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Timing of rates and magnitude of sea-level rise projection families

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In the past decade, many different projections of global and regional sea-level rise as a result of climate change have been published (Garner et al, 2018, Horton et al, 2018). This wide range of projections illustrates the large uncertainty about future sea-level rise, which is complicated for coastal decision makers relying on these projections. Here, we aim to provide insights into the available projections, by identifying the main contributing sources in each of the sea-level projections, and sorting the projections into ‘families’ that have contributing sources or methodologies in common. Using these ‘families’, we discuss the main differences between projections in terms of rates and timing of certain levels of sea-level rise.

Sea-level rise projections are often compared by showing amounts or rates at a certain future point in time, e.g., 2050 or 2100. For many areas, a sea-level rise exceeding 1 to 2 m will require truly transformative decisions. Such decisions have a long lead time (in the order of 30 years) for planning and implementation. Showing the timing of a particular rate or magnitude of sea-level rise may provide insight that it is not a matter of if and how to adapt, but when to adapt. This may help decision makers in dealing with the uncertainties and it may accelerate adaptation.

We find that a sea-level rise of 25 cm (since 2000) is first reached for each of the RCP scenarios (the 95th percentile) within a decade of each other. This indicates that for a structure with a lifetime based on a sea-level rise of 25 cm, decisions are not conditional on the RCP scenario. The latest year for crossing the 25 cm threshold (the 5th percentile), however, does depend more on the RCP scenario: for the RCP2.6 scenario this is later than for the RCP8.5 scenario, because the acceleration is less strong. As the levels examined grow (0.25 m, 0.5 m, 0.75 m, etc.), the initial year of reaching that level starts to diverge more between the scenarios, and therefore the timing of decision points starts to be more and more conditional upon RCP scenario. However, for investments with a long envisioned lifetime such as coastal infrastructure, certain amounts of sea level rise may still be within the lifetime independent of the RCP scenario.