COASTS OF THE FUTURE - New ways of land reclamation

FUTURE VISION

The interplay of the various protective components can create a safe, dynamic and attractive island as sea levels rise. The shape and location of Juist will change over time, but the island's already existing attractiveness will be further developed and enhanced.

Country / City	Germany, Hanover
University / School	Leibniz Universität Hannover
Academic year	5
Title of the project	COASTS OF THE FUTURE - New ways of land reclamation
Authors	Ann Katrin Schönmann

TECHNICAL DOSSIER

Title of the project	COASTS OF THE FUTURE - New ways of land reclamation
Authors	Ann Katrin Schönmann
Title of the course	Master Thesis
Academic year	5
Teaching Staff	Prof. Dipl.-Ing. Christian Werthmann, M.Sc. Lisa Seiler
Department/Section/Program of belonging	Fakultät für Architektur und Landschaft, Institut für Landschaftsarchitektur
University/School	Leibniz Universität Hannover

Written statement, short description of the project in English, no more than 250 words

Against the background of climate change, coasts worldwide are confronted with a multitude of problems. While in large parts of the world often no measures protect the settlement areas, high dykes at the North Sea provide the appropriate protection. However, such rigid structures can only be adapted to a very limited extent and cannot cope with future developments due to the uncertainty of the exact rise and the speed with which sea levels rise. Therefore, other protection strategies are needed.

On the basis of the East Frisian island of Juist, various possible protection scenarios were investigated, including sea-level rise of up to five metres, and the associated developments. While the pursuit of linear dyke protection would lead to enormous costs and an increase in problems, the scenario of the planned withdrawal of people from the island to the mainland was assessed as an unlikely strategy for the time being. The implementation of a horizontal protection graduation, on the other hand, represents a real alternative to today's approach and was subjected to a spatial test due to its sustainability and ecological added value.

Overall, it became clear that no measure is so multifunctional and effective that it alone can guarantee the safety and preservation of the island. The staggering of various alternative, but also already existing protection measures, on the other hand, ensures significantly stronger island protection, which must be improved and strengthened again and again, but which perceives the increase as an opportunity and thus creates more sustainable protection.

For further information
Máster d'Arquitectura del Paisatge -DUOT - UPC

T: + 34 93 401 64 11 / +34 93 552 0842
Contact via email at: biennal.paisatge@upc.edu

Máster d'Arquitectura del Paisatge -DUOT - UPC
ETSAB- Escola Tècnica Superior
d'Arquitectura de Barcelona
Avenida Diagonal, 649 piso 5
08028 Barcelona-Spain

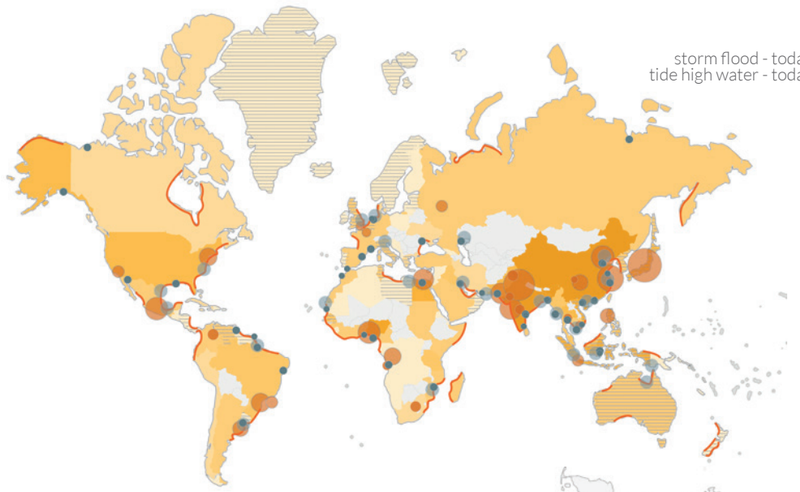
CLIMATE CHANGE AGAIN

11th International Biennial Landscape Barcelona

Barcelona September 2020

SCHOOL PRIZE

LIFE AT THE COAST



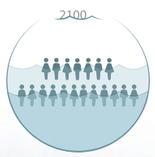
Population in the Low Elevation Coastal Zone (LECZ) 2060

- under 1 mio people
- 1-2 mio people
- 2-10 mio people
- 10-25 mio people
- 25-50 mio people
- 50-100 mio people
- 100-200 mio people
- 200-250 mio people

- flat coasts
- Megacitys - today
- Megacitys - tomorrow
- low regions
- Delta regionen
- over 70% of the country's population lives on the coast

100-year flood hits 350 million people in 2050

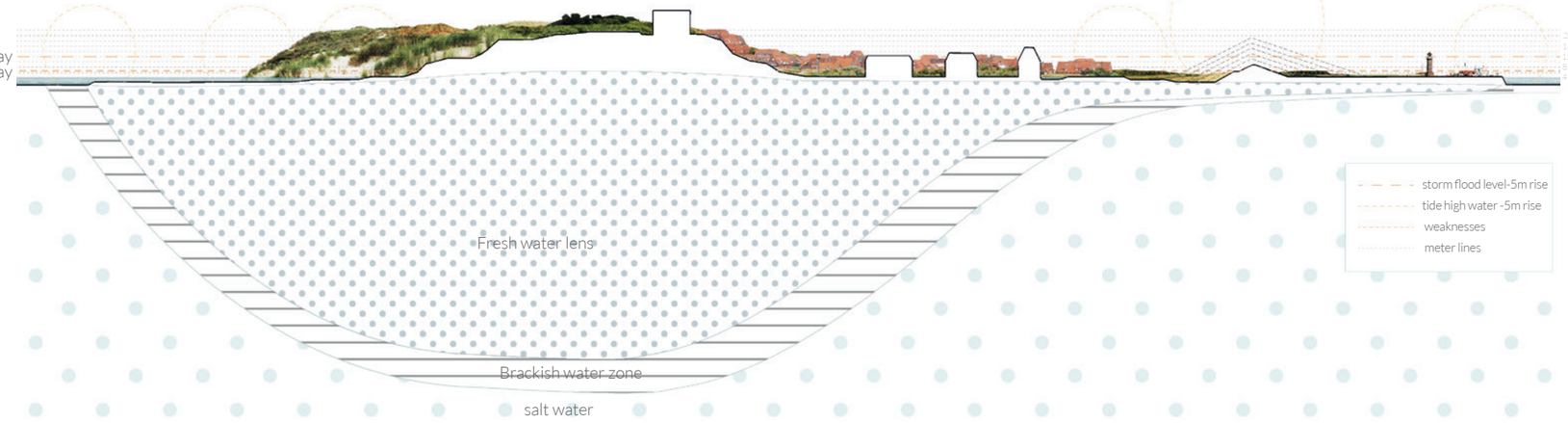
100-year flood affects 550 million people in 2100



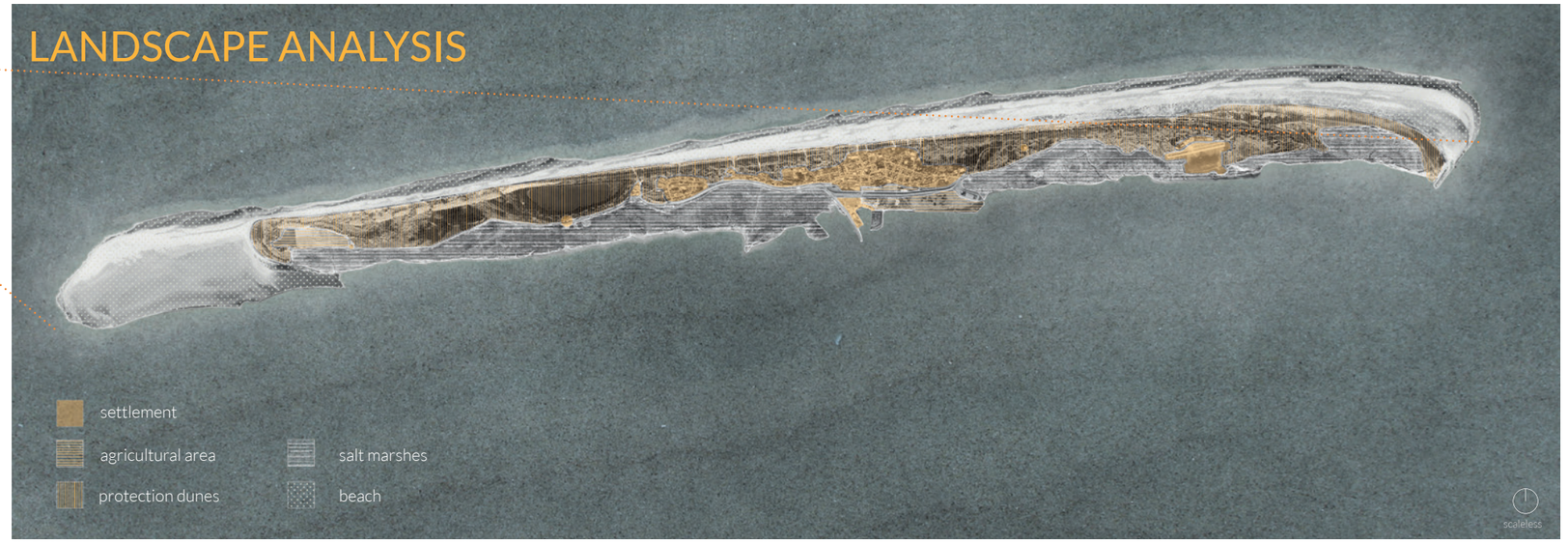
Sea level rise endangers 70-190 million people by 2100

Resettlement of 1.3 mio people due to natural hazards in the last 30 years

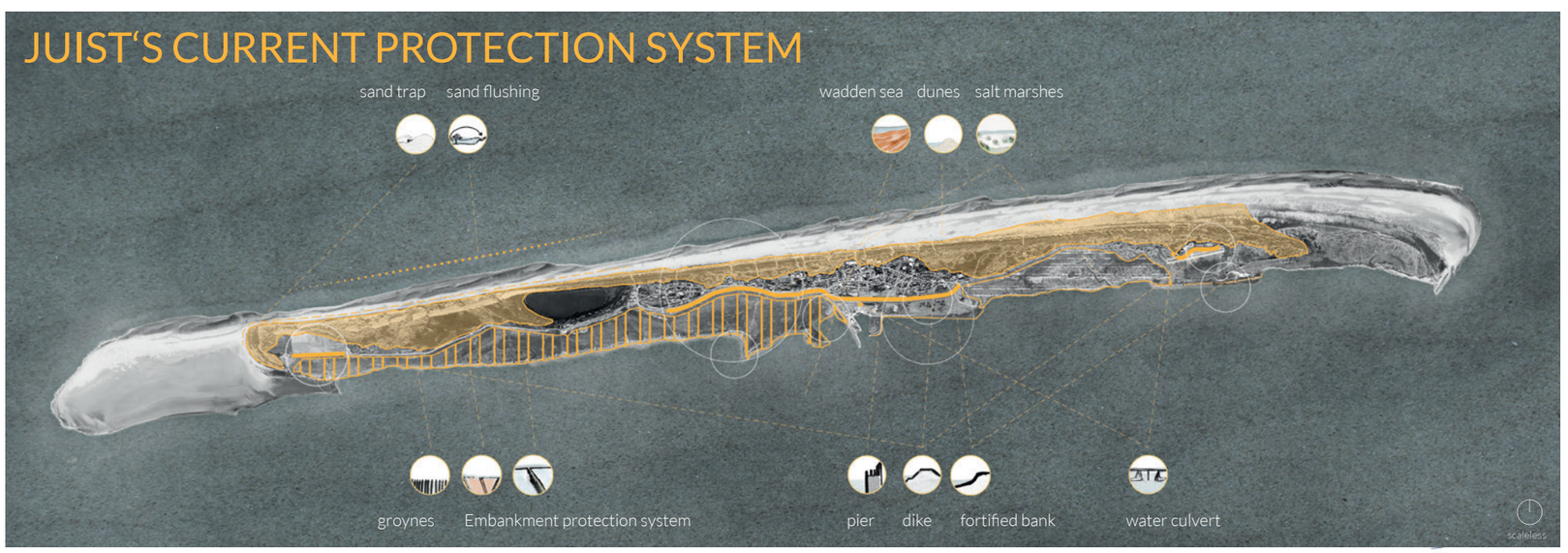
FRESH WATER LENS OF JUIST (2 TIMES SUPERELEVATED)



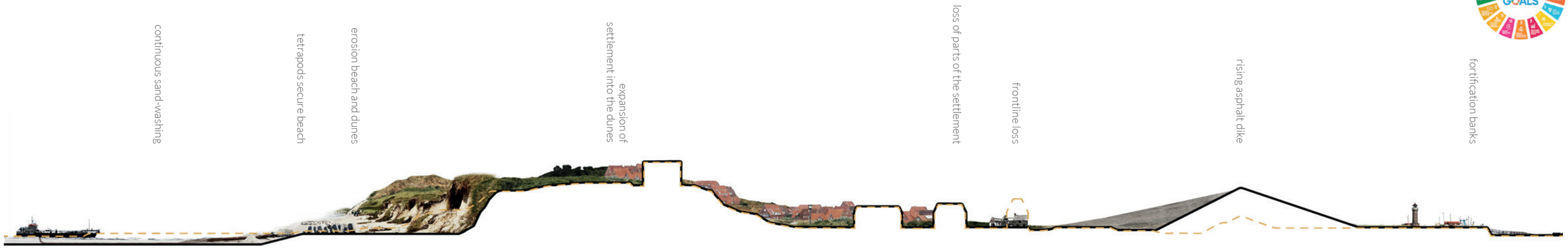
LANDSCAPE ANALYSIS



JUIST'S CURRENT PROTECTION SYSTEM

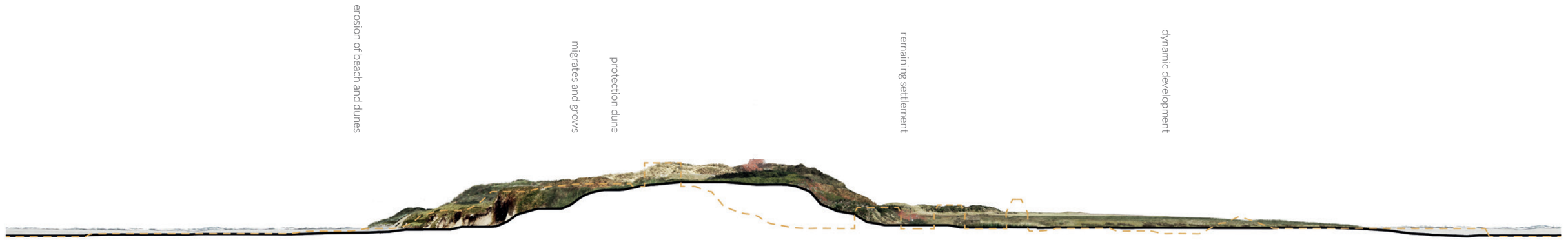


SCENARIO „LINEAR INCREASE“



landscape changes - linear increase (2 times superelevated)

SCENARIO „ORDERLY WITHDRAWAL“



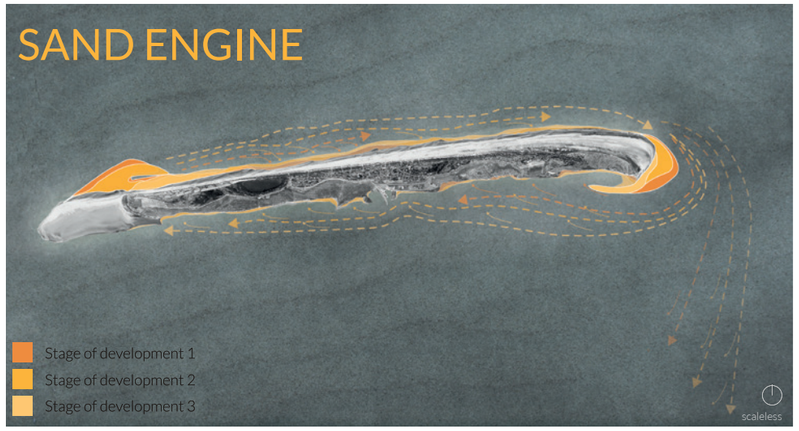
landscape changes - orderly retreat (2 times superelevated)

SCENARIO „HORIZONTAL STAGGERING“

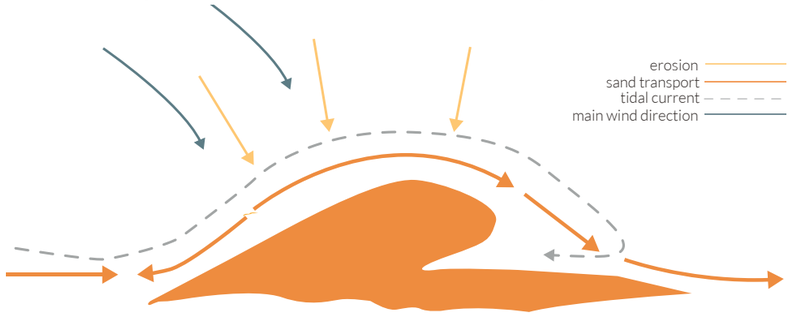
landscape changes - horizontal scaling (2 times superelevated)

current topography

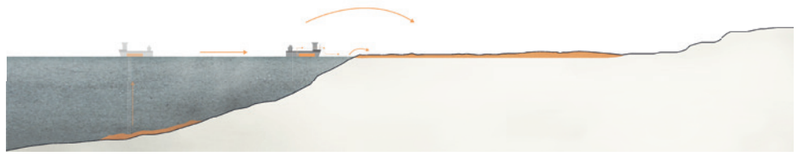
SAND ENGINE



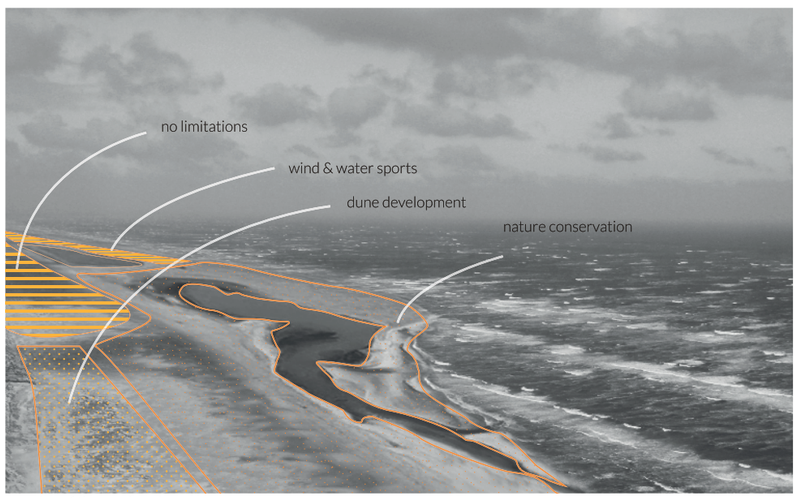
By locating a sand engine on the western head of the island, the supply of sediment to the beach and dunes is ensured. This is particularly important for the sections at the level of Lake Hammersee, as wind, currents and storm surges work hard on the island there and repeatedly lead to a decrease in its protected status. A further sand engine is planned on the eastern side of the island. At both ends, temporary habitats of beach and lagoon will be created, which will be shaped by the forces of nature, provide protection and at the same time be a tourist attraction. By zoning the area with restrictions or allocations of uses, wind and water sports enthusiasts, among others, can get their money's worth. However, areas are also allocated to dune development or nature conservation, which prescribe a correspondingly sensitive use. The sand motor is therefore important both for tourism and ecology.



currents and interactions at the sand motor

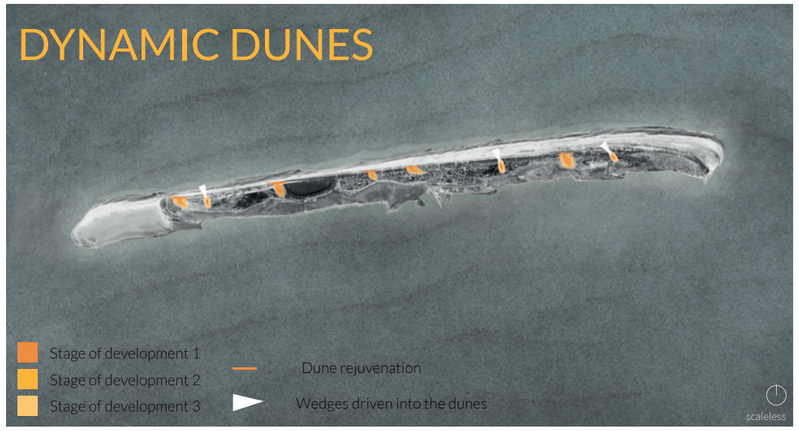


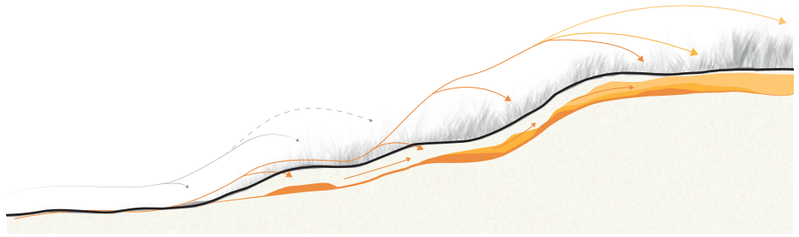
production of the sand engine



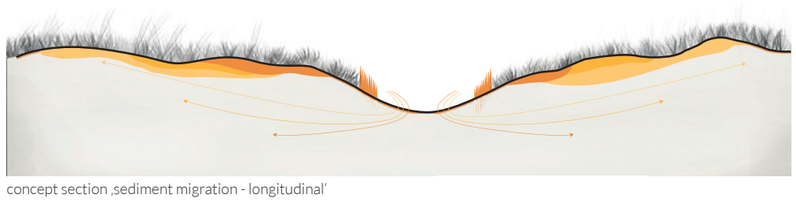
zoning of the sand engine

DYNAMIC DUNES





concept section ‚sediment migration - across '

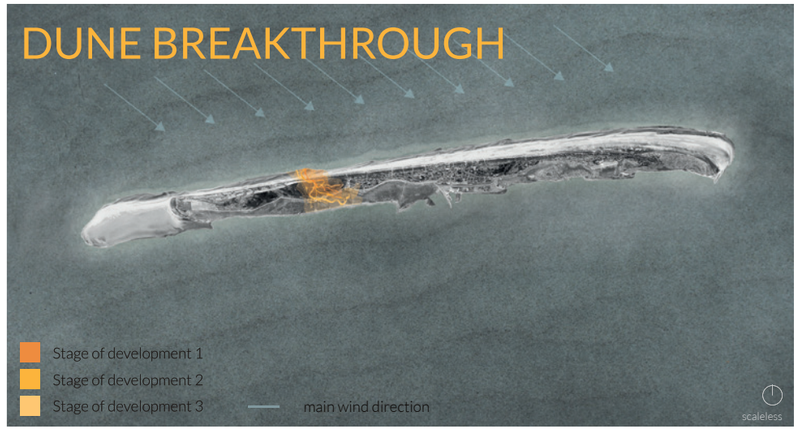


concept section ‚sediment migration - longitudinal'

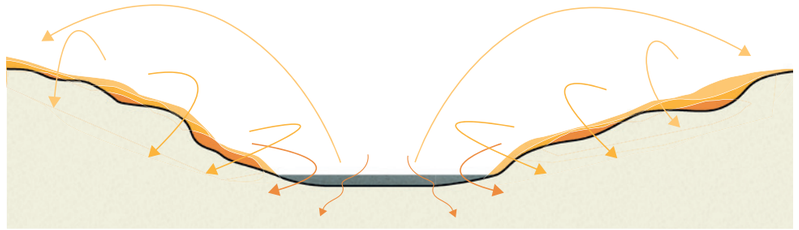
Before man fortified the East Frisian islands by planting the dunes and preserved their position, the barrier islands were a habitat characterised by sand transport, which preserved the system of protective dunes and remained viable with various natural zones. This mechanism is to be restored by dune rejuvenation in parts, so that the typical migration of the dunes is possible again and thus the preservation and development of the island is guaranteed. For this purpose, the vegetation will be removed in places, thus „releasing" the sand. On the other hand, holes will be punched in the outer dune chain, so that a new dune development will be initiated from there. With reed fences, which channel the wind at these free places, the sediment is led into the interior of the island, so that the sand blows up to 400m into the interior of the island. There, the sand grows, forms dunes and thus provides better protection. In this way, the dunes migrate about three to four meters per year. In addition, sand drifts in the unplanted areas can also create new dunes, which offer more protection as they grow up and increase the protection status with new primary and white dunes.

perspective ‚dynamic dunes'

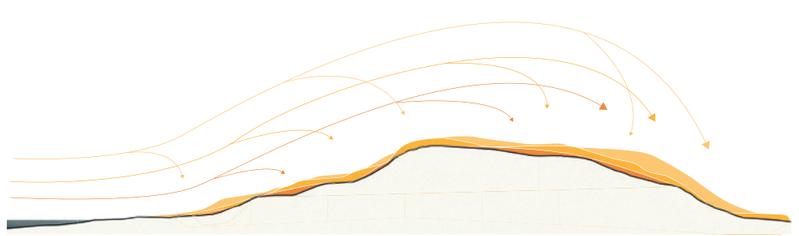
DUNE BREAKTHROUGH



The strongest erosion on Juist occurs in the area of Lake Hammersee. Due to a storm tide, the island broke in two at exactly this place already in the 18th century. This area, which has now been closed again, is still probably the weakest part of the island. A new breakthrough becomes more and more probable with the rise of the sea level and the associated increasing intensity of the storm tides. However, such a notch in the island does not necessarily have to be considered a negative impact on protection. As the example of the island of Texel shows, a dune breakthrough, which is subject to tide-related fluctuations, repeatedly brings new sediment into the interior of the island. The growing of the island from the inside can thus be made possible, as Over Wash is accepted. Thus, between 8000 to 20,000m³ of material per year enters the interior of the island through the 400 ha large area and thus allows the island's interior to grow up between two to five millimetres per year.



conceptual section ‚sediment migration dune breakthrough - across'



conceptual section ‚sediment migration dune breakthrough - longitudinal'

perspective „dune breakthrough'