

Dredged Materials in DiKE Construction

Implementation in the South Baltic Region using Geosynthetics and Soil Improvement

Editorial

This is the ninth and final newsletter of the DredgDikes project. After four years of successful research and development the project ends on 31 January 2015. In spite of the large amount of work done, it was much fun to work with the DredgDikes partners and to develop new ideas, technologies and recommendations. Many a day was spent outdoors - both in heavy rains and burning sun - to build, instrument and maintain the research constructions and to perform tests. This newsletter contains a short summary of the project as well as the most recent news. The research dikes will be maintained and promising project ideas are being developed in consideration of the research constructions. Detailed information about all activities can be found on the project web site www.dredgdikes.eu which will be maintained at least until 2020.

Final project meeting with fact finding workshop

On December 8, 2014 the final DredgDikes workshop took place in the Steigenberger Hotel Sonne in Rostock. The meeting combined the final official meetings of the steering and monitoring group and a workshop for future project cooperations on EU level.

Prof. Saathoff welcomed all participants in Rostock, followed by four presentations about the project results from Rostock and Gdansk.

Dr. Cantré led a discussion about the DredgDikes guideline, to which the participants contributed with many helpful comments.

In the afternoon, Mr. Graage and Dr. Hiller from *Steinbeis Team Nordost* spoke about future EU funding possibilities for topics associated with the DredgDikes project, followed

by a group workshop in which two main project ideas were developed. For these ideas EU funding programmes will be found, consortia will be put together and applications will be drafted. The general ideas are the development of dredged material management strategies in the Gdansk region and the concept of a multifunctional dike. Interested readers are welcome to contact the project partners.

The meeting was summarised by Prof. Saathoff and Prof. Sikora and the intensive work of the project partners as well as all contributions by associated organisations and contractors were very much appreciated.

The day was finished off with a joint visit of the Rostock Christmas market.



Summary of the DredgDikes project - 2011

The official start of the DredgDikes project was in September 2010. After the contracting with the EU and all partners, the project work was taken up in January 2011, starting with a kick-off workshop in Rostock. At first, the project management system was installed together with the internal communication platform and the website www.dredgdikes.eu was developed.



Fig. 1: Soaked construction site in Rostock, August 2011

In April 2011 the planning for the Rostock research dike started with a discussion workshop in Rostock. The original schedule aimed at building the research dike in August 2011 and therefore, the planning of the construction was an intensive task. The procurement was organised by partner P4 (Hanseatic City of Rostock). The construction company UTL (Teschow) was contracted, however, when they wanted to start building, extreme rains (333 % of the average summer rainfall) soaked the construction site and in spite of the efforts taken for trafficability, the work had to be stopped after two weeks to be resumed in spring 2012.

An installation testing field was built close to the site of the experimental dike to decide about the compaction technology. This site was subsequently used for undisturbed sampling as well as observation of vegetation and crack development.

A weather station was installed on the Rostock experimental site to collect data as early as possible. All data is available on the DredgDikes website.



Fig. 2: Promotion visit in Vilnius, Lithuania, December 2011

In parallel to the planning, the laboratory investigations for both the dredged materials and the sand-ash composites were started in Rostock and Gdansk. A large laboratory programme was scheduled for different dredged materials from Mecklenburg-Vorpommern and different sand-ash-composites from Poland, from which the materials for the research dikes were chosen.

In November the second DredgDikes workshop was held in Gdansk, in which the works of the year were presented, the plans for the Polish experimental dike were discussed. In spite of and cooperational issues were debated.



Summary of the DredgDikes project - 2012

In the winter of 2012, the laboratory testing was intensified, to prepare the construction of both experimental dikes and the planning of the pilot dike. In April the construction of the Rostock research dike was resumed to be finished at the end of May while the Gdansk research dike was built in the Summer to be finished in August.



Fig. 3: Construction of the Rostock research dike

In October, the first official open day was organised on the Rostock research dike. More than 50 interested people visited the dike. Apart from the general project layout, particularly the dessication cracks after three months of extreme drought as well as the germination of the seeds in a time of returning precipitation was of interest to the visitors.



Fig. 4: Construction of the Gdansk research dike

In April the third DredgDikes workshop was held in Rostock in the frame of which the construction site could be visited. In this way all partners and some associated organisations had the chance to observe the actual construction works.

During and after the construction air based documentation and deformation measurements were performed on the Rostock research dike using unmanned aera systems provided by the chair of Geodesy and Geoinformatics at the University of Rostock.

Starting in May, several conferences were visited to promote the DredgDikes project and to spread the knowledge already gained in the laboratory experiments, e.g. the 12th Baltic Sea Geotechnical Conference in Rostock and the WASCON in Gothenburg, Sweden.

In preparation of the planned overflowing tests, a laboratory analysis was performed in the frame of a Master's thesis, which was finally awarded the BWK environmental award 2012. The first seepage experiments were performed in Rostock to gain experience for the planning of the test series in 2013 which were also evaluated in the frame of a Master's thesis which was jointly supervised from both partner universities.

Because of the delay regarding the research constructions, a prolongation of one year was accepted by the South Baltic Programme.

The year was concluded with the fourth DredgDikes workshop held in Gdansk where the results were presented.



Summary of the DredgDikes project - 2013

In 2013 a considerable number of conferences was visited to present the first results of the DredgDikes project and to invite interested groups to the DredgDikes events. In April the GeSed conference of the INTERREG project SETARMS in Caen, France, was attended, as well as the XVII Konferencja Naukowo-Techniczna in Ustroń, Poland. In May, participants from Universität Rostock and Gdansk University of Technology took part in the 11th International Conference „Modern Building Materials, Structures and Techniques“ in Vilnius, Lithuania and in June a comprehensive DredgDikes paper was presented on the World Dredging Congress WODCON XX in Brussels, Belgium.

Due to the long cold winter with a lot of snow until April, the field experiments started late in spring. At first different series of seepage tests (seepage line caused by infiltrating water due to the hydraulic loading of the water side embankments) was performed and evaluated on both experimental dikes.

When the South Baltic Programme opened so-called „Mini-Calls“ for running projects to apply for additional funding connected to additional tasks, the DredgDikes project included an additional associated organisation, the Danish Coastal Authority, and a variety of tasks connected with Denmark into the project, such as sampling of dredged material in Denmark, analysis of Danish sediments and contracting a study about the legal background and the potential for the recovery of fine-grained dredged materials in dike construction on Zealand. Also, additional vegetation analysis and an additional technology testing field was granted.

In September, the first series of overflowing tests was performed after intensive planning and preparations. Therefore, flumes were installed on the inner embankments in which the flow velocity, water depth and eroded soil were

measured. The well developed grass cover (11 months after germination) protected the surface so well, that no erosion could be detected with the chosen water delivery system ($q_s, \max = 250 \text{ l/s/m}$).

A second DredgDikes open day on the Rostock research dike gave more than 70 visitors the opportunity to experience the large-scale overflowing tests.



Fig. 5: Construction of the pilot dike and quality control by students

In Autumn, the planning for the project conferences in 2014 was intensified and a link to another INTERREG project, the PRISMA project with partners from Netherlands, Belgium, France and UK was made. The PRISMA partners visited the DredgDikes research groups in Rostock and Gdansk and in November, a delegation from Gdansk visited the PRISMA presentation days in Norfolk, UK.

Also in November, the construction of the joint pilot dike at the Körkwitzer Bach 30 km north-east of Rostock was started. The year was concluded with the fifth DredgDikes workshop in Rostock, including group workshops to discuss the planned DredgDikes guideline.



Summary of the DredgDikes project - 2014

The year of 2014 started busy with the organisation of the two DredgDikes conferences, while in parallel the data of the 2013 experiments was evaluated and additional laboratory tests were performed.

In April, the first of the DredgDikes conferences, the South Baltic Conference on Dredged Materials in DiKE Construction, took place in the beautiful Yachthafenresidenz Hohe Düne in Rostock. 115 participants contributed to the conference in presentations, discussions, exhibition and excursion. The proceedings are available in print form and also as electronic PDF documents on the DredgDikes website.

Also in April, the pilot dike was finished. The dike had been planned by a local planner, WastraPLAN, in close cooperation with the project partners, lead by partner P3, the water and soil association. The local company STIG-Bau, Bad Sülze, won the contract and installed dredged material from the Hanseatic City of Rostock's treatment plant. During and after the construction, the dike was instrumented and the installation quality was co-checked by the University of Rostock for further analysis.

In May, the final series of seepage and overflowing experiments was started on the Rostock research dike. Now, a specific surcharge of up to 550 l/s/m was realised in the flumes and still no considerable erosion was measured. Even when installing poles in the flumes and putting holes in the vegetated surface, the results were extremely good. While the tests were running, another site visit was organised for interested stakeholders.

Also in spring, a contract was given to the company Orbicon in Roskilde, Denmark, to perform the sampling of Danish dredged material and to prepare the proposed study on the legal background and feasibility for the recovery of dredged materials in Zealand dike construction. The report is available on the project website.

In June, the South Baltic Conference on New Technologies and Recent Developments in Flood Protection - the second DredgDikes conference - was organised at Gdansk University of Technology. 145 participants showed great interest in the topic in Poland. Afterwards, the final series of infiltration tests at the Polish test dike was performed.

In September, flumes were installed on the Gdansk research dike and a series of overflowing tests was performed in cooperation between the two university partners.



Fig. 6: Overflowing tests in Rostock

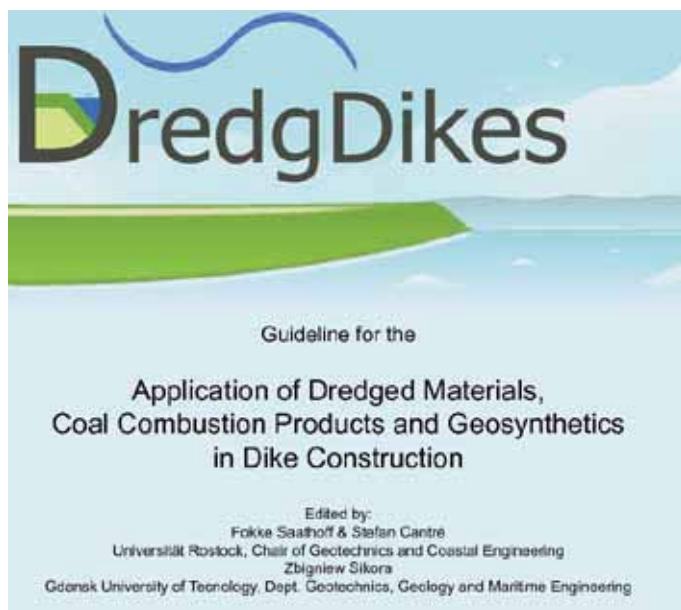
The erosion resistance of the comparably thin vegetation cover proved to be considerably lower than that of the fine-grained dredged materials in Rostock, while the well compacted and hardened sand-ash composite performed well compared to other dike core materials, such as standard sand.

Two official DredgDikes meetings and workshops were organised in 2014, the first in the frame of the Rostock conference and the second in December, where 35 participants were informed about the project results, discussed the contents of the guideline and brainstormed for future project ideas.



Guideline on the Application of Dredged Materials, Coal Combustion Products and Geosynthetics in DiKE Construction

The first guideline on the application of dredged materials and coal combustion products under consideration of geosynthetics will be published by the end of January 2015. There will be a main document in English language, which will be printed and distributed in the South Baltic.



The guideline will also be available in German and Polish languages as electronic documents (PDF) to be downloaded from the DredgDikes website.

There will also be an Annex document in two parts, including additional information on the guideline chapters and the scientific background with the description of all tests performed during the project lifetime. This document will be also available as a PDF from the project website and it will be in English language only.

Closing Remarks

The DredgDikes consortium would like to thank all associated organisations for their contributions and discussions, the student workers in Rostock and Gdansk for their great help, the financial management, the university administrations in Rostock and Gdansk, the first level controllers, the JTS in Gdansk, the contractors and suppliers with regard to constructions, instrumentation, external laboratory analyses, dissemination tools, meetings and conferences (to name only a selection), all those who helped develop the guideline with contributions and discussions and the people who took interest in the project to spread the knowledge, namely the participants of the workshops, conferences and excursions.

More than four years of intensive work on the topic of dredged material recovery are coming to an end. Now, new projects are being developed and we are looking forward to continue working in this field, as well as others, with the DredgDikes partners and stakeholders, be it in science or application.

Imprint

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