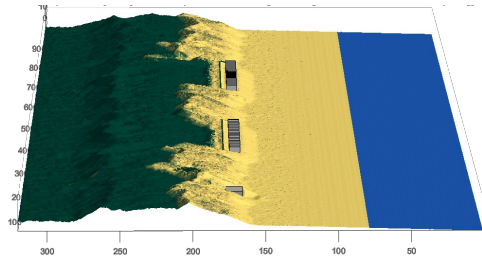


<b>Title of the project:</b> Long-term impact of buildings on the beach on coastal dune development	
<b>Assignment no.:</b> 29.22	<b>Internal/external:</b> External (HHNK)
<b>Head graduation committee:</b> Wijnberg	<b>Daily advisor:</b> Teixeira-Manion, Msc (UT) Horstman/Campmans, t.b.d. (UT) Goessen (HHNK) Arens (ABvS&D)
<b>Name(s) of participating companies or institutes:</b> <ul style="list-style-type: none"> <li>• Hoogheemraadschap Hollands Noorderkwartier (HHNK)</li> <li>• Arens Bureau voor Strand &amp; Duinonderzoek</li> </ul>	<b>Start of the project:</b> a.s.a.p.
<b>Required courses:</b> Data Analysis in WE&M, Building with Nature, Wave-Dominated Coastal Dynamics	
<b>Short description and objective of the project:</b>	
<p><b>Context</b></p> <p>Along sandy shores, coastal dunes are essential natural landscape elements that prevent flooding of the hinterland during storm surge conditions. These natural flood defences can grow with sea level rise as long as sufficient sand can be blown from the beach into the dunes for natural dune growth to occur.</p> <p>Along urbanized sandy shores, we increasingly see that the build environment encroaches onto the beach: seasonal recreational homes and/or permanent beach restaurants are expanding year after year in front of the dune rows. These buildings interfere with the wind-driven sand transport across the beach that feeds the dunes. At present, it is not clear to what extent this interrupted sand transport impacts dune morphology on the long term. This limits our understanding of the flood safety offered by nature-based sandy solutions, and how this depends on aspects like positioning and size of buildings and whether their presence is seasonal or permanent.</p> <p>As part of the research in our group, a bio-morphological model (DuBeVeg) for simulating long-term beach-dune dynamics has been expanded with a module that accounts for the effects of buildings on sand deposition and erosion (Poppema, 2022).</p>	
<p><b>Objective</b></p> <p>The objective of this MSc project is to make an in-depth analysis of the multi-year bio-</p>	



morphological development of foredunes fronted by buildings as well the developments of the adjacent stretches, for different beaches, to support the validation of the beach-dune dynamics emerging from the DuBeVeg model for beaches with buildings.

### **General research approach**

- Select study sites with long-term presence of buildings on the beach along the Dutch coast
- Obtain data on beach building characteristics at the study sites.
- Schematize long-term wind and water level time series for the study sites to characterize site specific forcing conditions.
- Quantitatively analyse long-term topographic data sets for beach-dune evolution at the study sites
- Using aerial image data, quantitatively analyse vegetation density patterns and or pattern development at the foredune for areas with buildings as well as along the adjacent stretches.
- Compare study sites

In this project, you will collaborate with Hoogheemraadschap Hollands Noorderkwartier and Arens Bureau voor Strand & Duin Onderzoek.

### **Literature**

Poppema, D. W. (2022). *Morphological effects of buildings in a sandy beach environment*. Dissertation University of Twente. <https://doi.org/10.3990/1.9789036553520>

Keijsers, J. G. S., De Groot, A. V., & Riksen, M. J. P. M. (2016). *Modeling the biogeomorphic evolution of coastal dunes in response to climate change*. *Journal of Geophysical Research: Earth Surface*, 121(6), 1161–1181. <https://doi.org/10.1002/2015jf00381>

NH Nieuws. (2019). *Strandhuisjes en paviljoens IJmuiden ontoegankelijk door dikke laag zand*. NOS. [www.nos.nl/artikel/2297339-strandhuisjes-en-paviljoens-ijmuiden-ontoegankelijk-door-dikke-laag-zand.htm](http://www.nos.nl/artikel/2297339-strandhuisjes-en-paviljoens-ijmuiden-ontoegankelijk-door-dikke-laag-zand.htm)

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