

Ecological coastal protection mussel beds, seagrass beds and saltmarshes.

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Sea level rise

Climatic change may cause a sea level rise in the Wadden Sea of circa 60 cm in the coming century. Raising of the dikes will be necessary at many locations, but also alternatives are being sought. An alternative method of coastal protection of salt-marsh shores is presented, namely by the restoration of a sequence of ecosystems that have been diminished or even disappeared during the last century, but substantially have contributed to coastal protection, as becomes increasingly known.

Mussel beds provide shelter to mid-littoral *Zostera marina* and *Z. noltii* populations. Additionally, mussel beds collect vast amounts of fine sediments and form biogenic reefs with patches of mussels and pools where water remains at low tide, which is all favourable to *Z. marina*.

Seagrass beds form elevated banks, as they accumulate sediments, in this way providing a natural barrier in front of the salt marsh edge.

In the pools seagrasses act as seed collectors for mussel spat which forms new beds when the old bed becomes senescent.

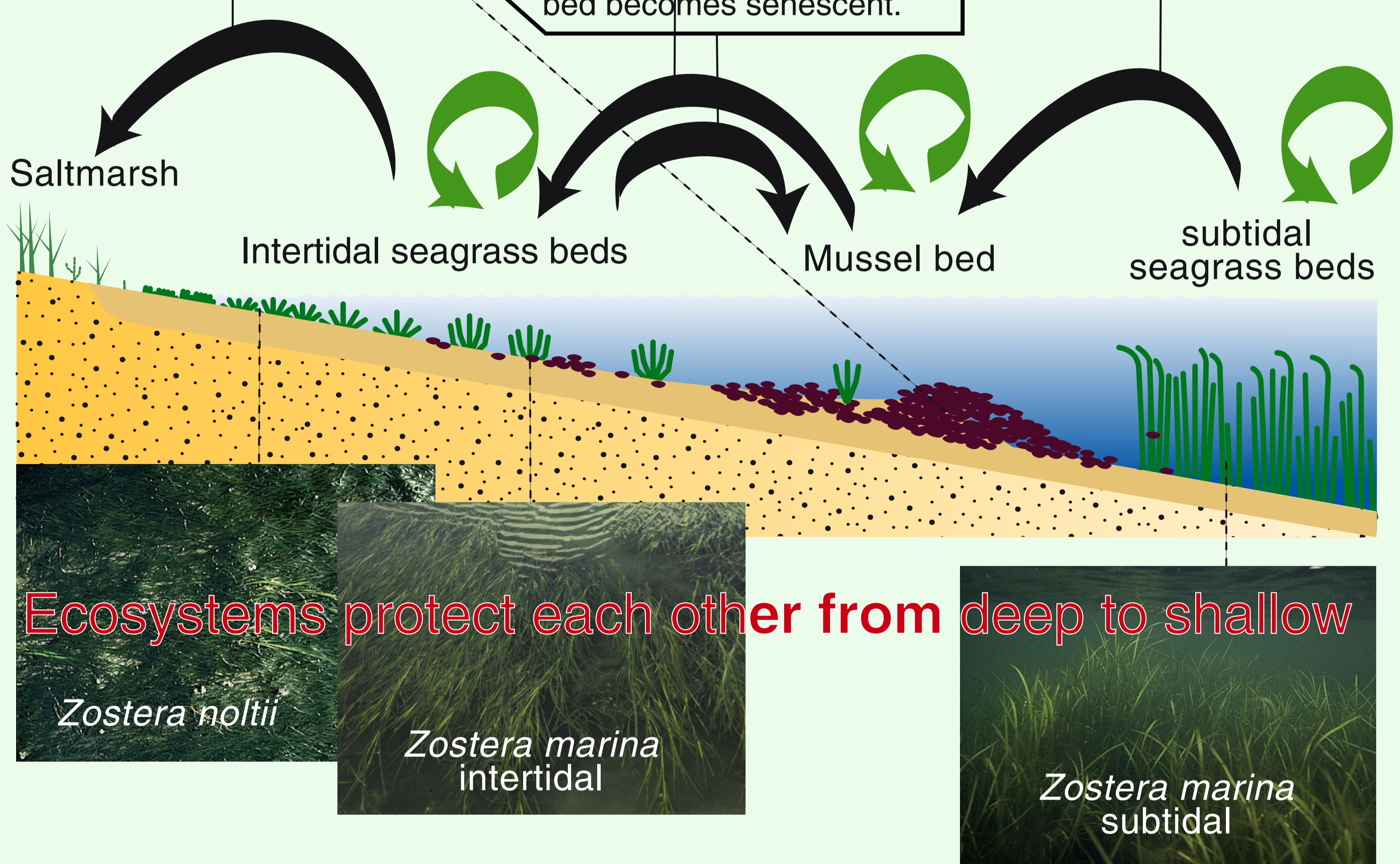
Sublittoral *Z. marina* beds can protect mussel beds against storms.

Seagrass beds and mussel beds: ecosystem engineers

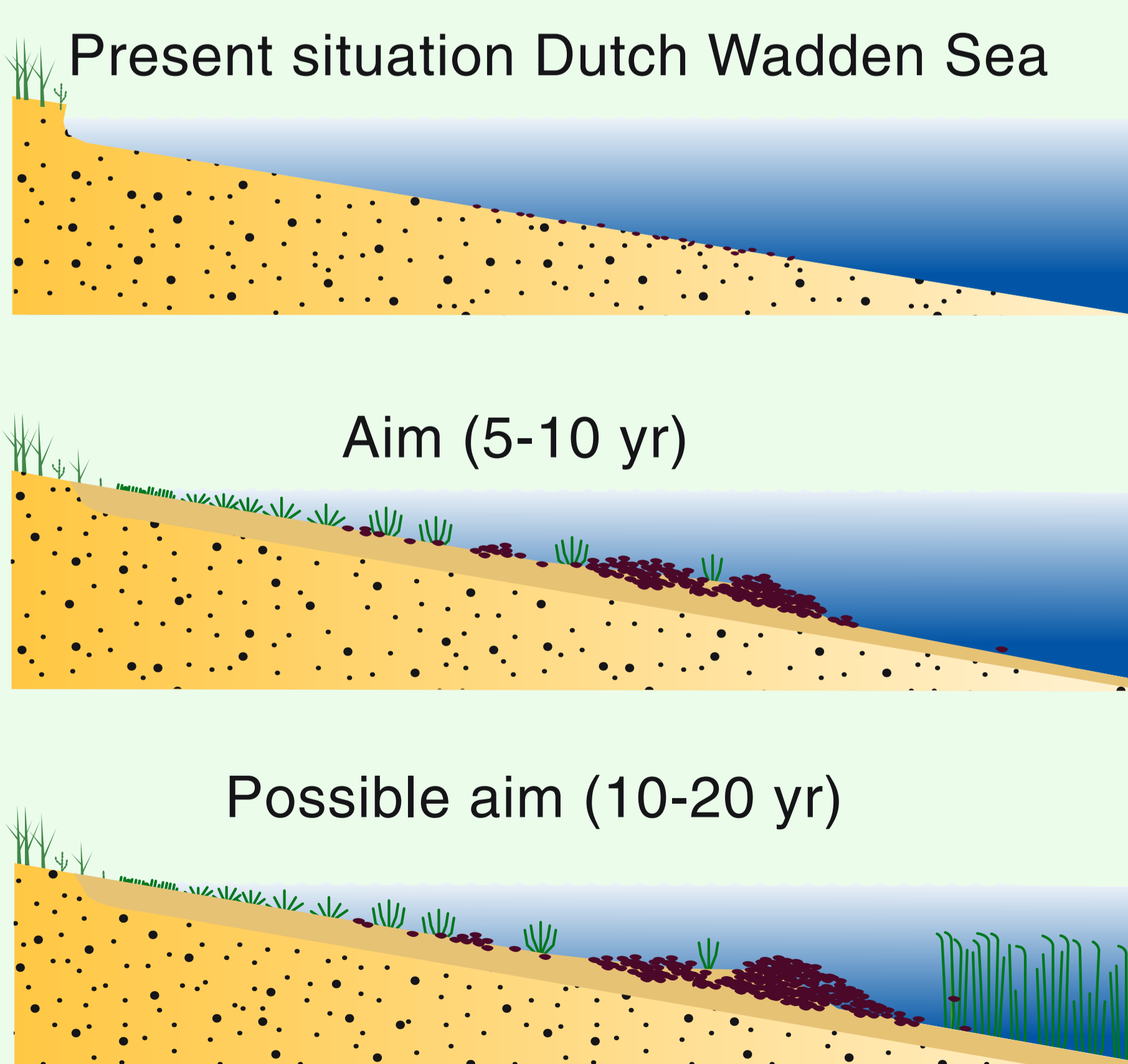
Both seagrass beds and stable mussel beds possess positive feedback mechanisms with regards to water and sediment dynamics and their consequences (green arrows). They act as ecosystem engineers.

Feedback mechanism seagrass beds: seagrass beds reduce current velocity, attenuate wave energy, alter sediment characteristics and enhance light availability by promoting the deposition of suspended sediments.

Feedback mechanism mussel beds: mussel beds provide suitable attachment surfaces and sheltered pools for the establishment of young mussel spat on the otherwise soft and unstable sediments of the Wadden Sea. Moreover, the epibiontic community on older mussel beds promotes additional recruitment of mussels.



Ecosystems protect each other from deep to shallow



Restoration

Restoration of the stable, biodiverse ecosystems that inhabited pristine coastal zones will help to protect saltmarshes, and contribute to the coastal protection of soft coasts. A seagrass restoration project in 2002-2006 (by the University of Nijmegen, Rijkswaterstaat, and Alterra) to restore nature value in the Wadden Sea, may help to make a start.

Information

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Saving 1 million Euro per year on sand suppletions of Dutch North Sea coasts:

A simple calculation reveals that substantial savings can be gained from restoration of seagrass and mussel beds. Yearly, circa 19 million m³ of sediments is required in the Dutch Wadden Sea to keep up with sea level rise. These sediments are indirectly obtained from erosion of the North Sea coasts, which subsequently have to be suppletted. So, every m³ of sedimentation in the Wadden Sea that is composed of fine particles, like the ones captured by seagrass and mussel beds (with the positive side-effect of clarification of the water), saves a m³ of sand, which costs about 6 Euro. Therefore, suppose one percent of the Dutch Wadden Sea area is covered by mussel and seagrass beds, this would save 1.1 million Euro per year.