# Stabilized *in situ* sediment as material used for experimental coastal protection and habitat restoration measures

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**Introduction:** In connection with the change in the water level manipulation of the reservoir, according to the EIA process, it was decided to take compensation measures to protect the littoral zone and create 43 ha of islands for water birds. The traditional approach of using stone for construction is costly due to long transport distances. Therefore, we designed and tested the possibility of reshaping local sediment into a material suitable for construction and implemented a pilot experimental polygon.

**Methods:** Within the lake, sediment samples were collected to determine spatial differences, recipe tests were conducted with the most suitable sediment type. Two approaches were tested, alkali activation with slag addition and Portland cement with improvement of grain-size distribution (increase of the coarser grains proportion).
Several types of new material with different properties and material costs were proposed. Finally different types of "products" were made and an experimental island with beach (Fig. 1) was built using low-drought boats.

Fig. 2 The experimental polygon („island with beach“) is soon to be finished.

**Results:** As the lake is the second in a cascade all the sediments were fine grained (d0.5 range 18-31 µm) with organic matter content 8-10 % (as LoI). The highest economical efficiency was reached by the combination of Portland cement and fine fraction (0-8 mm) of recycled concrete. Three materials with different geomechanical properties were made: the “crisp” one, which was used as the filling of the island and also as material on beach. This material has also been tested for the construction of submerged breakwaters. The “medium” material has been shaped as 10 to 10 cm cubes which would simulate the rough bottom substrate, naturally made of rocks, and the “hard” material was used to make octapode cube like blocks used as the other type of submerged breakwater. To make the field work realistic, the laboratory recipes were simplified. SED/CON/CEM weight ratio was 2/1/1 for “crisp” material; 2/2/1 for “medium” material and 2/2/2 (plus water-glass) for the “hard” material.
The monitoring of the geotechnical stability of the island as well as of the other materials was conducted for the next 12 months after the completion of construction.

**Discussion:** The geomechanical properties of the “new” materials remained the same after one year or improved a bit as the cement hydration reactions continued. Mainly the “crisp” material became harder and it also increased its volume for appx. 10 %.

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