

Sea level rise requires extra management to maintain salt marshes

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An eroded marsh with vegetation recovery on the neighboring tidal flat. Credit: Zhenchang Zhu at NIOZ

Salt marshes are important habitats for fish and birds and protect coasts under sea level rise against stronger wave attacks. However, salt marshes themselves are much more vulnerable to these global change threats than previously thought. Stronger waves due to sea level rise can not only reduce the marsh extent by erosion of the marsh edge, but these waves hamper plant (re-)establishment on neighboring tidal flats, thus making it much more difficult for the marsh to recover and grow again. An international research team, led by researchers from the Netherland Institute for Sea Research (NIOZ), reports these results in a paper published in *Limnology and Oceanography*.

Sea level rise limits recovery of eroded marshes

Marsh loss often takes place when waves erode the seaward marsh edge. Sea level rise is expected to increase such erosion by allowing

stronger waves on neighboring tidal flats due to raised water depth. While a healthy marsh can recover the lost land via plants recolonizing the bare tidal flats, waves enhanced by sea level rise can greatly slow down or even block such recovery by hampering seed establishment. "A few cm increase of wave height can double the time needed for vegetation recovery on the tidal flats," says Zhenchang Zhu, the leading author of this paper, who conducted this research at NIOZ, but is currently working at Guangdong University of technology, China. "This is problematic as sea level rise may speed up marsh erosion meanwhile limiting its recovery. In the long run, this can cause big losses in marsh extent and key ecosystems services humans rely on, such as coastal defense," Zhu continues.

Good neighbors make healthy marshes

How to improve marsh health and coastal safety under [sea level rise](#)? "The key is to manage their neighbors: the tidal flats." Zhu adds. Habitats at lower tidal elevations (e.g. tidal flats) do not make a direct contribution for flood defense, yet they affect the stability of ecosystems at higher tidal elevations (e.g. [salt marshes](#)) that directly protect the coast against wave attacks. When harnessing salt marshes as natural flood defense, it is important to maintain well elevated tidal flats for ensuring stable marshes and thus safer coasts. This may be achieved by, for example, supplying dredging materials to keep a sufficiently high elevation or by restoring shellfish reef ecosystems (oyster reefs and mussel beds) that limit wave formation on the tidal flat. Such measures are beneficial for quick vegetation recovery after marsh edge erosion to support healthy marshes. "Overall this research teaches us that with good management of our tidal flats, we can preserve wide wave-attenuating [marshes](#), and hence continue to benefit from their value for flood defense," says Zhenchang Zhu.



Seaward marsh edge. Credit: Zhenchang Zhu

More information: Zhenchang Zhu et al, Vegetation recovery on neighboring tidal flats forms an Achilles' heel of saltmarsh resilience to sea level rise, *Limnology and Oceanography* (2019). DOI: [10.1002/lno.11249](https://doi.org/10.1002/lno.11249)

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