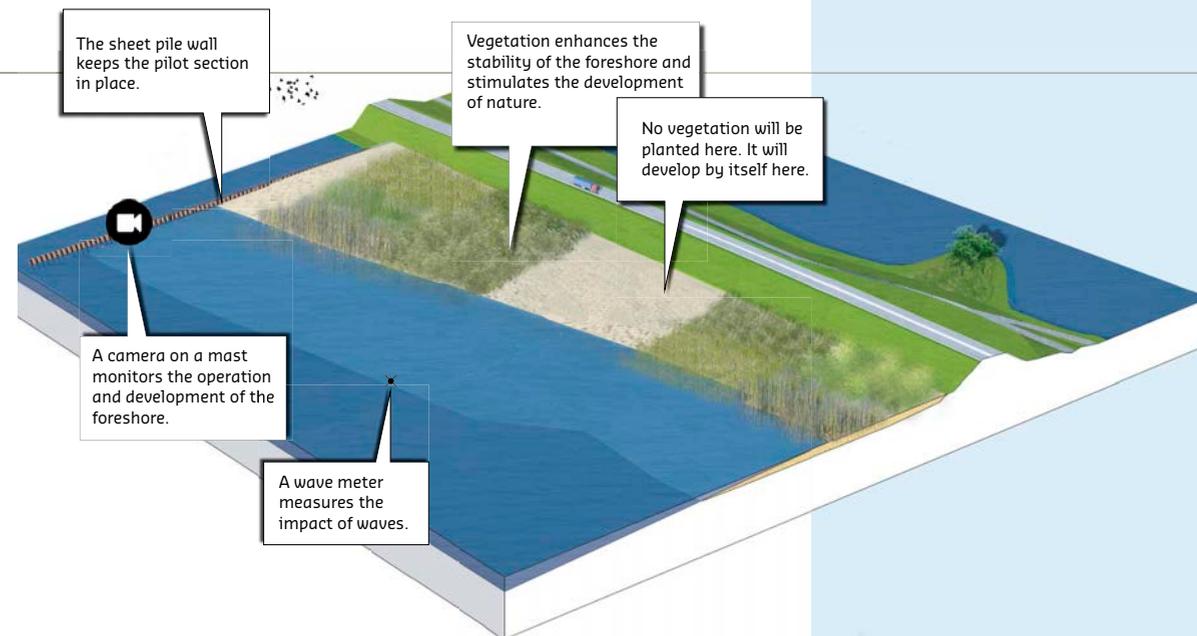


Vegetated foreshores to protect dikes

Natural foreshores are increasingly seen as a valuable alternative or supplement to conventional dikes. Natural foreshores consist of shallow zones and beaches with a gradual slope and near-natural vegetation. Examples are freshwater reed beds and wetlands, willow forests, salt marshes and mangroves. They provide additional flood protection by reducing wave attack on dikes partially or even completely. In order to better understand the crucial aspects of designing, constructing and maintaining a natural, vegetated foreshore, a pilot study is being conducted on the "Houtribdijk", the dike that separates two large Dutch freshwater bodies, the Markermeer and IJsselmeer lakes.

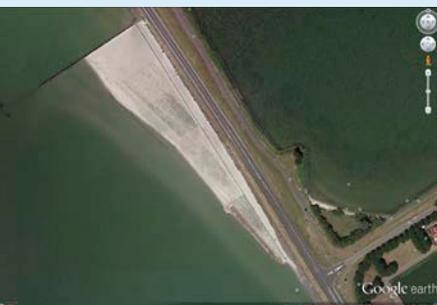
During the summer of 2014, a pilot section of a sandy foreshore (design slope 1:30 – 1:25) was constructed on the south-western shore halfway along the Houtribdijk. Vegetation was planted here in the spring of 2015 in several sections with different soils (areas with only sand and areas with a mixture of clay and sand in the top layer). A mixture of several willow and elder species was planted on the higher and drier sections, and common reed was planted on the lower section closer to the water. Thick willow mats (16 x 100 m) were placed on the waterline to help reeds to get established. Meteorological conditions, incoming waves, changes in morphology and the soil, and the development of the vegetation (both planted vegetation and the vegetation that established itself naturally) are all being monitored.

The pilot section has undergone some striking changes during the first eighteen months, particularly near the waterline, where a rather steep 1:10 slope has formed. This could be related to the relatively coarse sand and the constant water levels. Under the water a flat plateau has formed at a depth of approximately



1 metre. The initial slope has completely disappeared and the large willow mat on the waterline has been eroded away by the incoming waves, which can be up to 1 m high during storm events. Severe wind erosion of the exposed soil has created dunes in the highest section of the pilot section, where a wind screen has captured a lot of this sand. The sand is being displaced during storms and the shoreline shifts depending on the incoming winds. Overall, however, most sand has remained in the pilot section for now, with little being lost to the area outside the section.

The pilot section will be monitored until 2018 to establish a sound picture of the dynamics of this vegetated foreshore. The results will be used to produce guidelines for the better implementation and maintenance of these vegetated foreshores.



Bottom photo by Mennobart van Eerden