

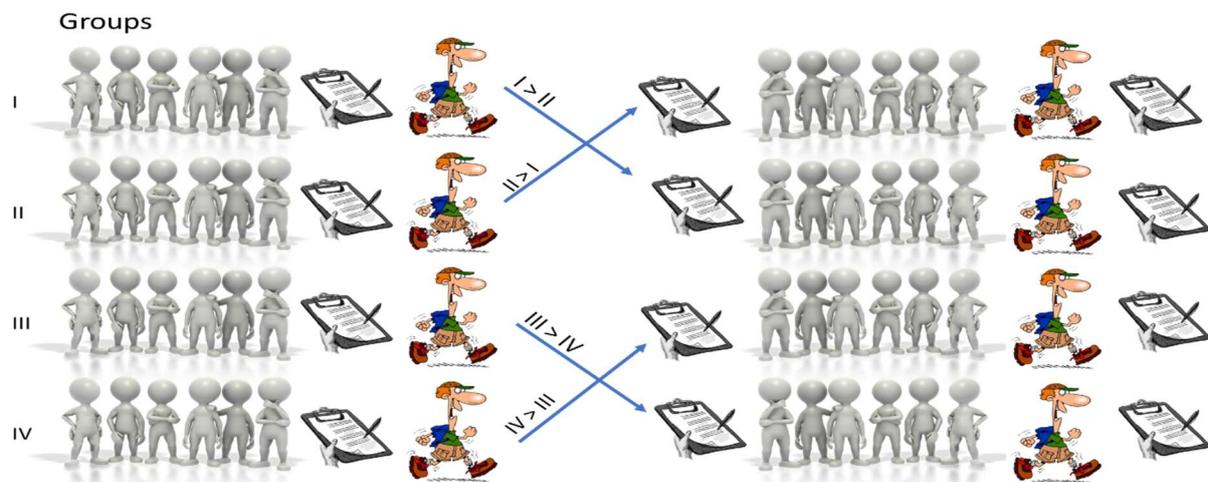
Wadden Sea ‘Sediment solutions’ Community of Understanding

7-8-9 October 2021 Trilateral excursion

2021-10-09 Chatwalk Wybelsumer Polder

The “chatwalk” idea

In a “chatwalk” we combine a walk on the site to visit, a discussion about topics related to this site in small groups and exchange gained insights to a next group by handing over your ‘registration form’ with the written down insights, additional information, answers of new questions. After the exchange of the form, halfway the walk, read the information the former group has gained and continue your discussion with their information. In a cartoon:



The topics to discuss:

- A) What is your first impression of this area?
- B) Given the estimate annual import of mud is 1,1 to 1,5 times the amount of annual deposits in the trilateral Wadden Sea, is it wise to extract mud from the Ems estuary, which is in the order of 10% of the annual import?
- C) The Rysumer Nacken and Wybelsumer Polder seems to be a clear example of a problem – solution – new problem chain. Seems to be a messy approach from a spatial planning point of view. What do you think?
- D) Non-developed land is combined with a windmill farm. The rough fields have considerable value for biodiversity. However, the windmills are a treat for birds and bats. Do you have ideas to improve combined values?
- E) To improve the Emden Port the mooring sites Emskai and Emspier should be closed with a nourishment (2,3 ha., 337 m. extra mooring length. With Ems-side dredging activities. Is an more integrative approach possible?

Please write your answers and insights on the backside of this paper. More information of Bärbel Amman of Niedersachsen Port and Albert Oost can be found in the annex of this chatwalk form.

A) What is your first impression of this site?

B) Is it wise to extract mud from the Ems estuary

C) What do you think about the spatial planning issues?

D) Do you have ideas to improve combined values?

E) Is an more integrative approach possible?

Annex 1 – Niedersachsen Ports information Wybelsumer polder etc.

Niedersachsen Ports Emden – Sediment Management and Dredging, version 28.09.2021
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1. About the company

The port of Emden is part of Niedersachsen Ports, situated at the river Ems.

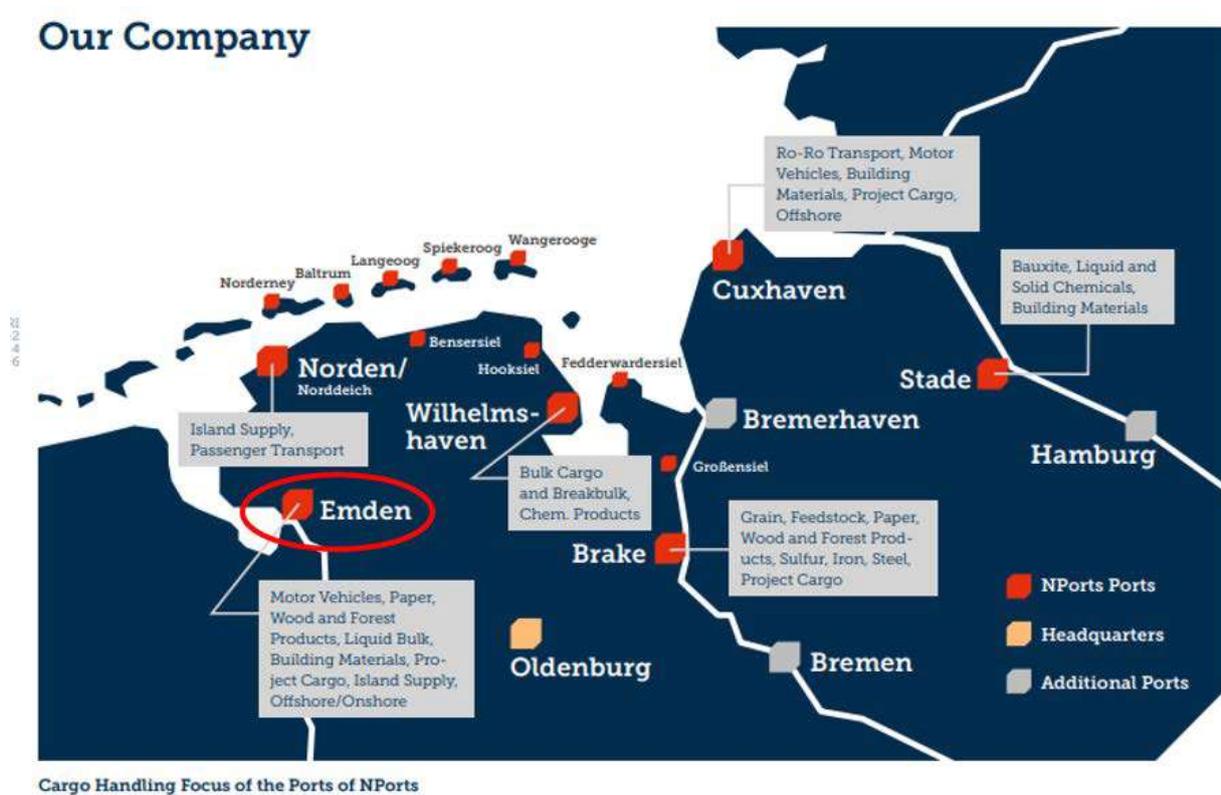


Abbildung 1: Niedersachsen Ports (Quelle: Niedersachsen Ports, Hafen+, Sustainability Report 2021)

Key characteristics of Emden Harbor:

- 1.163 ha (of which 963 ha land and 201 ha water)
- Tidal outer port / non-tidal inner port
- Nodal point between hinterland and river Ems
- 3 locks, 1 pumping station
- Fluid Mud
- Recirculation dredging

2. The dredging strategy and its development

The maintenance areas in Emden harbor are Emskai, Emspier (moorings at the river Ems) and the outer harbor as tidal part of the harbor, Great Sealock and Nesserland lock (as entrances to the nontidal part of Emden harbor) and the inner harbor.



Abbildung 2: The maintenance areas at the port of Emden

In the maintenance area (red lined) the water depths are guaranteed and there is regular dredging work necessary. In the other parts of the harbor dredging is an additional work and only done if necessary.

Until 1992 removal dredging work was done: every year about 4 Mio m³ were removed and deposited on large deposition areas in Emden Riepe. Since 1992 it was no longer possible to use these fields, they were recultivated and put back into agricultural use.



Abbildung 3: The port of Emden and its sludgepoints

The new fields in Wybelsumer Polder were much smaller. So a new dredging strategy had to be developed:

- Studies of material → fluid mud and bacteria
- Increased knowledge about fluid mud and its characteristics
- Trials to reduce material deposition on land
- What can we do to make the material more navigable?
- What means nautical depth in Emden harbor?

PIANC (1997): The nautical depth is the level where physical characteristics of the bottom reach a critical limit beyond which contact with a ship's keel causes either damage or unacceptable effects on controllability and manoeuvrability.

For Emden harbor this means:

The harbor bottom is determined by parameters like shear forces, yield, density or viscosity. It is an area without clear demarcation between water and sea bed because of silt, fluid mud or suspended matter. The main objective is to find the typical parameter to identify the nautical depth in Emden harbor and to demonstrate it is acceptable for pilots and captains. We want only to remove material which causes damage or unacceptable effects, that means to minimize deposition on land and to maximize treating of material to make it navigable.

There was more and more recirculation work done to keep the fluid mud navigable and less material was deposited on land (last deposition 2002). A change in maintenance of the water depth from extraction to recirculation was possible because of fluid mud.

Fluid Mud is a highly concentrated solution that can take a very long time for consolidation. The tiny space between particles is filled with bacteria slime which is lighter than water, has a good buoyancy force and stays floating for a long time.

With our recirculation-dredging work we want to maintain a constant pool of flowable and navigable fluid mud, we want to avoid consolidation and the entry of new material from the river Ems.

Fluid Mud and principles of recirculation

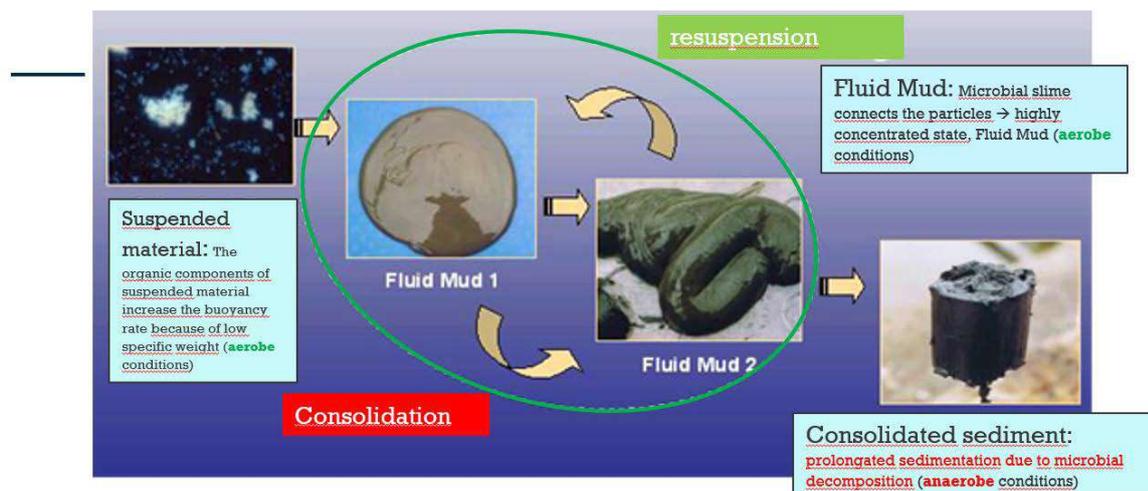


Abbildung 4: Principles of recirculation (Quelle: NPorts)

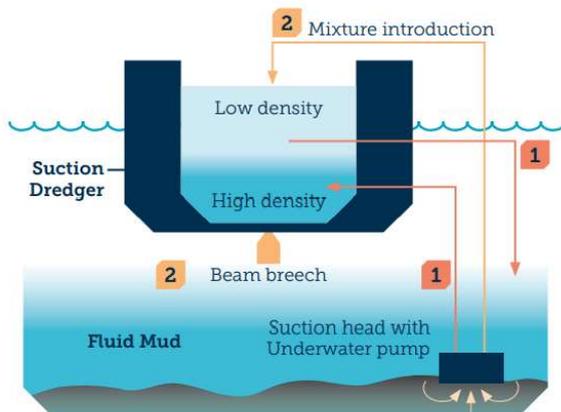
3. How do we monitor the sediment conditions and nautical depth?

We have to give a tried and tested proof of nautical depth in liaison with captains and pilots. So we check three parameters:

- Regular recirculation has to maintain a thickness of material < 11,55 KN/m³
- Living conditions for bacteria have to be supported by stirring and adding oxygen to obtain good buoyancy ratio
- Shear forces have to be checked regularly → shear forces > 50 Pa requires dredging

In addition we do soundings with 15 KHZ (reaches the transition phase between sediment and fluid mud) and 200 KHZ (reaches the transition between fluid mud and water). The hopper dredger works the whole year regularly in Emden harbor. The pump presses the material in thin layers into the hold, where the fluid mud gets in contact with oxygen. Then the material is returned by using the beam shutter.

Re-Circulation Process



During the recirculation process, fluid mud is put in connection with oxygen from the air in the hold of the dredging ship. This ensures that a consistent, oxygen-rich state is present within the fluid mud that is used by bacteria to produce slime. This slime production in turn maintains the soft consistency of the fluid mud. This process ensures that the sediment does not settle on the floor of the body of water, and that it stays buoyant, making it possible for ships to travel through it.

1: The pump pushes material down into the ship's hold (area of high concentration), the re-introduction occurs via an overflow (area of low concentration).

OR

2: The pump pushes material into the upper loading area, the dosed re-introduction occurs via a beam breach or via flaps in the ship's hull.

Abbildung 5: Recirculation process (Quelle: NPorts)

Every month we take samples and check shear forces and thickness. The working plan for the hopper dredger is based on these results in combination with soundings.

Since 2002 the maintenance of the guaranteed water depth in Emden harbor is done by recirculation work without bringing material on land.

The hopper dredger is continuously in use during the whole year. The situation is monitored very carefully, if necessary additional work is done.



Abbildung 6: deposition areas Wybelsumer Polder (Quelle: NPorts)

Annex 2 – input for the Wybelsumer chatwalk by Albert Oost 2021-10-04

The Larrelter und Wybelsumer Polder with a total area of 6.3 km² have been formed between 1912 and 1923. As such, it is one of the more early land reclamations with sediments dredged from the Ems estuary. A part is used agriculture concentrating on the production of vegetables. The most seaward areas are now partially in use as one of Europe's largest wind farms.

Given the estimate that the annual import of mud is 1.1 to 1.5 the amount which annually deposits in the trilateral Wadden Sea, is it wise to extract mud from the Ems estuary, which is of the order of some 10% of the annual import? Or should we put it back SE or NE of Borkum to remain within the system?

Like the Rysumer Nacken, the Wybelsumer Polder is clearly an example where a problem (dredging material) led to a solution (sediment dumping and poldering), which led to new problems (what shall we do with the area?), after which a host of solutions was thought of and partially developed, depending on the fashion of the time (food production by farmers, housing, food production by a conserve producing factory, cattle, lighthouse area, harbour (not developed), wind farm, nature reserve (developed?), dumping site (in preparation?). The whole approach led to a rather messy approach from a spatial planning point of view. Should there come a development plan for Polders which were formed in the 20th Century which allows for a clearer choice in functions in space and time?

Clearly land use has been limited in the most seaward fields of the Wybelsumer Polder. High wind mills are combined with rough fields which have considerable value for plant and bird life. However, the wind mills are a treat to birds and bats. Is a zonation of functions a way forward. For instance bird islands with special measures to prevent predation in a zone with no wind mills and intense use of the area with windmills a path forward?

To improve the Emden Port the area between both existing mooring sites of Emskai and Emspier should be closed with a nourishment over an area of 2.3 ha, so that an additional mooring length of 337 m can be realized. However the ship-site has to be dredged. The plan is to establish a new dumping location in the Wybelsumer Polder (plans 2018). Would it be possible to work out a plan in which a more integrative approach can be facilitated?

