Sediment Management Concept of the Port of Hamburg

Axel Netzband
Need for Water Depth Maintenance

Sedimentation rates up to several meters / year
Dredging with long history

First mechanical dredger 1834

Land reclamation in 1950’s
Natural Suspended Matter Transport in the North Sea

Source: Kappenberg (2007)
from ICONA, 1992; Eisma and Irion, 1988
Tidal Elbe glacial valley

1000 years ago
- Moraine
- Marsh
- Elbe
- Side branches

Present
- Moraine
- Settlements
- Dike
- Elbe
- Dike
- Agriculture
- Industry
Burden of the past - Sediment contamination

Mercury in fresh Sediments (mg/kg TS)

Start of dredged material research
Schleswig-Holstein

Dredging Volumes
Relocation
12 – 15 Mio. m³ / a

Lower Saxony

Land Treatment
1 Mio. m³ / a

Dredging Volumes
Relocation
3 – 5 Mio. m³ / a

Hamburg

WSA Cuxhaven
WSV.de
WSA Hamburg

Hamburg Port Authority
Dredged Material Management Concept

- Relocation
  - 3 - 5 Million m³
  - cost effective (2-8 €/m³)
  - dependancy

- Land Treatment
  - max. 1 Million m³
  - costly (50 €/m³)
  - limited
Open Water Placement Nessand

Since 1994. But:

- Environmental Window = seasonal restriction, only 5 / 12 months
- Tidal Pumping
Tidal Pumping

Net Transport of Suspended Load

Positive Value: Transport upstream

Negative Value: Transport downstream

IST05

1. adv. residual transp. of susp.load (mean), sum of all fractions, $Q = 180 \text{ m}^3/\text{s}$
2. adv. residual transp. of susp.load (mean), sum of all fractions, $Q = 720 \text{ m}^3/\text{s}$
3. adv. residual transp. of susp.load (mean), sum of all fractions, $Q = 1260 \text{ m}^3/\text{s}$

Period: 06/11/2006-04:00 - 06/25/2006-07:30
Starting point  To avoid fine material accretion in the estuary a certain amount of sediments has to be taken out of the estuarine system

Basis  System Study by Federal Institute of Hydrology (BfG)

Focus  Balance of fine, silty sediments in the Tidal Elbe and dredging operations

Aspects  Morphology and sediment transport, Contaminants, Ecology, etc.

Tools  Scenario analysis - Sensitivity study for placement sites

The future maintenance strategy should be flexible and adaptive.
Current state and strategy (for fine sediments)

Fixed relocation strategy:
From A go to B

from BfG 2013
Future strategy | Case A

River discharge is high

from BfG 2013
Future strategy | Case B

River discharge is low

from BfG 2013
Hexachlorobenzene in fresh Sediments

Yearly mean of monthly samples (µg/kg TS)

Hamburg Dredged Material (20 µm) ≈10 – 30
German Dredged Material Guidance Value R1 / R2 (20 µm) 2 / 6
Dutch Dredged Material Standard for North Sea (total sample) 20

Schmilka CZ-DE
Schnackenburg DDR-BRD
Seemannshöft HH
Contamination source regions in the Elbe Basin

Source: FGG Elbe (modified by ELSA)
Remediation of most significant contaminated sites

Sources = Burdens of the past.

River Basin Sediment Management = Task for the International Elbe River Community.

International Elbe Sediment Management

- Sediment contamination is still the major challenge for dredged material management in the Tidal Elbe.

- Therefore the Elbe Community Sediment Management Concept is of great importance.

- Hamburg supports remediation measures through its ELSA project.
New tidal volume – Kreetsand / Spadenländer Busch
## Tidal Elbe Management Concept

### River Engineering- and Sediment Management Concept

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Thank you for your attention!

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