

SHORT COURSE „*WORKING WITH NATURE*“:
CASE STUDY
„KREETSAND/SPADENLANDER BUSCH“

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Elbe catchment area

- 1.100 km river length in total.
- International catchment, source in Czech Republic.
- Estuary: 170 km in northern Germany.
- Sediments reach the estuary from North Sea and upper catchment.



Port of Hamburg

- Third largest port in Europe (TEU)
- Largest port in Germany
- 250.000 depending jobs in Germany
- 10.000 ship calls p.a.
- ~120 km distance to the North Sea
- Tidal influence



The challenge: maintenance of shipping channel and harbour basins!

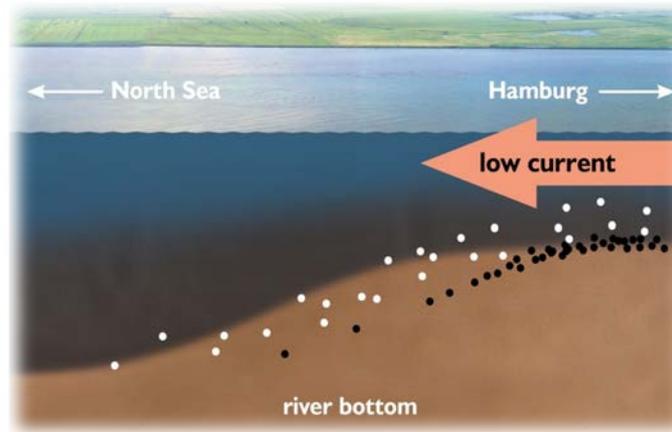
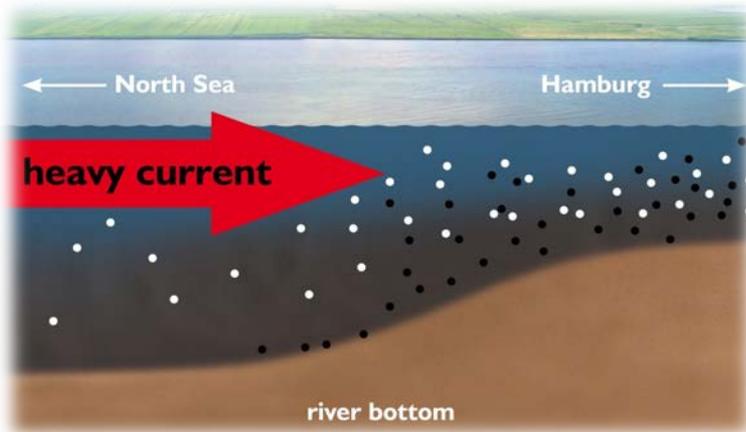


Challenge: Federal administration and diverse uses



Challenge:

High amounts of sediments due to tidal pumping



..results in sedimentation in anabranches, embankments and the port

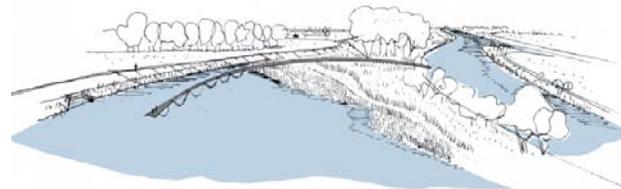


How to address challenge of high sedimentation?

- Apply 'Working with Nature' concept for river engineering measure
-> Measure should equally serve several purposes (win-win situation)



- **Reduce tidal energy & weaken** 'tidal pumping' effect by creating additional tidal volume.
- Create valuable **natural habitats**, e.g. for endemic plant 'Elbe Water Dropwort' (*Oenanthe conioides*), protected by EU legislation.
- **Recreation** for residents. **Increase knowledge & awareness** on tidal systems, sediment management and estuarine habitats.



Location



- Within city area of Hamburg.
- Subject to dike realignment in 1999.
- Excavation of high lying new foreland was not executed -> no tidal action
- Planning process started in 2008.

Before starting planning phase -> understand environment & natural processes!

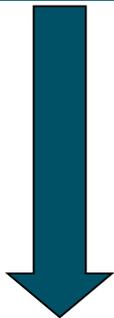
-> Detailed analysis, field work and desk studies
(modelling of possible design variations).

Before the start of the works: Planning process

Composition and evaluation of the preferential alternatives

Hydraulic

- 2-D-modelling
- evaluation of the flow conditions
- evaluation of the sedimentation process



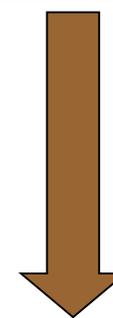
Nature protection

- Listing and evaluation of the stock
- Definition of the requirements of compensating measures
- Evaluation of the level of the target function that needs to be reached
- Preliminary environmental review



Earth works planning

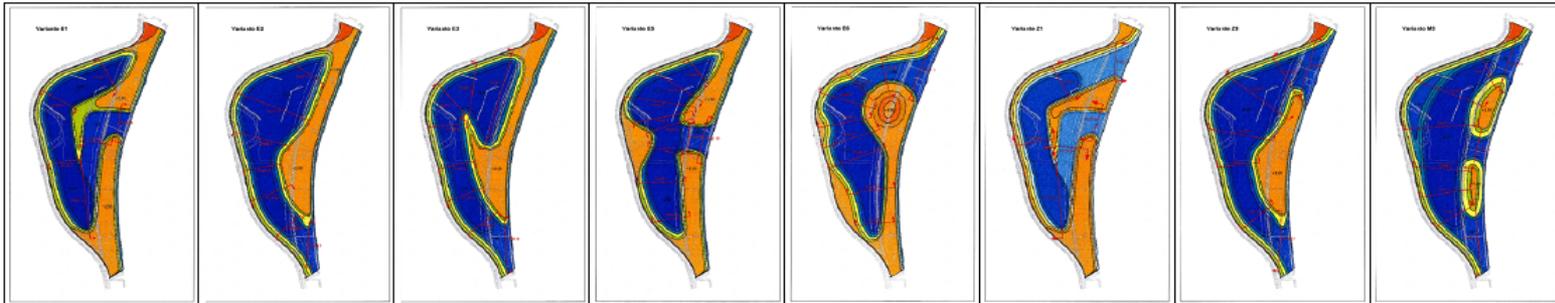
- Soil-mechanical and – chemical examination
- removal, conception of recovery and disposal
- Geotechnical analysis



Comparison, selection and technical planning of the preliminary design version

Planning process: selection of alternatives & modelling

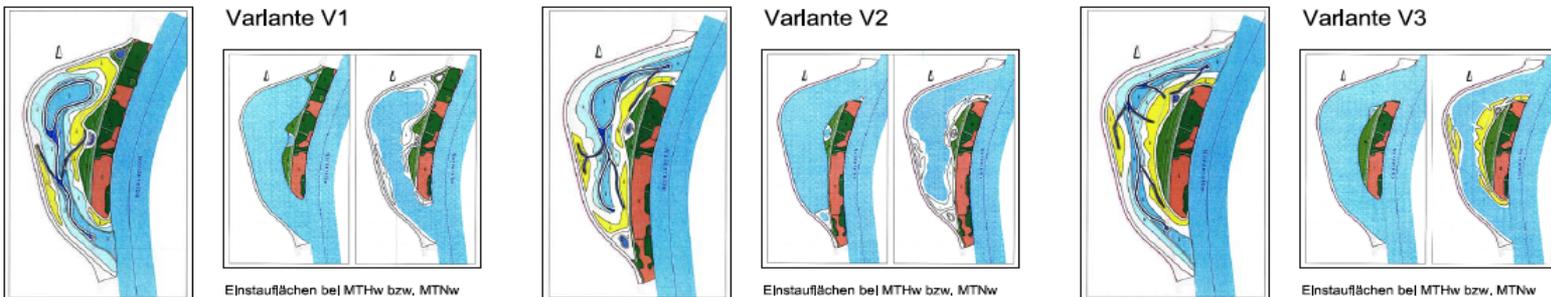
6. Vorauswahl von 8 Varianten im Hinblick auf die zu erwartenden Unterschiede bei der Strömungs- und Sedimentationsmodellierung
E1, E2, E3, E5, E6, Z1, Z3, M3



7. „Überschlägliche“ Modellierung der vorausgewählten Varianten, Ergebnisdiskussion

8. Verbal-argumentative bzw. rechnerische Bewertung der Varianten anhand der Kriterien gemäß Punkt 5

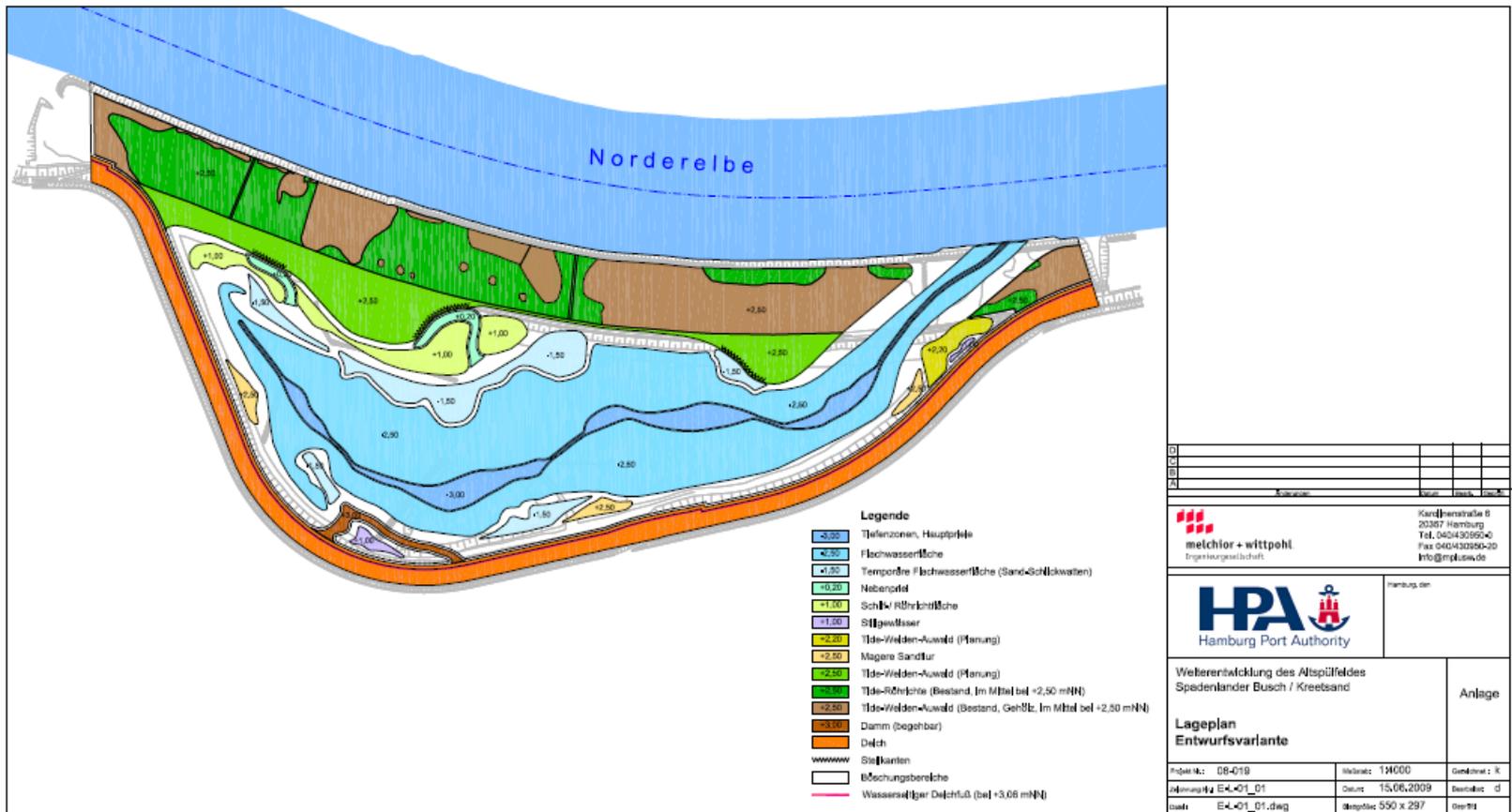
9. Auswahl von 3 Vorzugsvarianten



Planning process: detailed planning of selected version

One-sided connection to the northern branch of the Elbe

-> best possible combination of hydraulic efficiency and nature conservation objectives.



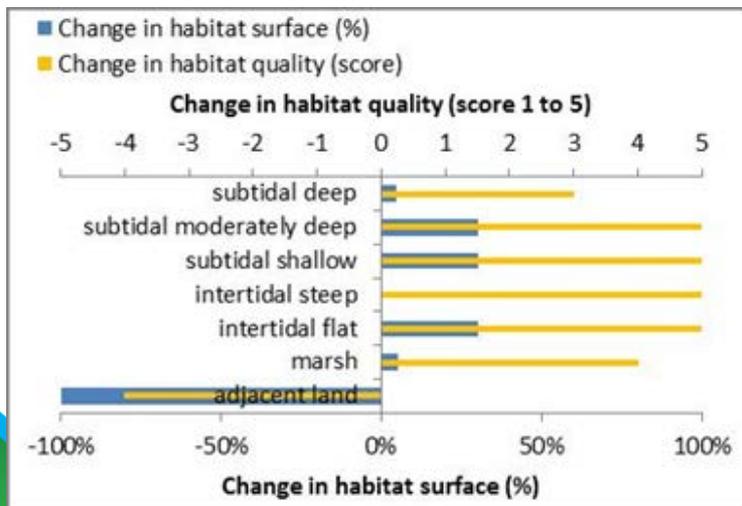
Nature should do its work

- Project creates an initial status.
- Then natural processes should form the site.
- Design: let nature help with the sediment management.
- But: maintenance work necessary approx. every 5 years (remove excessive sediments).



Impact on Ecosystem Services (ES)

- Assessment: based on importance of different habitat types for ES delivery.
- Results depend on habitat changes caused by measure.



- > Measure will generate positive effect on ES delivery
- > Habitat type with higher importance created (adjacent rural land -> estuarine habitats)

Results: targeted ES

1. **“Water quantity regulation: dissipation of tidal & river energy”**: less effect than expected
2. **Biodiversity, Cultural services** (Inspiration f. culture, art and design; Information for cognitive development, **Regulating service**: Erosion & sedimentation regulation (by water bodies): more than expected or unexpected

Communication

- Communication concept.
- Stakeholder involvement started in planning phase.
- Local citizens, NGO's, relevant authorities were periodically and personally addressed.
- Broader public was addressed during construction process.



- After completion, no trespassing, but public footpaths.
- Presentation boards for additional information.

Current state of the works

- Planning approval & start of the works: spring 2012.
- Shallow water area: removal of ~ 2 mill. m³ of soil material.
- ¼ of contaminated soil: disposed in specific landfill.
- Material is utilized in port construction measures or sold to market.
- Works started with dry activities on land, continued in layers influenced by ground water.
- Completion depends on utilization of removed soil, estimated in 2020.

Monitoring after completion

- Yearly base during the first 6 years.
- Followed by investigation every 5 years.
- Includes:
 - bathymetry & topography of shores,
 - development of different habitat types,
 - development of 'Elbe Water Dropwort' and fish species.



Conclusions and lessons learned

+ Integrated approach to meet several objectives

- Let nature help with sediment management.
- New valuable habitats within Elbe nature conservation area (EU Birds & Habitats Directive).
- Residents, NGO's and administrations involved: high acceptance.

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- Estimated costs of > 60 mill. € exceed planned budget.
- Maintenance work necessary -> disturbance & removal of fauna.
- Not the best location for "Dissipation of tidal and river energy"



-> Find other areas!

- *German system of federal states -> project implementation in Hamburg City area.*
- *Pilot project -> better understanding of estuarine system & effects of measures.*
- *Monitoring and evaluation will assess effectiveness.*

How further?

- More areas have to be found!
- Difficult process due to strong federal states and various interests!

Broad concept

See also presentation:

**BENEFITS FOR ECONOMY, ECOLOGY AND SOCIETY:
RIVER ENGINEERING MEASURES IN THE ELBE ESTUARY**

Forum "Tideelbe" founded in 2016!



Forum
Tideelbe

Thank You very much! Any questions?



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Task: Accessibility of the port

„How can the Elbe estuary at the same time be used as a shipping channel and entrance to the Port of Hamburg – and the interests of different stakeholders met as well as natural characteristics be kept?

- **Safeguard waterdepths**
- **Reduce amount of dredged material**
- **Minimise effects on nature**



Sediment management: „Strategy house“ of HPA

Sedimentmanagement at the Elbe estuary

Quality improvement

1. Remediation

*Identify and clean
pollution sources*

- Treatment and disposal on land: Cleaning of upstream located polluted sites

Reduction of (fine) sediments

2. Maintenance

Relocation of sediments

- In the estuary and North Sea
- Landfills

3. River engineering

*Manage tidal dynamics
- create space for the
river*

- Pilotproject Kreetsand
- Estuary partnership „Forum Tideelbe“

4. Communication & acceptance

5. Innovation

Next steps

- More areas have to be found!
- Difficult process due to federal system and various stakeholders' interests!



Broad communication process -> estuary partnership “Forum Tideelbe” founded in 2016

- 40 stakeholders.
- Platform for stakeholder information & consultation of responsible administrations.
- Trustbuilding & exchange of interests.
- Working groups for ranking further river engineering measures.



First results and future procedure

➤ Pre-ranking of 23 potential measures completed.

Criteria:

1. Contribution to reduction of tidal energy and upstream sediment transport,
2. Establishment of valuable habitats,
3. Feasibility.

