GEOWALL® technology as the key for unlocking the value of dredged sediments by reuse in civil structures and infrastructure

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Introduction: Siltation of rivers and lakes is a worldwide environmental and economic problem. In Europe, more than 200 million cubic metres of sediment has to be dredged and transported every year. The management of dredged sediment is an increasing issue for harbours and local authorities. Sediment from lakes, canals and rivers is continuously dredged to maintain the water depth, flow capacity and storage of water to prevent flooding. At this moment most of the dredged sediment is transported to depots as waste. A potential building material is therefore not used! Since at least 90% of the sediment in Europe is expected to be clean enough to be reused as main construction material in high value applications, a more sustainable, future proof solution is required. GEOWALL® combines different state of the art stabilisation techniques to convert dredged sediment into durable and circular building elements to create almost any type of civil structure or even buildings.

Methods: NETICS has developed a unique recycling solution where dredged sediments are reused in high quality solid building blocks. This innovation, which is patented by NETICS, is called GEOWALL® building element. GEOWALL® technology is able to create almost any type building block directly from dredged sediment with ranging sizes, interlocking features and custom made surfaces.

Fig. 1: *Examples of GEOWALL® building elements*

The applicability of the dredged sediment to create high-quality building elements depends on the composition of the material and unique properties like pH value, Atterberg limits, heterogeneity, organic matter, calcite levels, available minerals, etcetera. By collecting more then 100 types of sediment over the last twenty years we were able to built an extensive model which predicts the most optimal way of sediment stabilisation. The innovative GEOWALL® tool incorporates a huge number of state of the art stabilisation methods. This is summarized into four different categories; physical, mechanical, chemical and biological stabilisation.

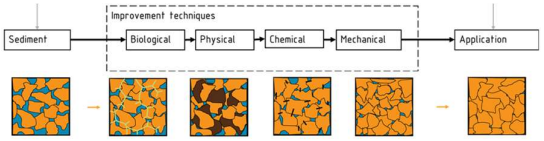

Fig. 2: *Schematization GEOWALL® modelling tool*

Based on the application needs unique combinations of stabilisation techniques are deployed to obtain the optimum production of GEOWALL® elements.

Results: The method for mechanical stabilisation makes the GEOWALL® Technology unique and innovative. By using an enormous pressing force combined with state of the art dewatering techniques the dredged sediment is transformed into building elements. The GEOWALL® production unit, also named the Sludge Factory, includes four different stages; 1) The collection and measurement of dredged sediment, 2) Dewatering of the sediment, 3) Mixing of binders according to a specific recipe, 4) Production of GEOWALL® building elements. During a real scale pilot project the Sludge Factory produced successfully more than 56.000 building blocks for creating a soundwall along a railway track.

Fig. 3: *GEOWALL® production as Sludge Factory*

Discussion: Many other applications are feasible such as covering stones for flood barriers, rock armour for breakwaters, separation walls, vertical embankments and even buildings. Owners of the sediment as well as key customers use GEOWALL® building elements locally to make new structures. The new material is a sustainable alternative for raw materials like wood, concrete, steel and plastics. By connecting the dredging chain with the construction chain, a resource efficient circular economy is created. After use the building elements are crushed and transformed into new elements without producing any waste. The presentation will give insight into the science behind the GEOWALL® Technology, its proven applications and circularity within dredging and building markets.

References: [1] Ekkelenkamp, H.H.M., Pieterse, J.J., Kranenburg, L.J., (2020) Zetsteen van Baggerspecie, Civiele Techniek 5 Nummer 3 2020