‘Building with Nature’: Coastal Sand Dunes

Strypsteen Glenn and Rauwoens Pieter

Department of Civil Engineering, KU Leuven, Spoorwegstraat 12, 8200 Bruges, Belgium
E-mail: glenn.strypsteen@kuleuven.be

The concept of ‘Building with Nature’ is gradually being recognized worldwide as a cost-effective approach to improve coastal protection against sea level rise and future flooding events. Opposed to hard engineering structures, this innovative approach, with emphasis on soft measures provides long-term sustainable solutions for restoration and protection of coastlines where possible. At the Belgian coast, the soft dune-before-dike solutions are receiving considerable attention: traditional sea dikes are reinforced with engineered dunes offering higher levels of protection of coastal infrastructure and at the same time offering a more natural appearance and higher ecological and socio-economical values. Vegetation, like marram grass, plays a vital role in the formation and development of these engineered dune areas. On windy days, sand grains from the beach get picked up by the wind and move towards the dune area to fall back to the surface as vegetation reduces wind speed and thereby trapping and holding the sand. To this day, no clear protocols or guidelines exist on how to design or construct engineered dune areas and plant vegetation, and often knowledge is drawn from other projects. Despite the value of dune areas and environmental benefits, their basic function as dynamic landforms and their role in providing these benefits are therefore not always well understood or appreciated by coastal landowners and beach users. In this study, we fill in the knowledge gap by measuring and monitoring early-stage dune development along an engineered dune area with different planting strategies at Oosteroever, Oostende by means of dedicated field campaigns focussing on the interaction between aeolian (wind-blown) sand transport and vegetation. The dune area of 120x20 m² is created in front of the traditional sea dike where marram grass is planted in six successive zones (20x20 m²) with plant densities varying from 6 to 15 plants/m² covering different spatial distributions (regular, random and clustered). Our hypothesis is that early-stage dune development and initial topographic changes in the dune area can be expressed as a function of aeolian sediment supply from the beach, vegetation characteristics, and sediment erosion by wind and storm surges.

Keywords: Early-stage dune development; Aeolian sand transport; Vegetation distributions; Field campaigns