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TITLE: Future response of global coastal wetlands to sea-level rise

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ABSTRACT:

The response of coastal wetlands to sea-level rise during the twenty-first century remains uncertain. Global-scale projections suggest that between 20 and 90 per cent (for low and high sea-level rise scenarios, respectively) of the present-day coastal wetland area will be lost, which will in turn result in the loss of biodiversity and highly valued ecosystem services 1?3. These projections do not necessarily take into account all essential geomorphological 4?7 and socio-economic system feedbacks8. Here we present an integrated global modelling approach that considers both the ability of coastal wetlands to build up vertically by sediment accretion, and the accommodation space, namely, the vertical and lateral space available for fine sediments to accumulate and be colonized by wetland vegetation. We use this approach to assess global-scale changes in coastal wetland area in response to global sea-level rise and anthropogenic coastal occupation during the twenty-first century. On the basis of our simulations, we find that, globally, rather than losses, wetland gains of up to 60 per cent of the current area are possible, if more than 37 per cent (our upper estimate for current accommodation space) of coastal wetlands have sufficient accommodation space, and sediment supply remains at present levels. In contrast to previous studies1?3, we project that until 2100, the loss of global coastal wetland area will range between 0 and 30 per cent, assuming no further accommodation space in addition to current levels. Our simulations suggest that the resilience of global wetlands is primarily driven by the availability of accommodation space, which is strongly influenced by the building of anthropogenic infrastructure in the coastal zone and such infrastructure is expected to change over the twenty-first century. Rather than being an inevitable consequence of global sea-level rise, our findings indicate that large-scale loss of coastal wetlands might be avoidable, if sufficient additional accommodation space can be created through careful nature-based adaptation solutions to coastal management. A global modelling approach shows that in response to rises in global sea level, gains of up to 60% in coastal wetland areas are possible, if appropriate coastal management solutions are developed to help support wetland resilience.

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