DredgDikes

Newsletter 8

www.dredgdikes.eu

October 2014

Dredged Materials in Dike Construction

Implementation in the South Baltic Region using Geosynthetics and Soil Improvement

Editorial

This is the eighth newsletter of the DredgDikes project. After the two successful project conferences in Rostock and Gdansk this spring the large-scale testing was continued on both research dikes. The pilot dike construction was instrumented and vegetation is establishing. A separate installation test for homogenised dredged material was performed in Rostock. Overflowing tests with extreme overflowing rates were performed both on the Rostock and Gdansk research dikes. Detailed information about all activities can be found on the project web site www.dredgdikes.eu.

South Baltic Conference on New Technologies and Recent Developments in Flood Protection - a Great Success!

The South Baltic Conference on New Technologies and Recent Developments in Flood Protection which took place in *Gdansk*, 5-6 June 2014 was a great success. 145 participants from 7 European countries took part to discuss the interesting presentations.

Particular emphasis has been put on the application of new materials and improved geo-engineering technologies for increased efficiency of dikes and other flood protection structures. Other important aspects presented during the conference were modelling and monitoring technologies as well as legal and administrative issues related to flood protection and mitigation. The warm and sunny weather allowed to present an experiment on the Gdansk test dike.

The conference was officially opened by

- Prof. Józef E. Sienkiewicz, Vice-Rector for Scientific Research of Gdansk Univeristy of Technology,
- Czesław Elzanowski, Pomorskie Voivodship,
- Prof. Fokke Saathoff, DredgDikes project leader, and
- Prof. Zbigniew Sikora, coordinator of the Polish part of DredgDikes project.

The opening lecture titled “Stability And Defence Of Flood Protection Dykes” was presented by Prof. Heinz Brandl – from Vienna University of Technology.

The conference sessions were opened by Prof. Ivan Vaníček from Czech Technical University in Prague with lecture titled “Earth Structures As Main Anti-flood Protection Systems”.

The organising team would like to thank all speakers, participants and helpers to make the conference such a successful event! The proceedings are available online in PDF format on the conference page of the dredgdikes website.

The proceedings of the *Rostock* conference in April 2014 are also available online as PDF files.

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Overflowing Experiments on the Rostock Research Dike

For the 2014 overflowing tests on the *Rostock* research dike overflowing events of up to 600 l/s/m were simulated. For the overflowing experiments, the three parallel flumes were installed on the slopes again. They were fed by water overflowing the lowered sections on the western dike.

Fig. 1: Overflowing experiments Rostock, May 2014

The tests confirmed the results from September 2013: Again, all slopes withstood the maximum overflowing rate of 600 l/s/m with a maximum flow velocity of 5.5 m/s. The results were obtained in stage tests in which different discharge volumes were applied for 45 minutes each. Between the stages the potential erosion was measured. Also, 24h long-term tests were performed which did not result in any erosion.

Poles were installed in the flumes and the vegetation cover was removed on an area of 0.3x0.9 m² to accelerate erosion. However, the slopes stayed intact due to a very good grass cover developed on the dreded materials.

Overflowing Experiments on the Gdansk Research Dike

In September 2014 an overflowing test was performed on the *Gdansk* research dike. Again, the 60cm flume system was used. The maximum specific discharge was 400 l/s/m. The experiments showed that the grass cover, which was applied using pre-vegetated grass sods placed on top of the clay and Tefra slopes, had not clung into the subsoil sufficiently. Thus, during a discharge of more than 200 l/s/m the top soil and vegetation was destroyed.

Fig. 2: Overflowing experiments Gdansk, September 2014

The bare clay cover showed erosion after a discharge of 50 l/s/m for 10 minutes, while the sand ash mixture performed better, showing only little erosion after 40 minutes of overflowing with discharges up to 200 l/s/m. Thus, it can be assumed that after a destroyed grass cover, the sand ash composite would still be stable for some time, however, a good vegetation cover is generally more effective.

For a durable vegetation cover, however, a solution other than pre-vegetated grass sods will have to be used.

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Geoelectric Crack Detection on the Rostock Research Dike

During the first week of September 2014, Dr. Zielinsky, formerly researching geoelectric crack detection on embankments at the University of Strathclyde in Glasgow, Scotland, visited the *Rostock* research dike to perform his crack detection measurements. He used an electronic resistivity tomography method with a dense electrode grid of 0.4x0.4 m². With this method sections D, E and H (materials M2 and M3, with and without geosynthetic reinforcement) were investigated to receive a 3D image of the electric resistivity inside the sections, thus allowing to visualise large dessication cracks and animal bore holes. Also, longitudinal 2D scans were performed on the crests of the dikes.

The results will be provided during the next months. They will be a great help in evaluating the seepage tests, which have been finished this September. Also, there may be information on the actual performance of the geogrid reinforcement.

Fig. 3: ERT measurements on the Rostock research dike

Pilot Dike at the Körkwitzer Bach as of August 2014

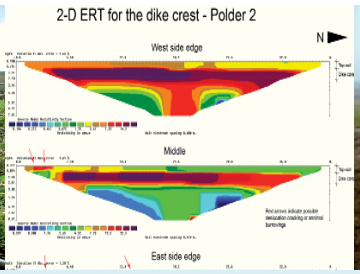
The pilot dike construction at the Körkwitzer Bach near Ribnitz-Damgarten, approximately 40 km north-east of Rostock, was completed in April 2014. The 500 m section of the degenerated flood protection structure was reconstructed using a cover of ripened fine-grained and moderately organic dredged material.

The pilot dike was instrumented with a small weather station, piezometers in the stream and dench on both sides of the dike as well as tensiometers and stand pipes on the dike (cover and core).

The extensive data taken during the construction regarding compaction, deformation and shear strength of the cover material is still being evaluated. It will be presented on the DredgDikes website once finished.

The vegetation has developed during the summer. Figure 4 shows the dike after the August grass cut.

Fig. 4: Vegetation developed on the pilot dike



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Installation Testing Field

Based on the experience from the research and pilot dikes regarding inhomogeneities of the dreged materials, the quality control using the degree of compaction is difficult. Particularly the high variation of local water contents in the installed materials are problematic. Therefore, an additional installation testing field was prepared in Rostock.

Fig. 5: Compaction testing field, August 2014

In the installation tests two different materials were installed (a fine-grained and a sandy dredged material). The materials were homogenised using a screening bucket fixed to an excavator. For comparison, also non-homogenised material was installed. Compaction was realised with the excavator shovel, the excavator tracks (replacement for the bulldozer), a small compactor and a large sheep's foot roller compactor.

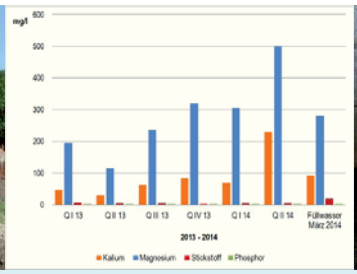
The tests are now being evaluated in the frame of a master's thesis. The results will be available on the project website by the end of 2014.

Environmental Analysis - Final Sampling

In September 2014 the final investigation for chemical soil analyses at the Rostock test dike and pilot dike were carried out. The samples will be analysed until October and the results will show the risk potential through the applied dredged material and changes in the contents through application, weather conditions and repeated filling and infiltration at the test dike. The samples will be analysed regarding heavy metals and organic contaminants as well as basic parameters like pH, TOC, lime content as well as salt and nutrient ions in solids and eluate.

Fig. 5: Soil sampling at the research dike

The materials show higher salinity and organic matter content than traditionally used materials for dike construction founded by the origin in brackish water bodies. Thus there may be a need for the monitoring of the salt and nutrient ions if dredged material shall be applied. Heavy metals, on the other hand, only play a minor role during the potential leaching.



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Investigations in Denmark

During the 3rd Mini-Call of the South Baltic Programme the DredgDikes project successfully applied for additional funding to perform investigations in Denmark. The marine investigations company Orbicon from Roskilde was contracted to take samples from six locations in the Danish Zealand region. The samples were analysed in the geotechnical

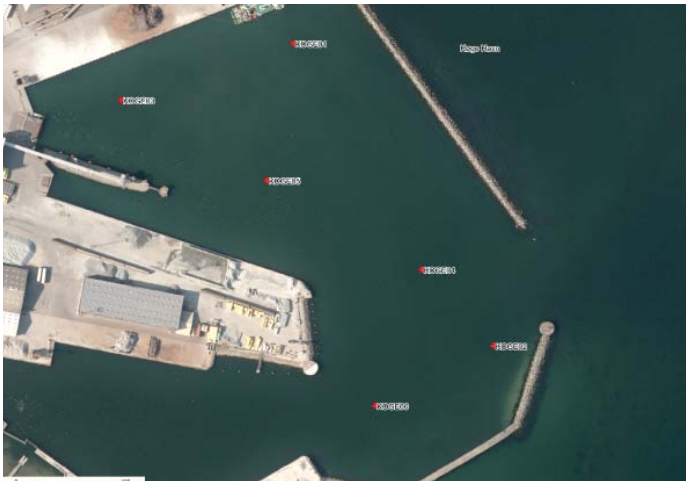

Fig. 7: Sampling locations in the port of Køge, Denmark

laboratory at the Chair of Geotechnics and Coastal Engineering, University of Rostock and in a geochemical laboratory in Rostock. The results were then provided to the contractor for further analysis.

The contractor also prepared a comprehensive study about the legal framework and actual possibilities for the use of dredged materials in dike constructions in Denmark and evaluated the results of the sediment analysis in accordance to the Danish regulations. The report of the study is available on the DredgDikes website.

Dissemination 2014

10-11 April	South Baltic Conference on Dredged Materials in Dike Construction, Rostock
24 April	BWK-Küstentag, Heiligendamm
21-23 May	HTG-Congress, Berlin
5-6 June	South Baltic Conference on New Technologies and Recent Developments in Flood Protection, Gdansk
14-19 Sept	60th Scientific Conference of Committee of Civil Engineering and Hydroengineering, Polish Academy of Sciences
21-25 Sept	10ICG - 10th International Conference on Geosynthetics, Berlin
24-25 Sept	8th Rostock Dredged Material Seminar
22-24 Oct	XXIst International Conference on Coal Ash from Energetics, Zakopane

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