Global Climate Forum

IPCC Sea-Level Rise Scenarios Not Fit For Purpose For High-Risk Coastal Areas

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The sea-level rise scenarios of the Intergovernmental Panel on Climate Change (IPCC) do not necessarily provide the right information for high-risk coastal decision-making and management, according to new research involving scientists from the Global Climate Forum in Berlin.

A commentary, published today in the journal *Nature Climate Change*, warns that the IPCC scenarios are often inappropriate or incomplete for the management of high-risk coastal areas as they exclude the potential for extreme sea-level rises. This missing information is also crucial for a number of policy processes, such as discussions by G7 countries to establish climate insurance policies and allocations of adaptation funding by the Green Climate Funds.

“Although the IPCC scenarios are a big step forward in understanding how the climate system works, these scenarios are not designed from the perspective of coastal risk management and, unfortunately, this is not spelled out clearly both within and beyond the IPCC reports,” says lead

author Dr Jochen Hinkel from the Global Climate Forum. Dr Hinkel is also Lead Author of the coastal chapter of the Working Group 2 contribution to the latest IPCC report.

The IPCC sea-level rise scenarios are developed for the purpose of understanding the physics of the earth system through so called process-based models, which are models based on the laws of physics. As a consequence, these scenarios cover only the central range of possible sea-level rise. For example, the scenarios of IPCC Fifth Assessment Report estimate that by 2100 global mean sea-level is likely to rise by 0.28–0.98m relative to 1986–2005. The probability of staying within this range is, however, estimated to be only at least 66 per cent.

Knowing the central range is, however, generally not sufficient for coastal risk management. This is because inhabitants of densely populated coastal zones generally prefer to avoid major damage under all circumstances and hence coastal planers are particularly interested in possible high-end sea-level rise scenarios beyond the IPCC range.

“Consider, for example, the situation of London,” explains Dr Hinkel, “which is protected against coastal floods through the Thames Estuary Barrier. There was concern that rapid sea-level rise would not allow sufficient time to upgrade or replace the Thames Estuary Barrier because such large engineering tasks require 25–30 years for planning and implementation.” For such a situation, the IPCC scenario range is not the right piece of information, because there is a 0–33 per cent probability of sea-level rise lying outside of this range. Such a high residual risk is not tolerable from the perspective of protecting major cities from sea-level rise. These situations require high-end scenarios in order to make sure that there are options available that can be realised even in the worst case to come.

Co-author Professor Carlo Jaeger from the Beijing Normal University says: “Ongoing work on projecting the central range of sea-level rise should be complemented with the development of high-end scenarios for different time

horizons that correspond to different real-world coastal management decisions."

"Such scenarios should also consider all the information on future sea levels including semi-empirical models, physical constraints on ice-sheet dynamics and paleo-records of sea-level change, because coastal high-risk management requires an analysis of decisions against all available knowledge, including all uncertainties and also ambiguities amongst expert opinions and their distinct approaches," says Dr Hinkel.

The researchers say that the current subdivision of the IPCC is an area that needs to be addressed.

Professor Jaeger adds: "Dividing the IPCC into Working Groups by disciplines with sea-level science sitting in Working Group 1 and coastal risk management in Working Group 2 hinders a stronger focus on better understanding of the high-end tail of sea-level rise in support of risk management. Given that the mandate of the IPCC is to be policy-relevant, a more effective organisation of its assessment would be by policy questions. One of these questions should link sea-level rise information to the needs of coastal risk management."

Notes for editors:

A copy of the article 'Sea-level rise scenarios and coastal risk management' by Hinkel, Jochen, Carlo C. Jaeger, Robert J. Nicholls, Jason Lowe, Ortwin Renn and Peijun Shi. Published in *Nature Climate Change*, doi: 10.1038/nclimate2505 is available upon request.

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