Sediments in a changing Environment
Ecological implications of dredging and relocation
in the Elbe estuary
Günther Eichweber, WSD-Nord
Basic problem: sediment budget out of equilibrium
Effects: Increasing width of river bed
Effects: Increasing tidal amplitude

Development of cross-section at the mouth

Development of tidal amplitude

- QsFl 07
- QsFl 08
- QsFl 09
- MittelQsFl
- Thb St. Pauli
- Polynomisch (MittelQsFl)
Effects: Increasing tidal amplitude

Continuously decreasing low water levels
Effects: escalating cycle of fines by short-range relocation
Changing the relocation strategy: wide-range relocation of fines
Changing the relocation strategy: construction of a sediment trap to prevent marine material from intrusion into harbour
Valuable branches of the Elbe estuary
Wischhafen - attenuation of a branch

1721
1812
200 years ago – still
500 m wide and 10 m deep

today
Wischhafen - attenuation of a branch
Cutting off tributaries

Mouth of Stör 1972
Cutting off tributaries

Mouth of Stör today
Effects: Siltation on flood plains reaches values of 60 cm in 30 ys by reduction of floodplains.
Developing relocation strategies means assessment and integration of many criteria

Criteria by economy:

- size and cost of dredger
- economy of work schedule
- relocation distance
- sediment reflux
Criteria by ecology:

- toxicants, sinks of toxicants
- effect on oxygen content
- effect on benthic organisms
- fish and spawn
- siltation on mud flats
- sediment accumulation by cycles
Sediment management means:
the current and accurate solution of ever changing goal conflicts

Minimizing the emission of toxicants

locally – overall

In the estuary – in the North sea

Minimizing the impact on fish and benthic organisms

In the marine section – in the freshwater section
Solving goal conflicts: evaluation of long-term impacts for different relocation scenarios

Wir machen Schifffahrt möglich.
Sediment management means the current and accurate solution of goal conflicts among regulations like

London-, OSPAR-Convention
Water Framework Directive
Natura 2000-Directive
Sediment management means the current and accurate solution of ever changing goal conflicts

all of these have to be integrated in a management concept, but...

goal conflicts are not always insoluble:
Optimization by engineering criteria and by ecological criteria may lead to similar concepts for relocation

- Reducing reflux for economic reasons
- Stabilizing sediment budget for engineering reasons
- Reducing siltation of shallow areas
- Promoting high oxygen values

are to be followed by the same strategy of long range relocation!
Sediment management means the current and accurate solution of goal conflicts.

Oxygene levels show critical minima at Wedel in summer.
For the implementation of river maintenance in the integrated management plan of the Natura 2000 Directive the following procedure is defined:

- specific monitoring of endangered species (red herring)
- monitoring of maintenance related parameters like toxicants, siltation, sinks of toxicants
- evaluation of maintenance effects important to Natura 2000 goals
- optimization of strategy of dredging and relocation by monitoring results
In order to solve goal conflicts, basic understanding and assessment of ecological effects is needed to prioritize criteria of

- effects of morphology
- effects of deposition
- effects of overall water quality
- local effects of toxicants
- wide range long term effects of toxicants
Thank You for Your attention!