Impact of coastal dune management on sandspray in the hinterland

The 8th International Conference on Aeolian Research (ICAR VIII) 21-25 July 2014, Lanzhou, China

Riksen, M.J.P.M.[1], Huiskes, H.P.J.[2], Krol, J.[3] and Slim, P.A.[2]

Background

The Dutch have traditionally intensively managed their coastal zones. Often a 'soft engineering' approach has been used that involves placement of sand fences between the sea and the foredune along with the planting of *Ammophila arenaria* (Marram grass). From 1990, however, 'dynamic coastal management' has been increasingly implemented and where possible, dunes are no longer established with sand screens and Marram grass. On the Dutch Barrier island of Ameland in The Netherlands, this has resulted in the shift to the dynamic management approach, and more recently in the creation of several blowouts in the foredunes, to encourage more sediment transport by wind into the hinterland. This could than have a positive effect on the sediment balance and dune ecology. Beside saltation, sandspray (short term suspension) is seen as one of the differentiating processes involved here. To date no accurate data on the deposition rate, pattern and impact on the growing conditions exists.

Objective

To increase insight into the effects of foredune dynamics on the deposition of sediment by sandspray in the area behind the foredune and related soil properties, growing conditions and dune vegetation.

Materials and Methods

The MarbleDustCOlector (MDCO) was adapted (Fig. 1B) to use as a sediment trap (MSCO) to measure the total sediment deposited over time. In December 2012 6 line transects were installed with 5 sediment catchers each on the Barrier island Ameland. Three transects were located behind foredunes with a blowout and 3 transects behind foredunes without a blowout (Fig.1A and 1D). Each transect started a few meter behind the land-ward foot of the foredune. Vegetation was monitored in May 2013 and 2014 (Fig. 1E).

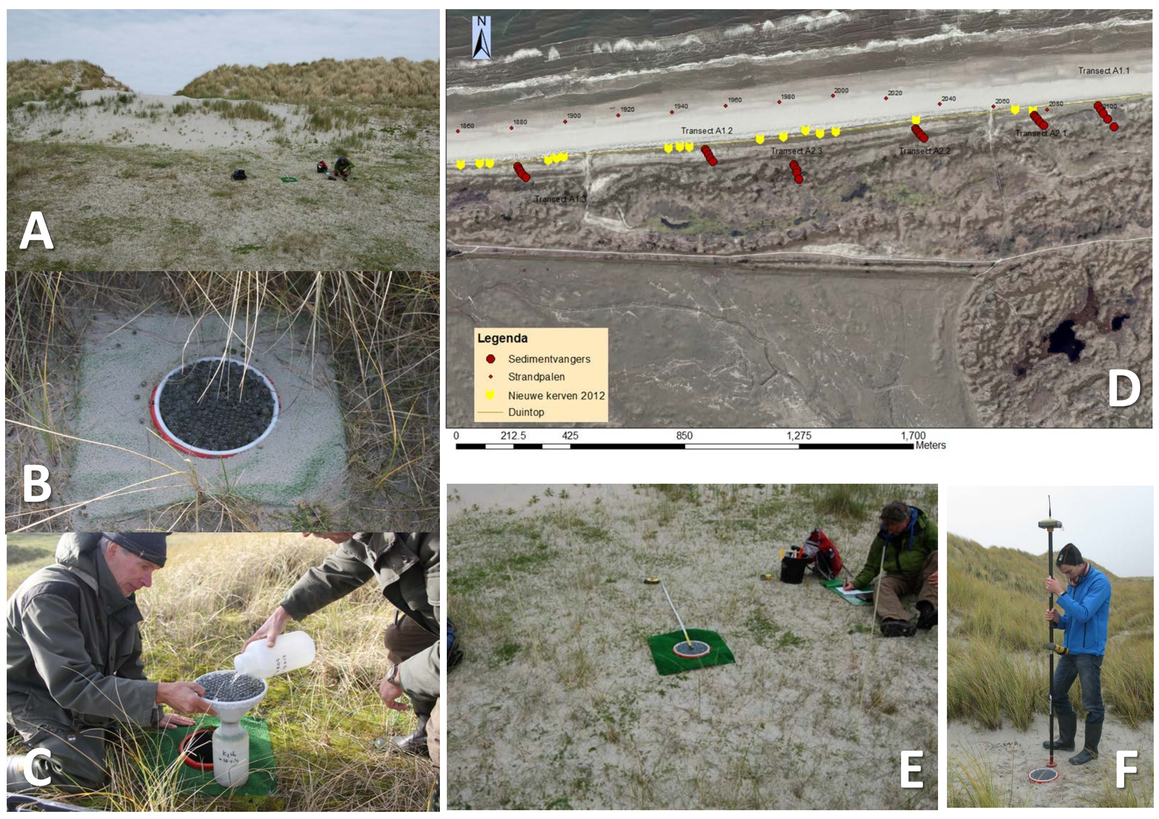

Figure 1. A Transect behind a blowout; **B** Marble Sediment Collector; **C** Collecting the sediment from the catcher; **D** Location of the transects; **E** Field survey on soil and vegetation; **F** Measuring the position of the MSCO traps with a DGPS.

Preliminary results and discussion

Sandspray was observed behind each transect as shown by Figure 2.

- The amount of sandspray behind the dunes without blowouts mainly depends on the activity of sediment transport on the front side of the dune ejaculating sediment into the air at the dune crest.
- The pattern and travel distance of the sediment depends on the height of the dune.

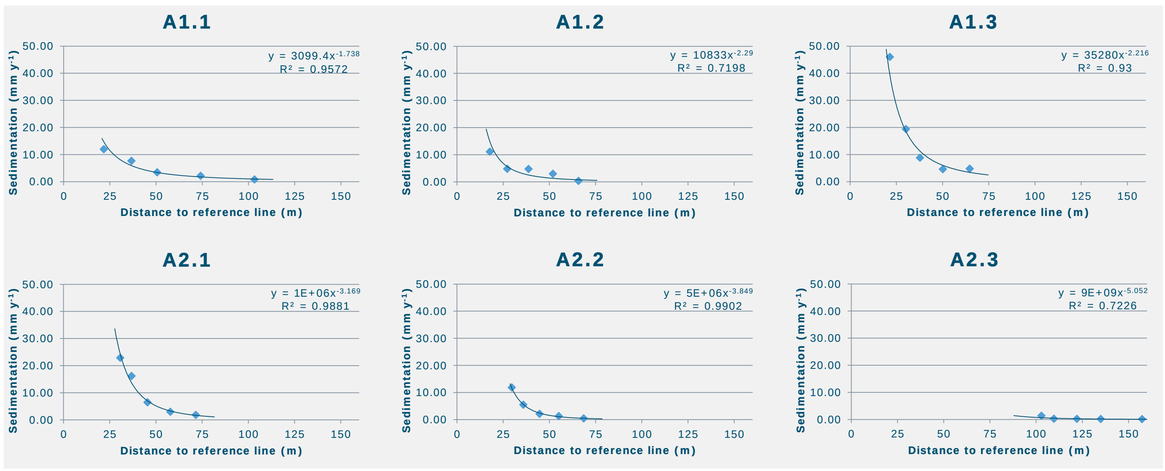

Figure 2. Average yearly deposition (mm y^{-1}) along three transects behind foredunes without a blowout (A1) and with a blowout (A2) measured at Ameland between 18 November 2012 and 26 May 2014.

- The amount of sandspray behind the dunes with blowouts depends primarily on the activity of erosion and sediment transport in the blowout area, mainly depending on the size, shape and orientation of the blowout. Sediment is transported by saltation in the blowout to the back where a new ridge is formed. On the slope of this ridge sediment is ejaculated in the air resulting in sediment transport by sandspray.
- Blowout A2.1 (3 m wide) is a very active blowout resulting in high sedimentation rates close to the blowout. The amount decreases more rapidly compared to the sedimentation patterns found behind the dunes without a blowout. This can be explained by the lower height of the ridge compared to the dunes which are twice as high.
- Blowout A2.3 is much bigger (approximately 20 m wide) and lower than the other two. Most sediment transport in landward direction is by saltation. As a result the dune width has increased by approximately 60 m. Behind this active zone the amount of sandspray is limited as shown in Figure 2.
- As a result of the landward displacement of the landward dune foot most change in vegetation was expected in the zone next to the new dune foot position. However the vegetation composition along the transects (with and without blowouts) still showed much similarity in the first and second year; and little change was observed behind the blowouts.

Conclusions

- The created blowouts did not lead to higher sandspray rates;
- Because the blowouts are lower, the distance of the transport by sandspray is less behind the dunes with blowout;
- The landward movement of the dune with a blowout had little or no impact on the vegetation composition in the zone next to the new dune foot position.

Acknowledgements

We extend our thanks to It Fryske Gea for their support of this research.

1) Soil physics and Land Management group
Wageningen University
P.O. Box 47, 6700 AA Wageningen
The Netherlands
Contact: Michel.Riksen@wur.nl
Phone + 31 (0)317 482833, M +31 (0)6 28264050
www.SLM.wur.nl

2) Vegetation, forest and landscape ecology group
Alterra, Wageningen UR
P.O. Box 47, 6700 AA Wageningen
The Netherlands
Contact: Rik.huiskens@wur.nl
Phone + 31 (0)317 485885

3) Natuurcentrum Ameland
Postbox 60, NL 9163ZM Nes Ameland
The Netherlands
Contact: natuurcentrum.jkrol@planet.nl
Phone +31 (0)519 542737
Mobile +31 (0)6 51932645