



## **Climate-based indicators to assess the risks of impact of climate change on small islands: case studies of Tuamotu archipelagos and La Reunion island**

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Small islands are widely acknowledged to be highly vulnerable to climate- and sea-related risks, especially coastal erosion, marine inundation and coral bleaching. In a fast human-induced climate change resulting from anthropogenic greenhouse-gas emissions, small islands are likely to be much more affected by these risks, which are strongly influenced by both the impacts of global warming on climate stressors (e.g., ocean warming, long-term sea-level rise, or more severe extreme events such as tropical cyclones or distant-source swells) and CO<sub>2</sub>-linked environmental impacts (e.g., ocean acidification). These pressures may in the end compromise the inhabitability of atoll reef islands. However, depending on both the intrinsic physical characteristics and the location of these island systems, and the global greenhouse-gas emissions scenarios considered, a variety of storylines of vulnerability to climate change emerge in the 21st century for small islands, making it difficult for stakeholders to design relevant adaptation plans. In this context, we propose climate-based indicators to track future change in small islands' exposure to the abovementioned risks. Co-designed from in situ observation-based threshold criteria by an interdisciplinary research team including ecologists, geomorphologists and physical climate specialists, these indicators are analyzed under different climate change scenarios focusing on two case studies: the Tuamotu archipelago, in the Central Pacific, and La Reunion island, in the south-western Indian Ocean. This highlights the regional disparities of small islands' risks to climate change. While projections show that the hottest months exceeding the critical sea surface temperature for coral reef may be reached by 2050 in some models in both regions for the pessimistic scenario, a higher sea level rise is projected by 2100 for La Reunion island than for Tuamotu. We will consider the limits of a global multi-model-based approach for assessing the future vulnerabilities of small islands.