Ecobeach

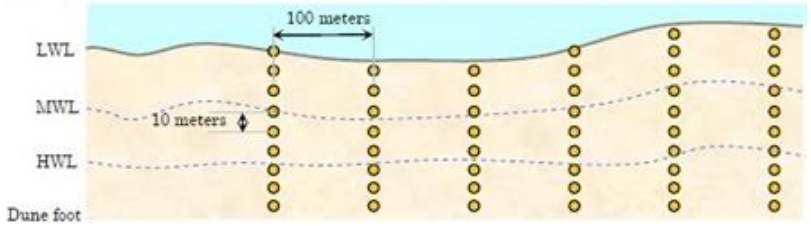
Results from the Dutch Ecobeach pilot project

Bas Reedijk, Ad van ‘t Zelfde, Jelle-Jan Pieterse, Marco van Leeuwen, John Rae Manaois

Bas Reedijk, head of coastal department BAM Infraconsult
b.reedijk@baminfraconsult.nl

What is Ecobeach

- Invention for beach stabilisation
- Invention of Danish inventor Poul Jakobsen
- Ecobeach is passive drainage of the beach with vertical drainage tubes
- Passive drainage, so no CO2 emissions
- Drains placed in intertidal zone, just below beach level
- Drains place in rows perpendicular to the coast



Purpose of Ecobeach

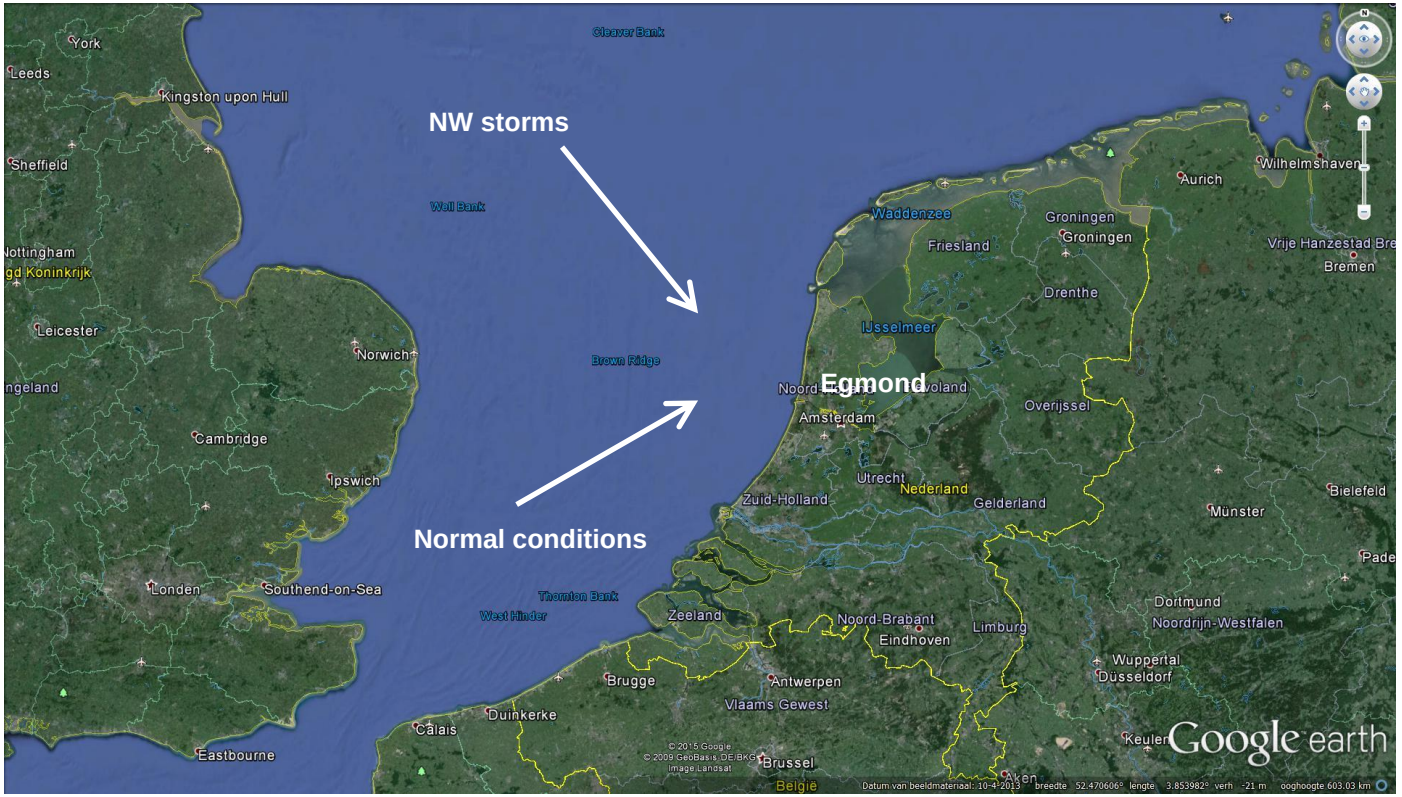
- Enhance natural accretion of the beach
- Stabilise eroding beaches
- Create wide and dry beaches suitable for recreation
- Increase the lifetime of beach nourishments
- Let nature bring sand from foreshore nourishments to the beach, faster

Why BAM and Ecobeach

- BAM triggered by images previous Ecobeach trials
- It is known that active beach drainage can work
- So could passive drainage work?

Dutch Ecobeach Pilot 2007 - 2011

- Initiated by Royal BAM group
- In cooperation with Rijkswaterstaat and other stakeholders
- Research a.o. by Universities of Delft, Amsterdam, Deltares



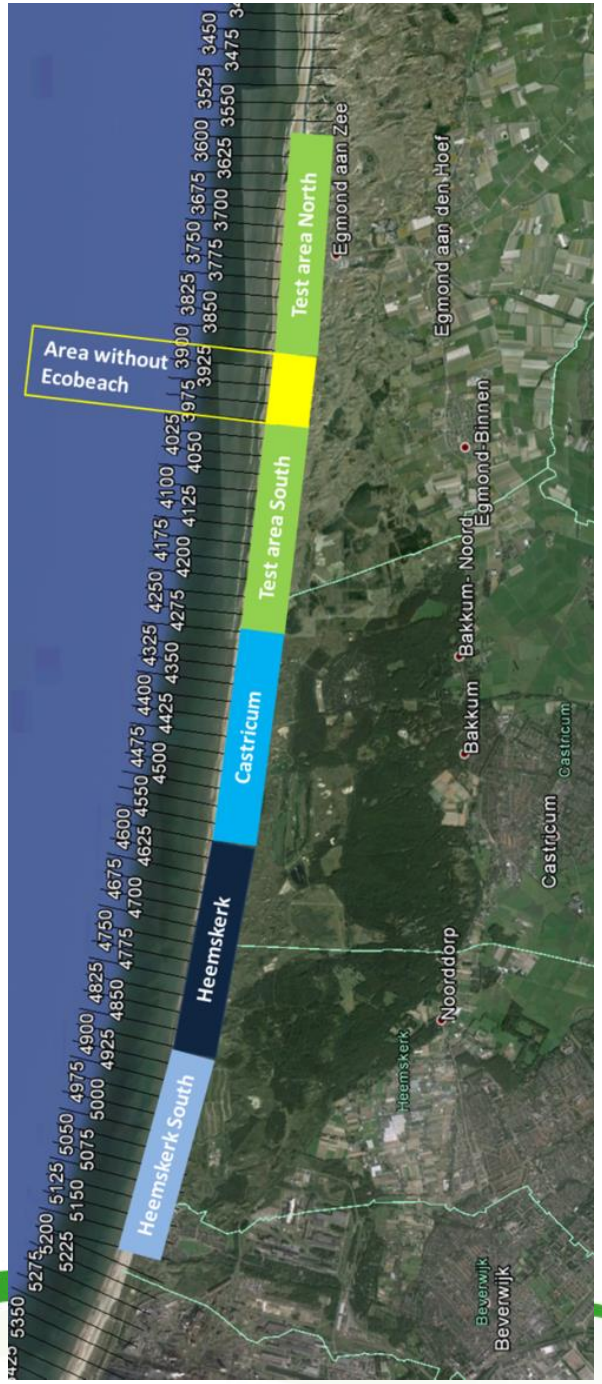
Dutch Ecobeach Pilot 2007 – 2011

Beach at Egmond aan Zee, North Sea Coast

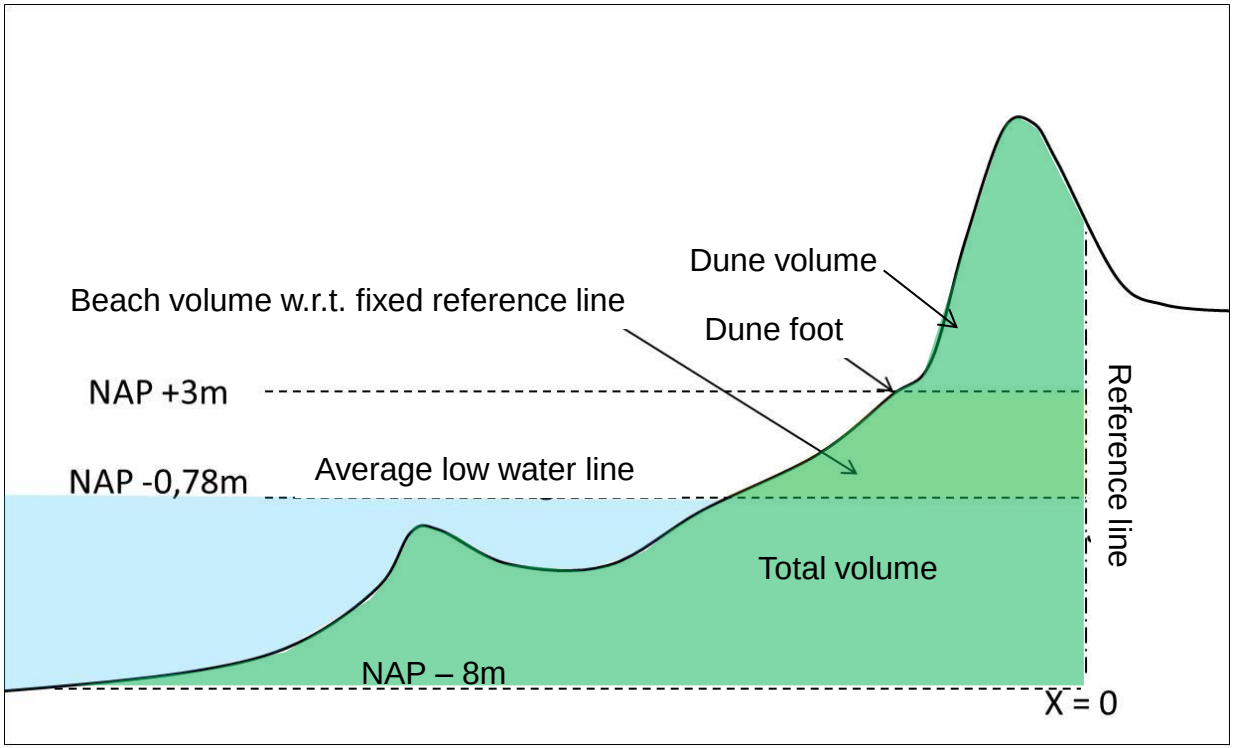
- Very well monitored since 1965
- Yearly JARKUS measurements
- Argus camera in both sections

- Test area north (3 km); *influenced by nourishments, every 5 years*
- Test area south (3km); *relatively undisturbed*

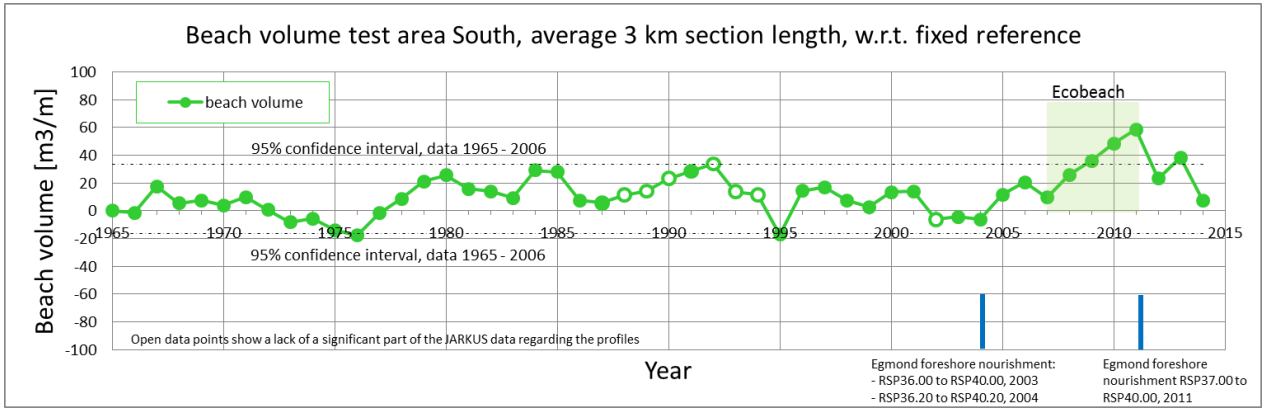
- Northern test area nourished 1.5 years before start Ecobeach pilot
- Heemskerk area also nourished 1.5 years before start of pilot



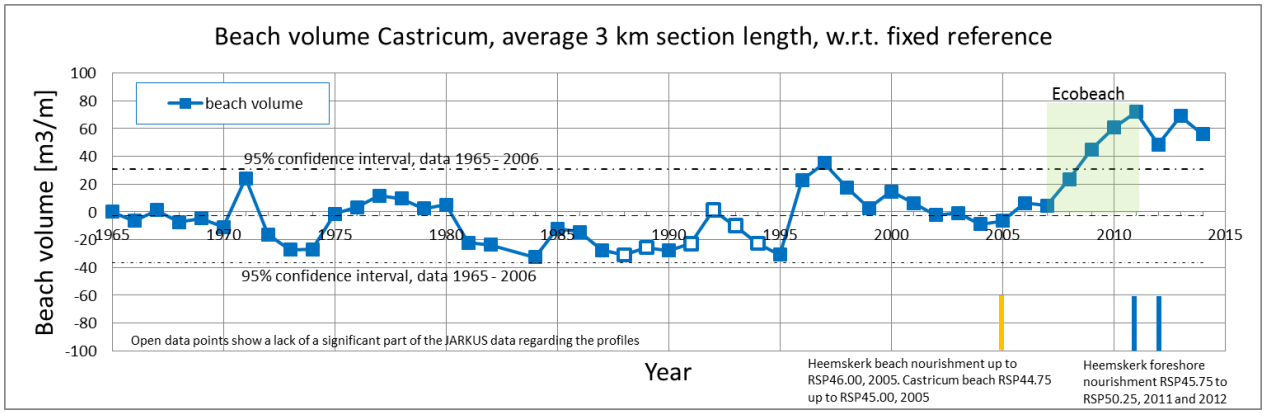
Main Coastal State Indicators

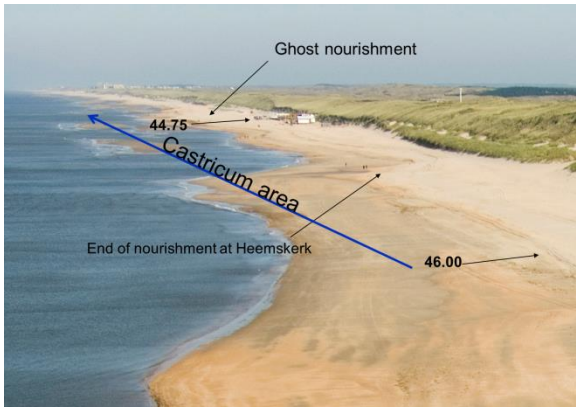


Beach volume - area South



Relatively undisturbed area



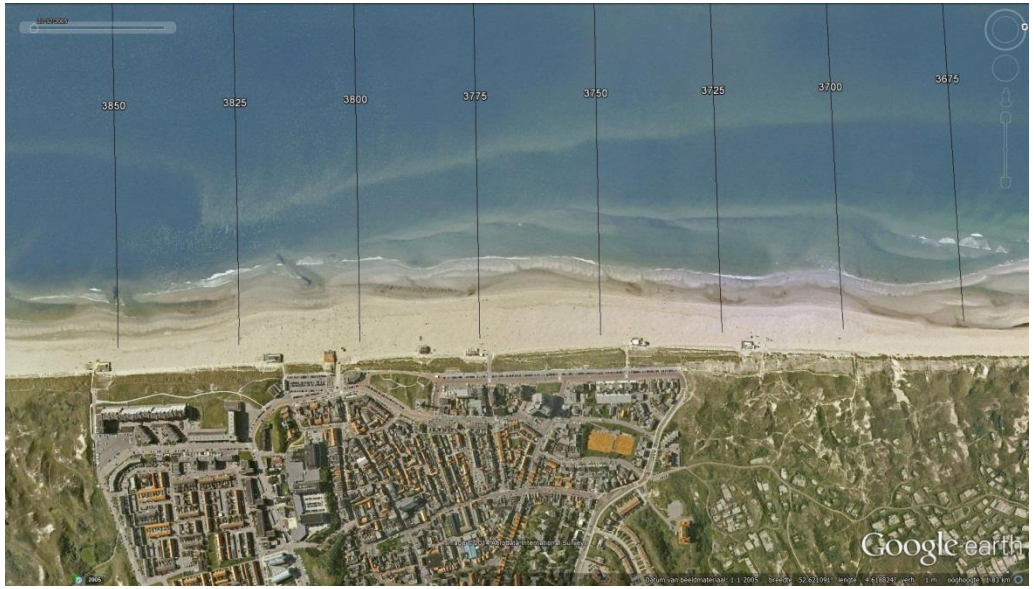


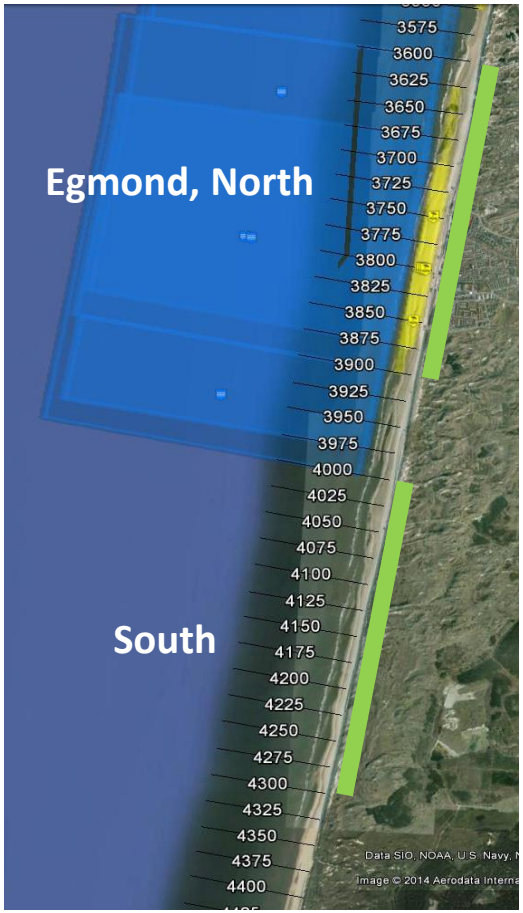
Beach volume southern Ecobeach test area (3 km length):

- Between 2007 – 2011: 50 m³/m' gain of beach volume, outside confidence limits
- In 2011: highest beach volume ever measured (since 1965)
- After removal of Ecobeach system back to long term average

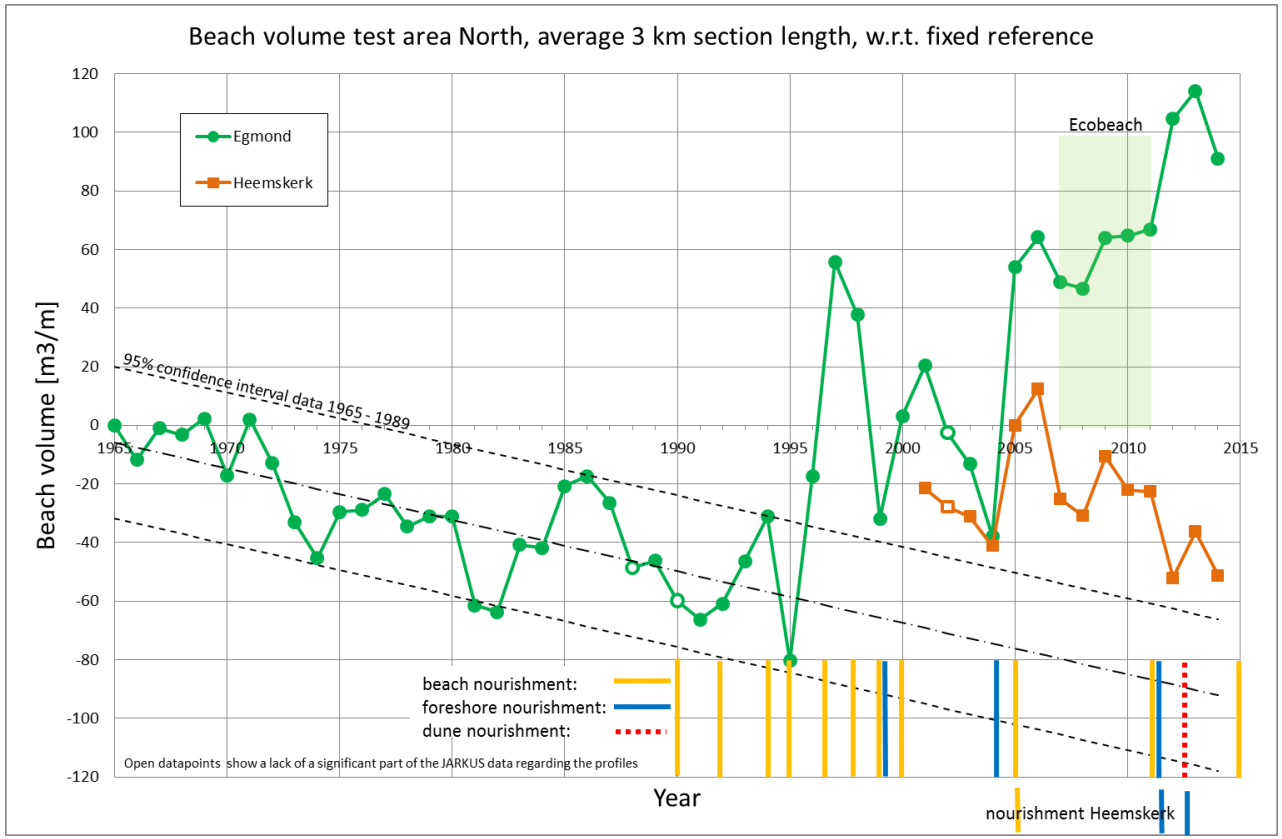
Ecobeach on a nourished beach

- Beach at Egmond nourished since 1990
- Both beach and foreshore nourishments
- In April/May 2005: 486.000 m3 beach nourishment
- Ecobeach installation started November 2006
- Ecobeach installed in beach nourishment





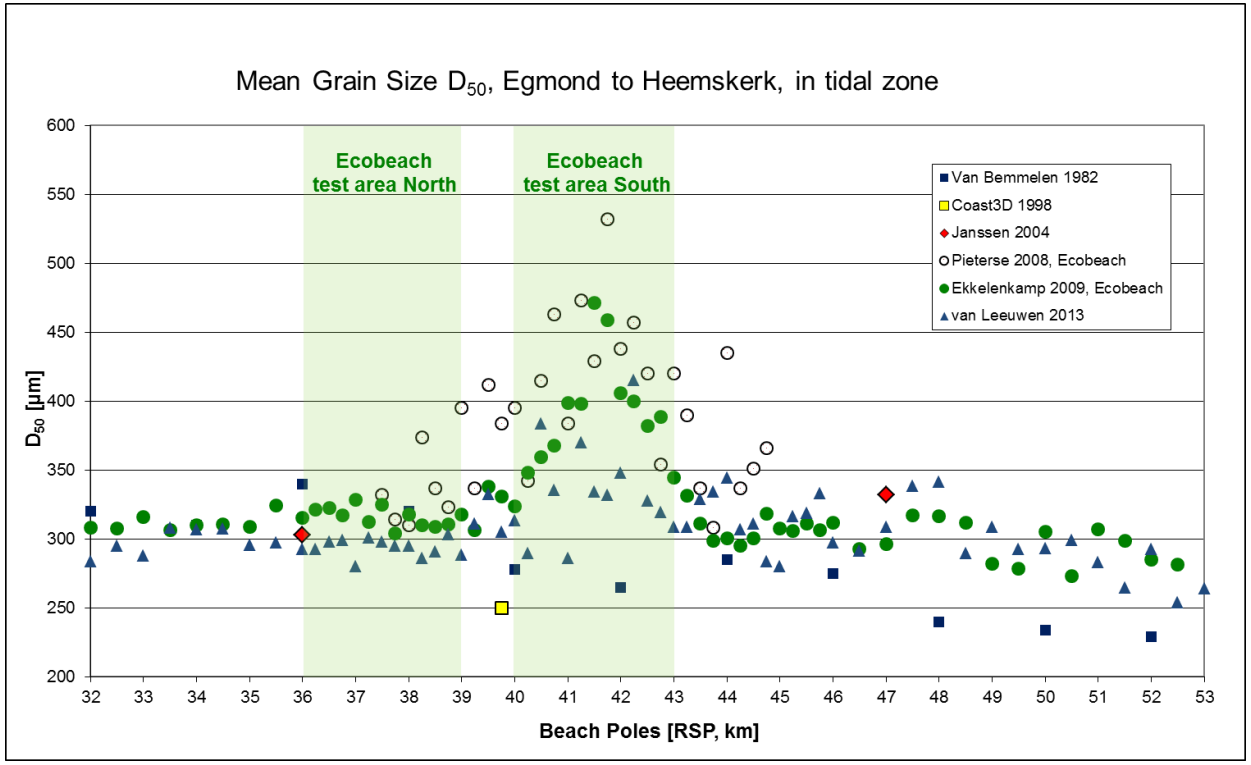
Test results - area North



Beach volume northern Ecobeach test area (3 km length):

- Between 2007 – 2011: 20 m³/m' gain of beach volume, while normal lifetime of nourishment 5 years
- In 2011 at end of Ecobeach pilot: highest beach volume measured since 1965 (6 years after nourishment)
- Beach nourishment at Heemskerk eroded

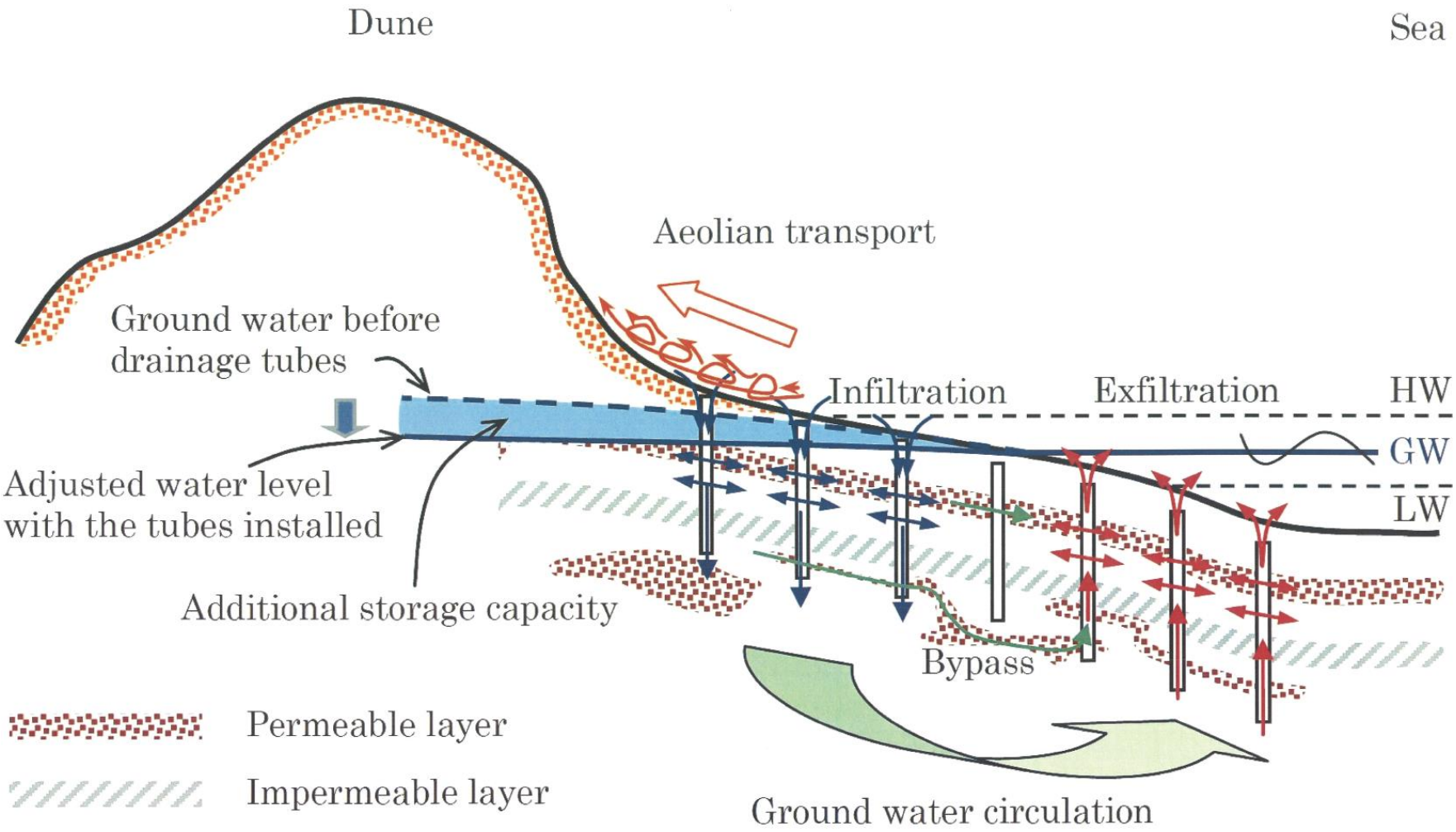
Test results - Grain size analysis



- Coarsening of beach sand in southern test area during Ecobeach pilot
- Coarser sand only in the active zone of the beach (upper 2 m)
- Below active zone original beach sand

Possible Working Mechanisms

Conclusions 2014 – research still in progress



Possible working mechanisms

- Drains penetrate through less permeable layers
- Drains connect more permeable layers
- Beach dries faster after wave run up and when it is ebbing
- Wind transports more fine sand to the dunes
- Active layer of beach coarsens and becomes more permeable
- Coarser and more densely packed beach sand is more stable

- Also outflow of fresh water observed through drain near low water line

Beach restaurant during Ecobeach Pilot

Beach restaurant, Ecobeach removed

Conclusions

- A successful trial was carried out with Ecobeach in the Netherlands
- Both test areas gained significant quantities of sand during the pilot
- Highest volume of beach sand measured since 1965 at end of pilot
- Coarsening of beach sand observed in southern test area

- Ecobeach can be used in combination with beach and foreshore nourishments