

Interactive comment on “Accommodation space indicates dune development potential along an urbanized and frequently nourished coastline” by Corjan Nolet and Michel J. P. M. Riksen

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Always fascinating to read about the efficacy of the Zandmotor and I'm sure there will be a wide audience for this paper. Specifically the authors consider the potential for this intervention to create space for the growth of marram grass and the development of embryo dunes.

They approach this question primarily from an earth science perspective. They identify

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the 'beach' above a height subject to storm surge and which has experienced sand accretion. Incidentally, I find it difficult to apply the term 'beach' in this context. Also, a 12-month period is a very short period to assess embryo foredune development. Was this a typical 12-month period in relation to storm surge and wind stress?

The results point to the establishment of a large accommodation space as a result of the nourishment. Foredunes have developed adjacent to the Zandmotor, presumably (and forgive me if the authors explain this) as a result of bioengineering. The development of embryonic dune across the beach, since culmination of the Zandmotor, has been patchy. Even the embryonic dunes at the back of the beach, adjacent to Duinfietspad (the road boarding Zandmotor) – some of which have been established from deliberate plantings of marram - have barely flourished.

There is an alternative – ecological - perspective on this situation. A considerable section of the paper is committed to explaining how marram grass traps sand and grows by the vertical and horizontal extension of rhizome. But what the germination and growth requirements of this species? Does the surface of the Zandmotor, or most of the surface, satisfy these requirements? Further, marram growth and embryo dune development results from the deposition and germination of marram grass seed and / or rhizome. The process of marram rhizome dispersal and growth is well documented in these papers:

Konlechner, T. M., Hilton, M. J., & Orlovich, D. A. (2013). Accommodation space limits plant invasion: *Ammophila arenaria* survival on New Zealand beaches. *Journal of Coastal Conservation*, 17(3), 463-472. doi: 10.1007/s11852-013-0244-5.

Konlechner, T. M., Orlovich, D. A., & Hilton, M. J. (2016). Restrictions in the sprouting ability of an invasive coastal plant, *Ammophila arenaria*, from fragmented rhizomes. *Plant Ecology*, 217(5), 521-532. doi: 10.1007/s11258-016-0597-6.

In short, if marram propagules are not being deposited on the surface of the Zandmotor we cannot expect the development of dunes. Moreover, a range of conditions will limit

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the germination of seed and the success of growth from rhizome. In the case of the former the seed must remain close to the surface (within 7cm) to avoid dormancy (to germinate and to avoid entering the long-term seedbank). A very active substrate, where there are high rates of sedimentation, may also result in unfavourable growth conditions, even if germination occurs. A wind rose was not included in the paper, but I recall the drift potential is generally to the northeast . . . so there is no source of seed upwind of the Zandmotor? Similarly, the likelihood of the waves depositing rhizome on the beach is low or nil because of the elevation of the beach.

Marram growth from either seed or rhizome is inhibited by high moisture content and the surface of the beach appears to be corrugated with alternating transverse proto-dunes and moist deflation areas. One last (ecological) point. Marram requires nutrients to grow and so growth is usually most vigorous immediately adjacent to a beach, where decomposing algae and marine debris provide abundant fuel for growth. I wonder what the nutrient status of the substrate of the Zandmotor might be? It is probably quite low.

Therefore, if I'm correct, the actual accommodation space generated by the Zandmotor might be a good deal less than you estimate. I would like to see some experimental work on the Zandmotor, with the goal of examining the biological requirements of marram grass and the dispersal of propagules. Maybe the authorities should plant more marram? But where to maximise success? It may not be in the areas experiencing the most rapid accretion! Because in these areas the rate of accretion may exceed the tolerance of seedlings and be too dry for growth from rhizome (which would not be deposited at these sites in any case).

A couple of other issues. I found the maps very difficult to interpret (although I was dealing with the grey-scale versions). I very much enjoyed reading about the coast to the north and the constraints imposed by use of the coast.

Finally, my apologies for the time it has taken me to comment. I value the paper and it is a worth contribution provided you acknowledge you are looking at a discrete element

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of the (biogeomorphic) dune system.

Interactive comment on Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2018-37>, 2018.

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