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TITLE: Most atolls will be uninhabitable by the mid-21st century because of sea-level rise exacerbating wave-driven flooding

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ABSTRACT:

Sea levels are rising, with the highest rates in the tropics, where thousands of low-lying coral atoll islands are located. Most studies on the resilience of these islands to sea-level rise have projected that they will experience minimal inundation impacts until at least the end of the 21st century. However, these have not taken into account the additional hazard of wave-driven overwash or its impact on freshwater availability. We project the impact of sea-level rise and wave-driven flooding on atoll infrastructure and freshwater availability under a variety of climate change scenarios. We show that, on the basis of current greenhouse gas emission rates, the nonlinear interactions between sea-level rise and wave dynamics over reefs will lead to the annual wave-driven overwash of most atoll islands by the mid-21st century. This annual flooding will result in the islands becoming uninhabitable because of frequent damage to infrastructure and the inability of their freshwater aquifers to recover between overwash events. This study provides critical information for understanding the timing and magnitude of climate change impacts on atoll islands that will result in significant, unavoidable geopolitical issues if it becomes necessary to abandon and relocate low-lying island states.

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