

Expert assessment: Sea-level rise could exceed one meter in this century

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In contrast, for a scenario with strong emissions reductions, experts expect a sea-level rise of 40-60 centimeters by 2100 and 60-100 centimeters by 2300. The survey was conducted by a team of scientists from the USA and Germany.

"While the results for the scenario with climate mitigation suggest a good chance of limiting future sea-level rise to one meter, the high emissions scenario would threaten the survival of some coastal cities and low-lying islands," says Stefan Rahmstorf from the Potsdam Institute for Climate Impact Research. "From a risk management perspective, projections of future sea-level rise are of major importance for coastal planning, and for weighing options of different levels of ambition in reducing greenhouse-gas emissions."

Projecting sea-level rise, however, comes with large uncertainties, since the physical processes causing the rise are complex. They include the expansion of ocean water as it warms, the melting of mountain glaciers and ice caps and of the two large ice sheets in Greenland and Antarctica, and the pumping of ground water for irrigation purposes. Different modeling approaches yield widely differing answers. The recently published IPCC report had to revise its projections upwards by about 60 percent compared to the previous report published in 2007, and other assessments of sea-level rise compiled by groups of scientists resulted in even higher projections. The observed sea-level rise as measured by satellites over the past two decades has exceeded earlier expectations.

Largest elicitation on sea-level rise ever: 90 key experts from 18 countries

"It is therefore useful to know what the larger community of sea-level experts thinks, and we make this transparent to the public," says lead author Benjamin Horton from the Institute of Marine and Coastal Sciences at Rutgers University in New Jersey. "We report the largest elicitation on future sea-level rise conducted from ninety objectively selected experts from 18 countries." The experts were identified from peer-reviewed literature published since 2007 using the publication database 'Web of Science' of Thomson Reuters, an online scientific indexing service, to make sure they are all active researchers in this area. 90 international experts, all of whom published at least six peer-reviewed papers on the topic of sea-level during the past 5 years, provided their probabilistic assessment.

The survey finds most experts expecting a higher rise than the latest IPCC projections of 28-98 centimeters by the year 2100. Two thirds (65%) of the respondents gave a higher value than the IPCC for the upper end of this range, confirming that IPCC reports tend to be conservative in their assessment.

The experts were also asked for a "high-end" estimate below which they expect sea-level to stay with 95 percent certainty until the year 2100. This high-end value is relevant for coastal planning. For unmitigated emissions, half of the experts (51%) gave 1.5 meters or more and a quarter (27%) 2 meters or more. The high-end value in the year 2300 was given as 4.0 meters or higher by the majority of experts (58%).

While we tend to look at projections with a focus on the relatively short period until 2100, sea-level rise will obviously not stop at that date.

"Overall, the results for 2300 by the expert survey as well as the IPCC

illustrate the risk that temperature increases from unmitigated emissions could commit coastal populations to a long-term, multi-meter sea-level rise," says Rahmstorf. "They do, however, illustrate also the potential for escaping such large [sea-level rise](#) through substantial reductions of emissions."

More information: B. P. Horton, S. Rahmstorf, S. E. Engelhart, A.C.Kemp: Expert assessment of sea-level rise by AD 2100 and AD 2300. *Quaternary Science Reviews* (2013). [DOI: 10.1016/j.quascirev.2013.11.002](#)

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