12. Marine sand and coastal safety

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The impact of climate change on the coastal region and by extension the province of West Flanders, the Flemish region and the federal state is particularly large. Extensive statistical analysis of the measured water level at sea already showed a linear long-term sea level rise of +2 mm per year (Oostende 1925-2014). In addition to the water level, the wave setup and wave action also determines the condition of our first-line sea defenses and the ability to maintain it. The level of protection is determined on the basis of extreme values statistics, whereby a sea level rise of one meter already implies a risk increase by a factor 100.

The possible consequences of extreme storm surges are correspondingly. Calculations indicate that at an expected water level of +7m TAW, the human toll and material damage as a result of a failing sea defense, possible dike breaches and flooding, is extremely great. So we'd all better be well prepared for this imminent threat, whatever climate scenario will unfold in reality.

The Agency for Maritime and Coastal Services is responsible for your coastal safety in Belgium and the implementation of adaptive measures now and in the near future. On June 10th 2011, the former Flemish Government approved the Master Plan Coastal Safety. The official start of the implementation took already place in the autumn of that same year with a medium beach nourishment in Koksijde. We are now ten years beyond that milestone, ten years of investing in a safe, attractive and natural coast.

The principle choice from start was convincingly made in favor of soft, flexible measures wherever possible, rather than rigid, hard measures. We therefore prefer to work with natural solutions (Nature Based Solutions) to strengthen this natural, sandy coast of beaches and dunes. Nourishments are still the basic solution. On a wider and higher beach, waves can break and lose their energy before they can damage the seawall or the buildings on top. The final findings of the 2019 CREST research project demonstrated that this flexible approach actually works. By adding extra sand to the beaches, to the foreshore (= the stretch of beach just below the low-water mark) or at the foot of the dunes, we do not only reinforce the sea defense but also strengthen the natural coastal dynamics and ecology. Finally, it is a flexible solution that allows the coast to grow with the rise in sea level. With the replenishment of Knokke-Heist (works partially carried out in Duinbergen during the spring of 2021), the ultimate goal of the Master Plan to raise our protection level against storm surges with a return period of 1 in 1000 years, is clear in sight.

Apart from the adaptation measures in the context of a future-oriented coastal vision, we fall back on a necessary maintenance regime. The sand that disappears from the dry beach or tidal zone during a storm is moved towards the low water mark and the foreshore and still contributes to the safety level. Research shows that after a storm, some beaches partially recover spontaneously within the following months. The wind and tide return some of the washed-away sand to the beach. At the same time, the maintenance nourishments strengthen the dunes and erosive zones and provide a protective buffer for the sea dikes against the force of nature.

Since 2011, 13.2 million cubic meters of sand has been deposited on our beaches in the interest of coastal safety. About 84% of this comes from the primary licensed extraction zones on the Belgian Continental Shelf. The remaining 16% falls under the term beneficial use. Sandy dredged material or sand from small to large (infrastructure) works on- and offshore, finds a useful application in sea defenses if all quality requirements can be met. The intention is at least to increase this share in the coming years and to actively look for new synergies around. Therefore, the sand demand for primary sea sand originating from the BCP can be significantly reduced, aiming to make a positive contribution to the circular use of raw materials and reducing the cost of the nourishment program.

Even better is when the sand can also be retained in those exact places where it is of maximum use. Successful projects involving the planting of marram grass and the fixation of sea defense dunes are in

full development in Westende, Raversijde, Mariakerke and Oostende Oosteroever in collaboration with various scientific institutions.

At the beginning of October 2021, the construction of four new beach groynes in the critical and maintenance-intensive area around Wenduine has started. The purpose of this proven technique is also to retain the sand and to reduce longitudinal transport to the marina of Blankenberge.

Finally, special attention should also be paid to the final part of the Masterplan coastal safety, adjacent to the Dutch border. In the period 2016 to 2019, sand from deepening the main channel at the Zwin entrance was used for the construction of the core of a new 4km International Zwin Dike. Large-scale works that led to the rebirth of the Zwin nature reserve.