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Can we avoid coastal squeeze through nature-based coastal adaptation?

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Intertidal coastal wetlands, including tidal marshes and mangrove forests, are at risk of disappearing under the influence of global sea level rise (SLR). Loss of their ecosystem services could significantly impact global carbon budgets, increase coastal erosion and flooding and lead to loss of fisheries, particularly along densely populated coastal zones such as large estuaries and deltas. Regional to global-scale projections suggest a reduction in present-day coastal wetland area by 20% to 90% in response to projected rates of future SLR. Recent studies have highlighted the importance of coastal squeeze, i.e. the inhibition of inland migration of tidal coastal wetlands due to the existence of anthropogenic infrastructure, in combination with wetland loss due to sea level rise, which is aggravated by a global decline in coastal sediment supply.

Nature-based adaptation, consisting of the reservation or creation of space for inland wetland expansion, is widely regarded as a promising strategy to counteract coastal squeeze and create/restore natural habitats through inland migration. Based on global and regional modelling outputs, this paper discusses how different scenarios of global population growth, expected declines in global sediment supply, delta subsidence and various coastal management strategies impact on global areas of intertidal coastal wetlands, and coastal squeeze in particular. For example, we estimate that until the year 2100 up to 280,000 km^2 of coastal wetlands may be lost due to coastal squeeze. If strategically implemented on a regional to global scale nature-based solutions to coastal management could increase the global total area of intertidal coastal wetlands by up to 60%.

However our current understanding of this process is very limited, partly due to the limited field evidence in sedimentary archives (e.g. during the early Holocene where SLR were high). We argue that this is related to the combined effects of wetland inland migration and wetland drowning during periods of high SLR rates, raising the question as to whether or not future coastal wetland will be able to provide ecosystem services comparable to those of natural systems.