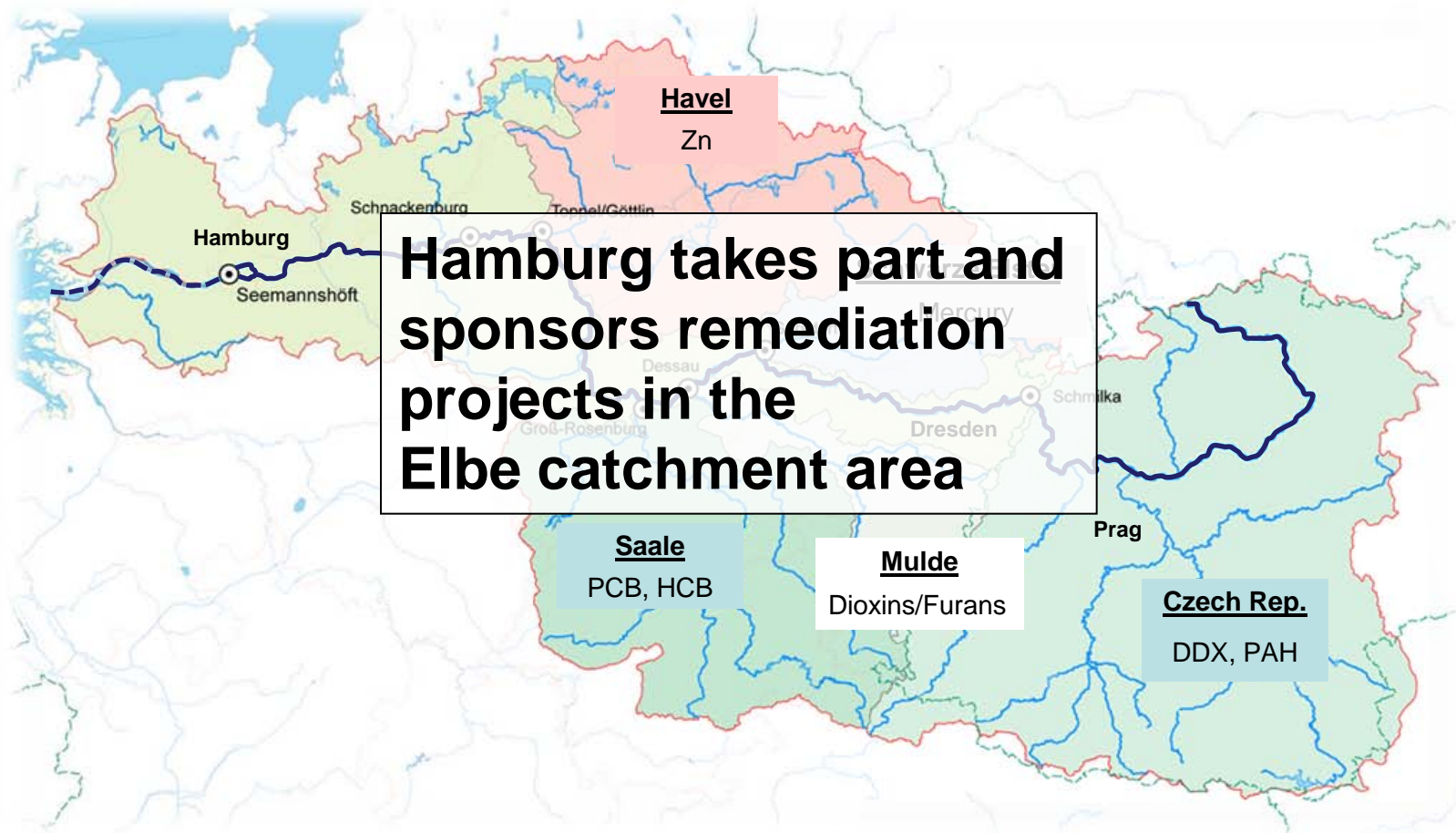
#### Pilot Measure: Sediment Catchment Basin



Monitoring >>



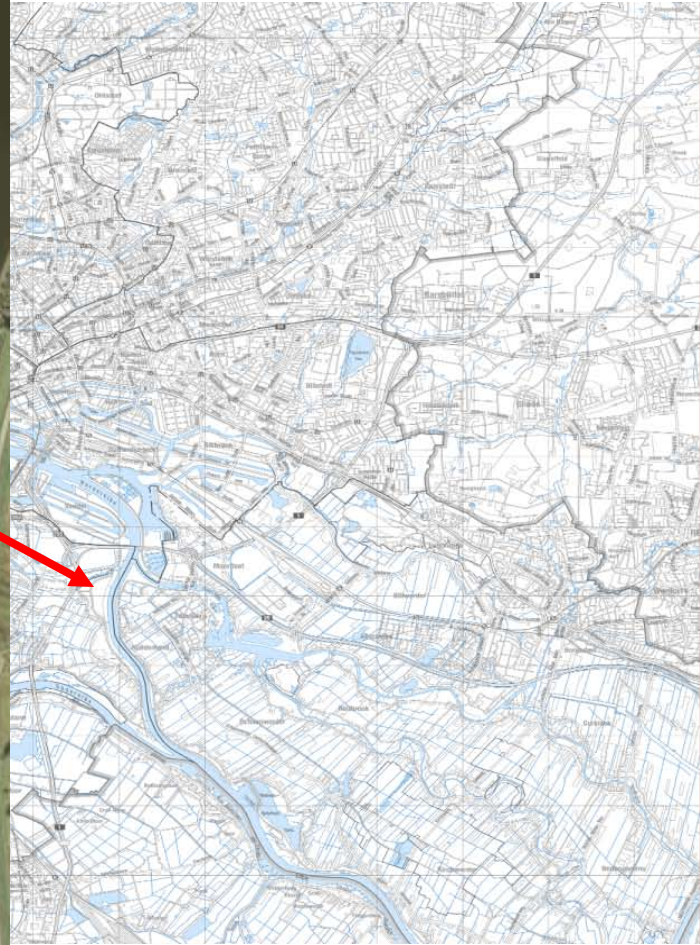
### 3) Sediment Management: source remediation



## 2) Tidal Volume: Cleaning up the Port



## 2) Tidal Volume: Scenarios for Hamburg



## 2) Tidal Volume: Pilot Project Spadenlander Busch

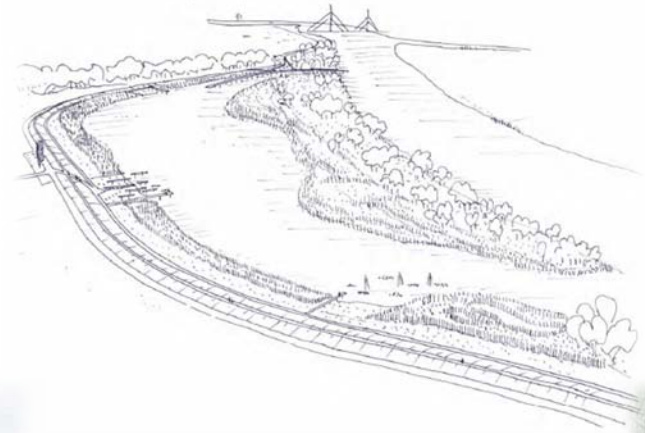
ca. 0.47 km<sup>2</sup> | former Spoil Area | mean surface level +5,50 m NN



## 2) Tidal Volume: Pilot Project Spadenlander Busch



## 2) Tidal Volume: creating Tidal Landscapes

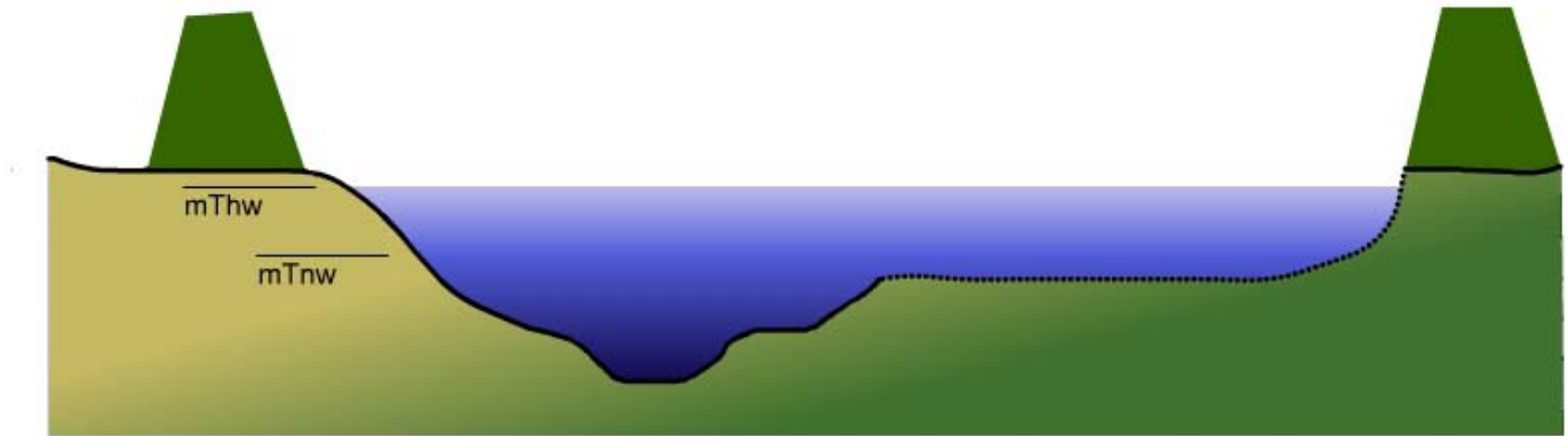


TIDEERLEBNIS im TIDEPARK KREETSAND



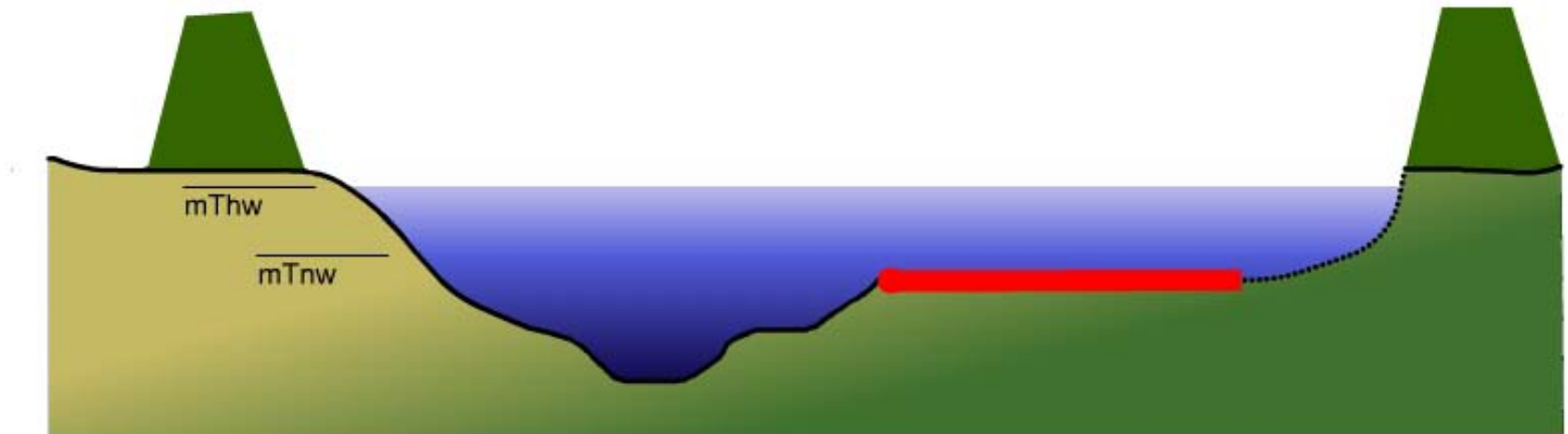
## 2) Tidal Volume: Tidal Polder and Storm Surge Relief

Future: realized shallow water area at mthw



## 2) Tidal Volume: Tidal Polder and Storm Surge Relief

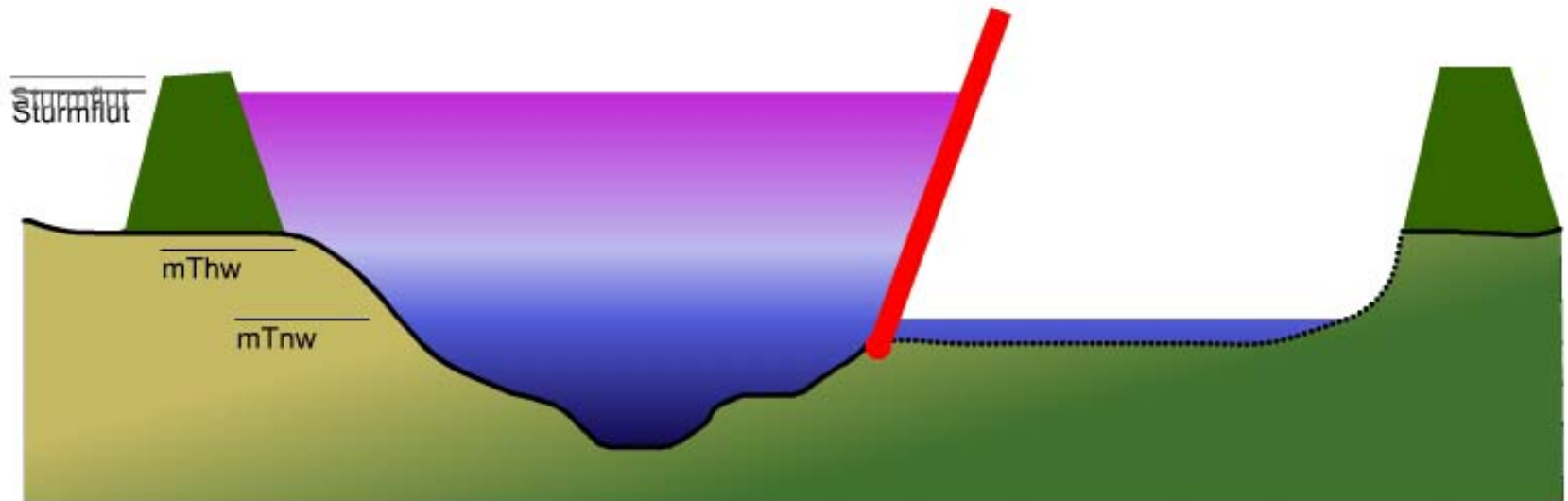
Future: realized shallow water area with lowered polder flap at mthw





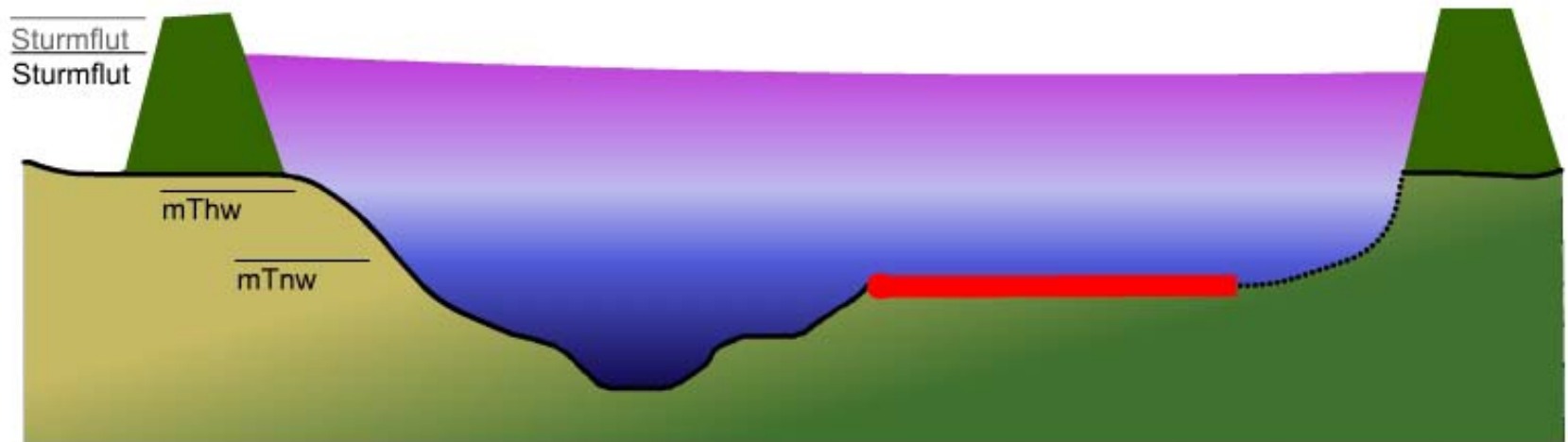
## 2) Tidal Volume: Tidal Polder and Storm Surge Relief

Future: realized shallow water area with raised polder flap shortly before peak-level



## 2) Tidal Volume: Tidal Polder and Storm Surge Relief

Future: realized shallow water area with lowered polder flap at peak level



# 1) Taming the Tide: River Engineering in the Mouth

**Further investigation / research is needed**



Soil Sampling



Drillhole Probing



Geophysical Tests



Water Sampling

# 1) Future Scenarios for the Mouth

today

eroding sandbanks



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Im Auftrag von HPA

# 1) Future Scenarios for the Mouth

future

Stabilisation / nourishment  
of sandbanks

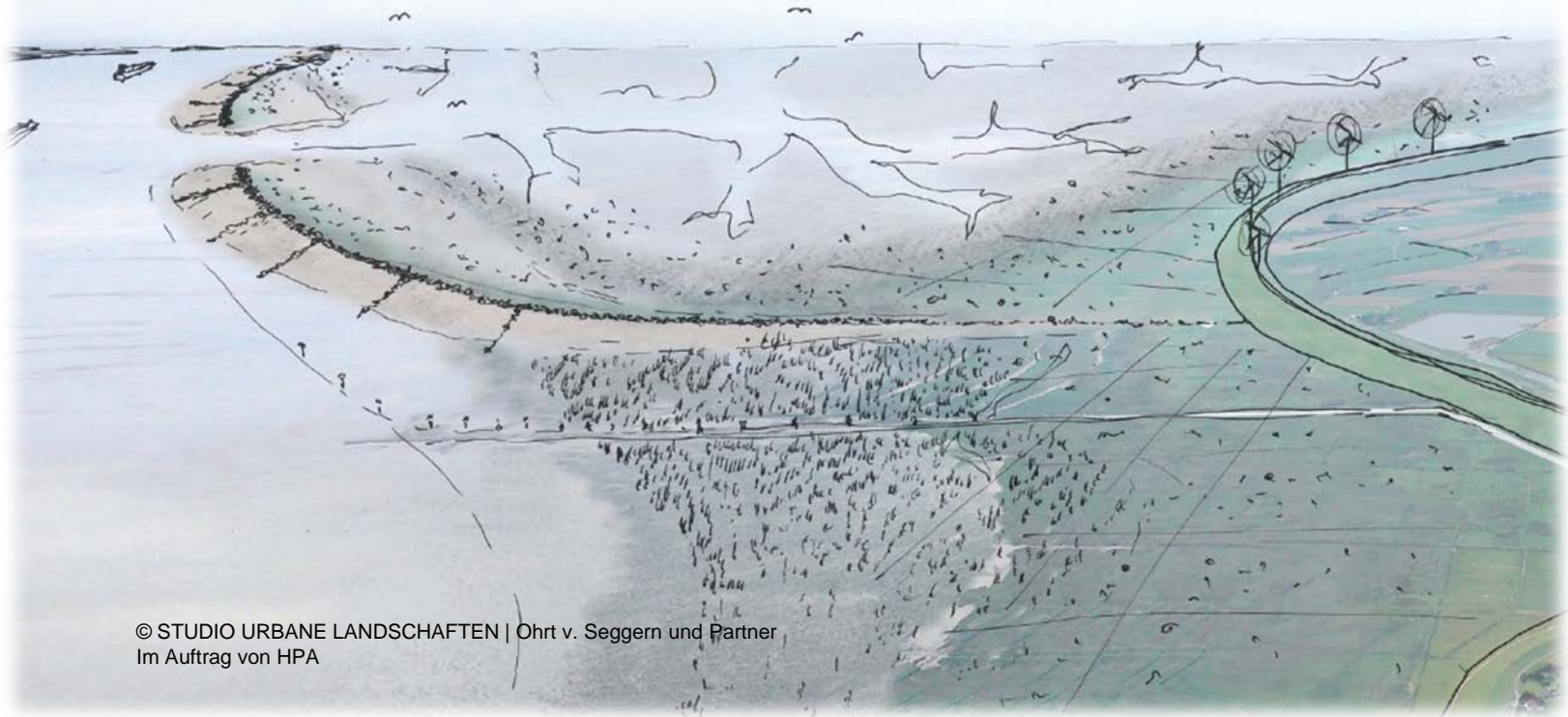


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# 1) Future Scenarios for the Mouth

future

Long term development  
of dams

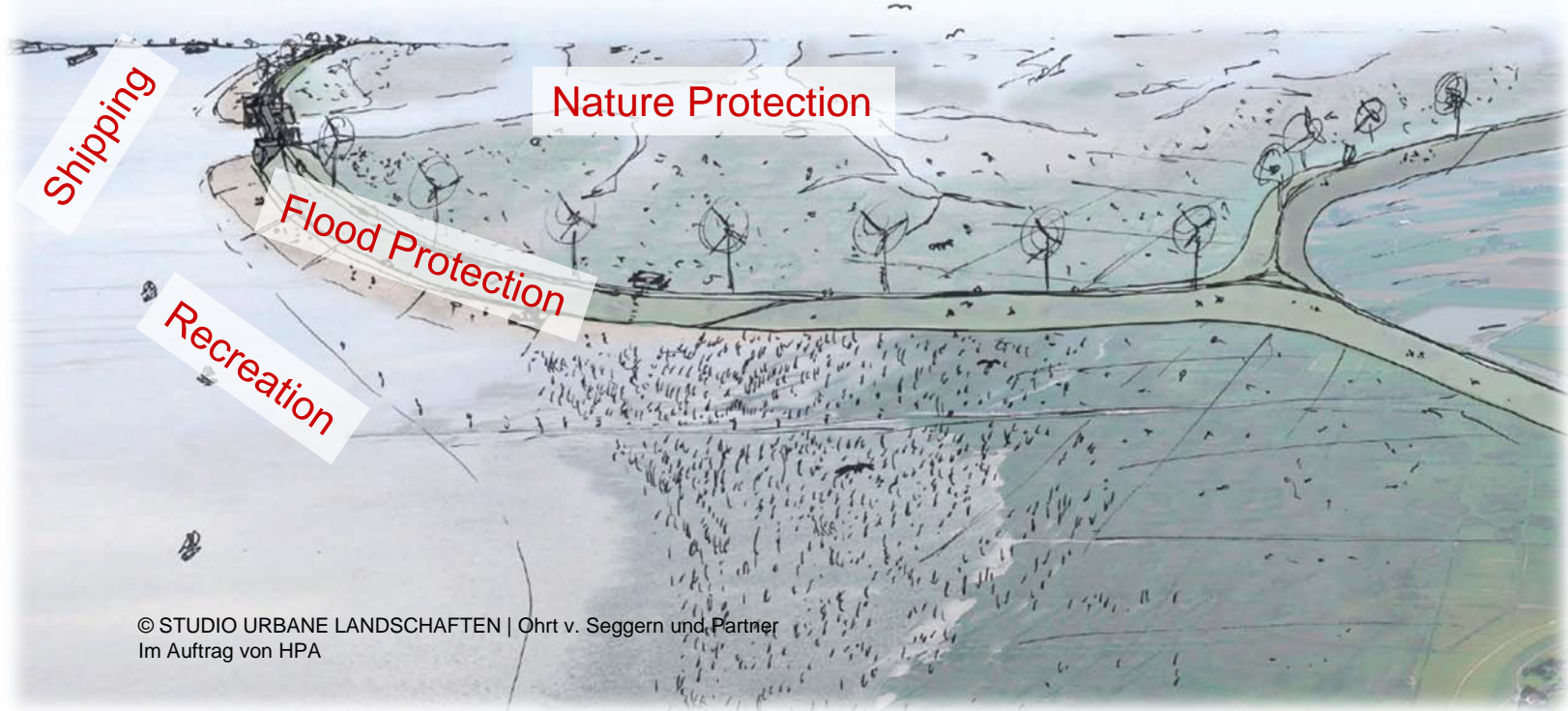


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# 1) Future Scenarios for the Mouth

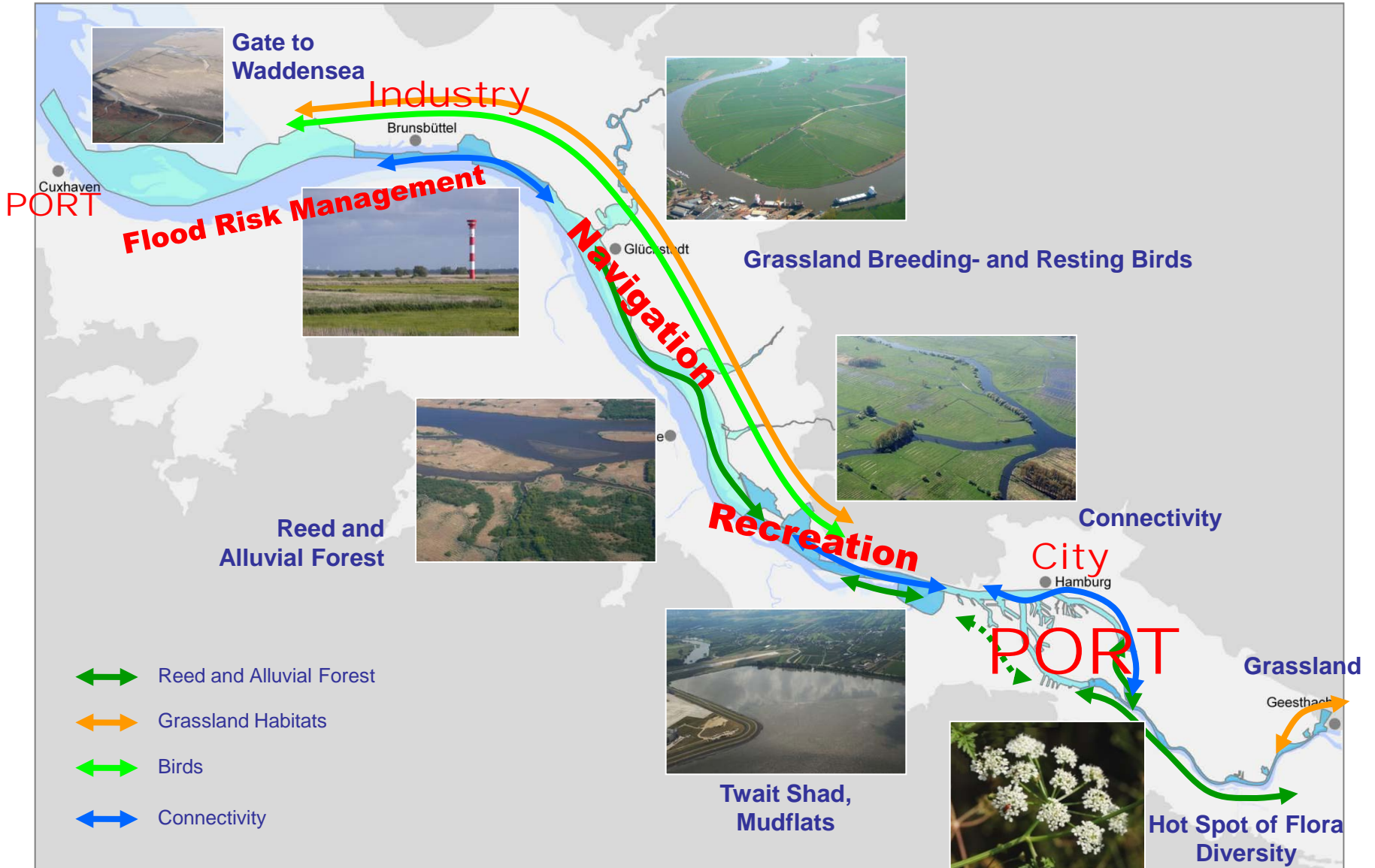
future

Foundation for new dykes



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# Working Together: Integrated Management Plan


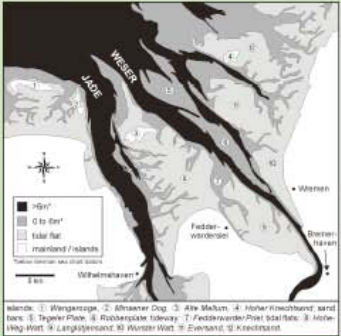






# Working Together: Expert Exchange TIDE

# TIDE

Tidal River Development

| Elbe / DE   | Weser / DE   | Humber / GB   | Schelde / NL - BE   |
|---|--|---|---|
| Port of Hamburg<br>Length: 141 km   | Port of Bremerhaven<br>Length: 40 km   | Ports of Hull, Immingham,<br>Grimsby and Goole<br>Length: 121 km                    | Port of Antwerp<br>Length: 160 km   |
|  |  |  |  |



The Interreg IVB  
North Sea Region  
Programme



[www.tide-project.eu](http://www.tide-project.eu)



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