

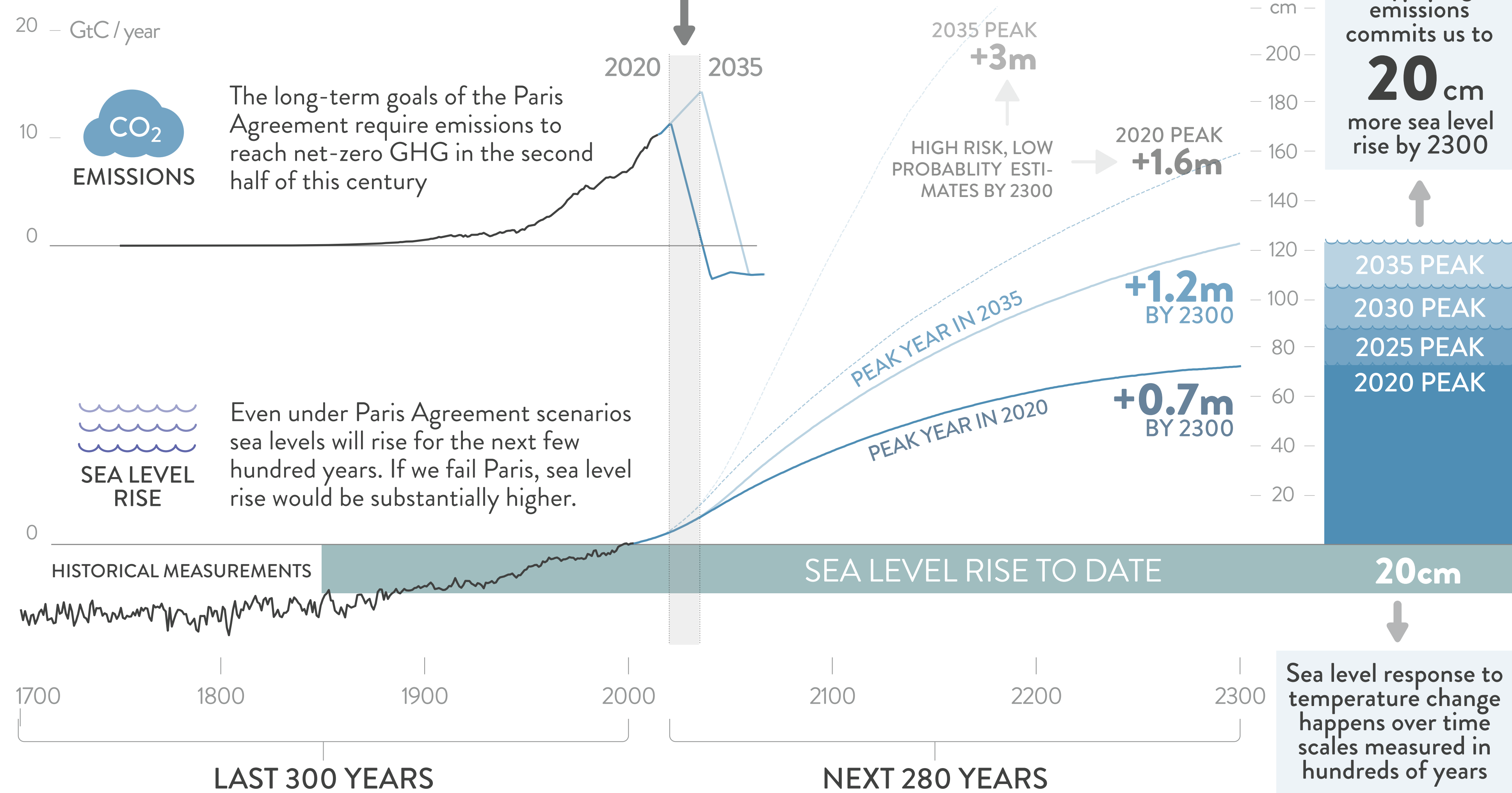


THE SEA LEVEL LEGACY OF DELAYED MITIGATION ACTION

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OUR CRITICAL WINDOW OF ACTION

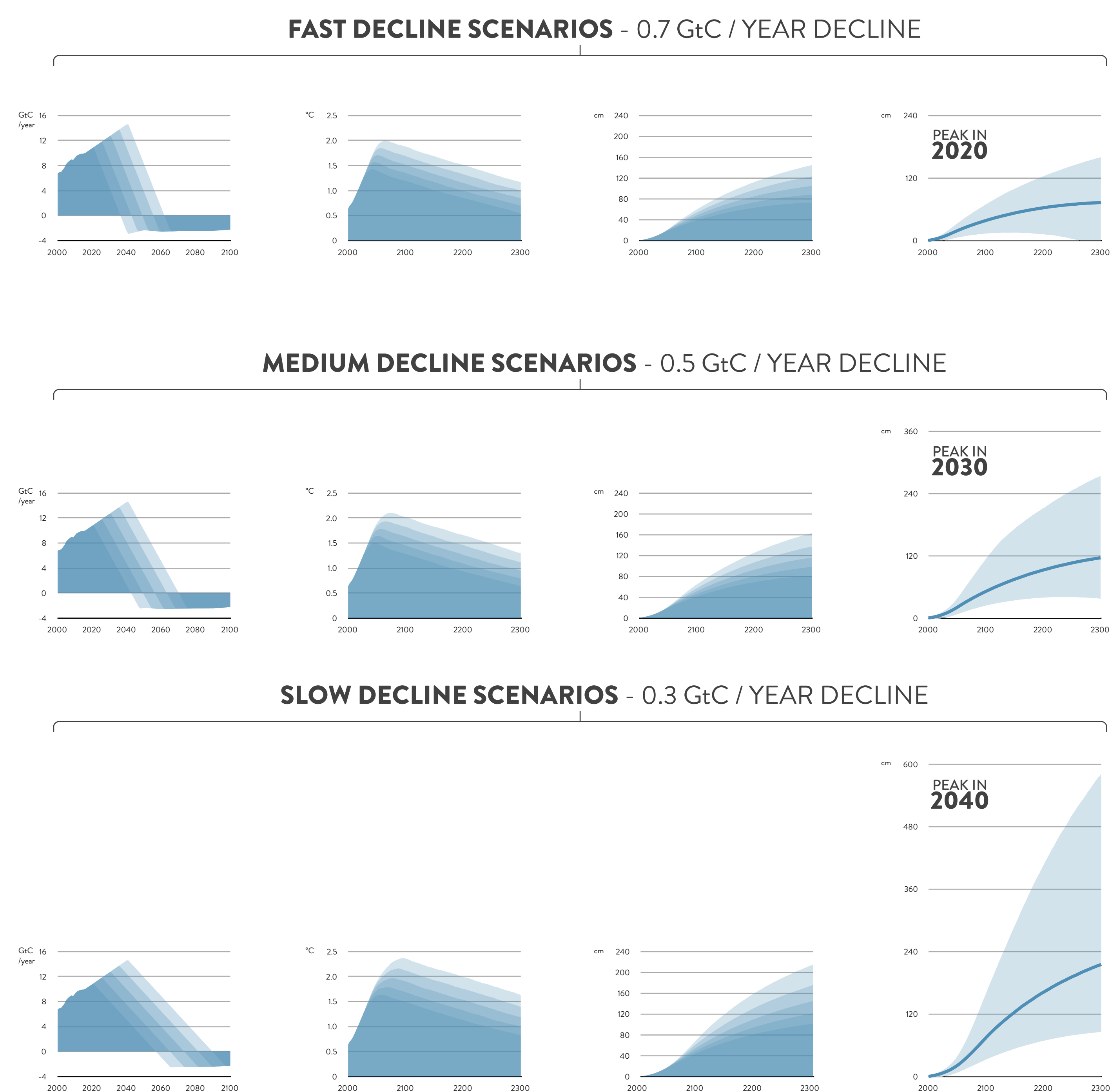
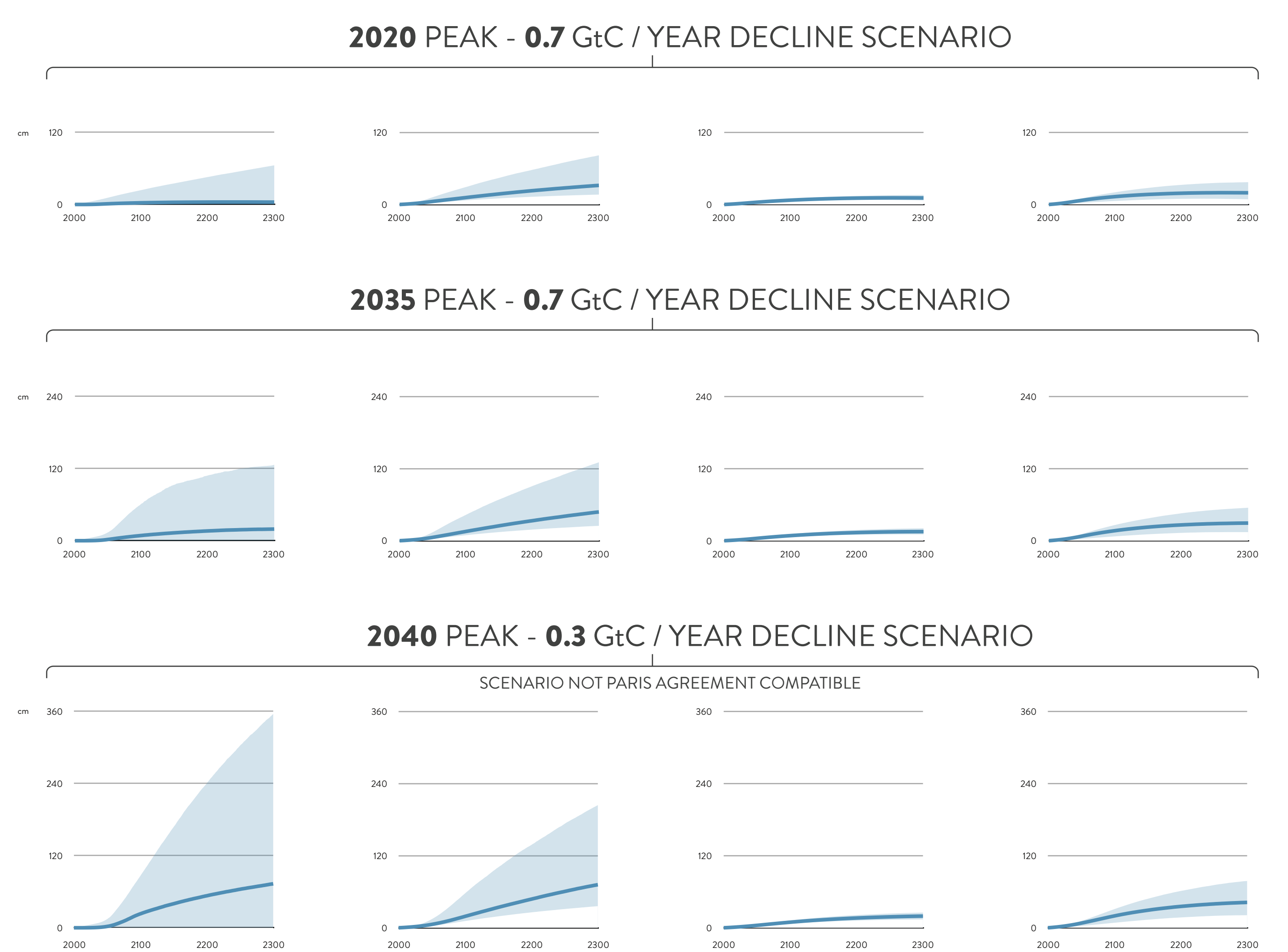
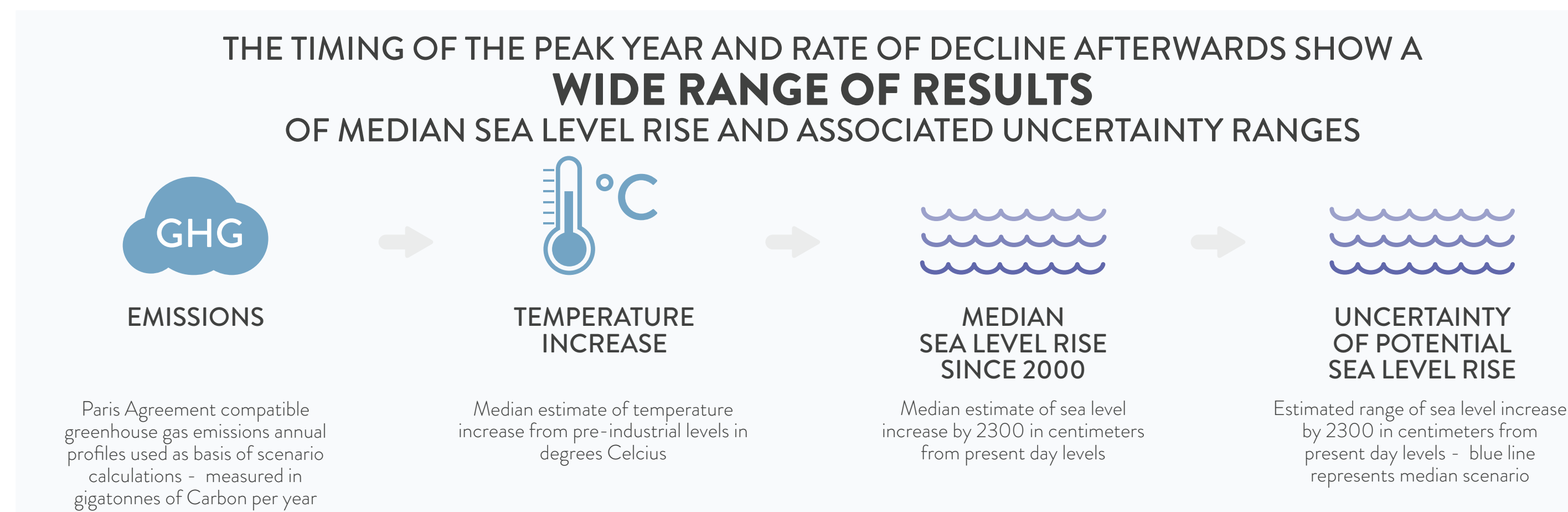
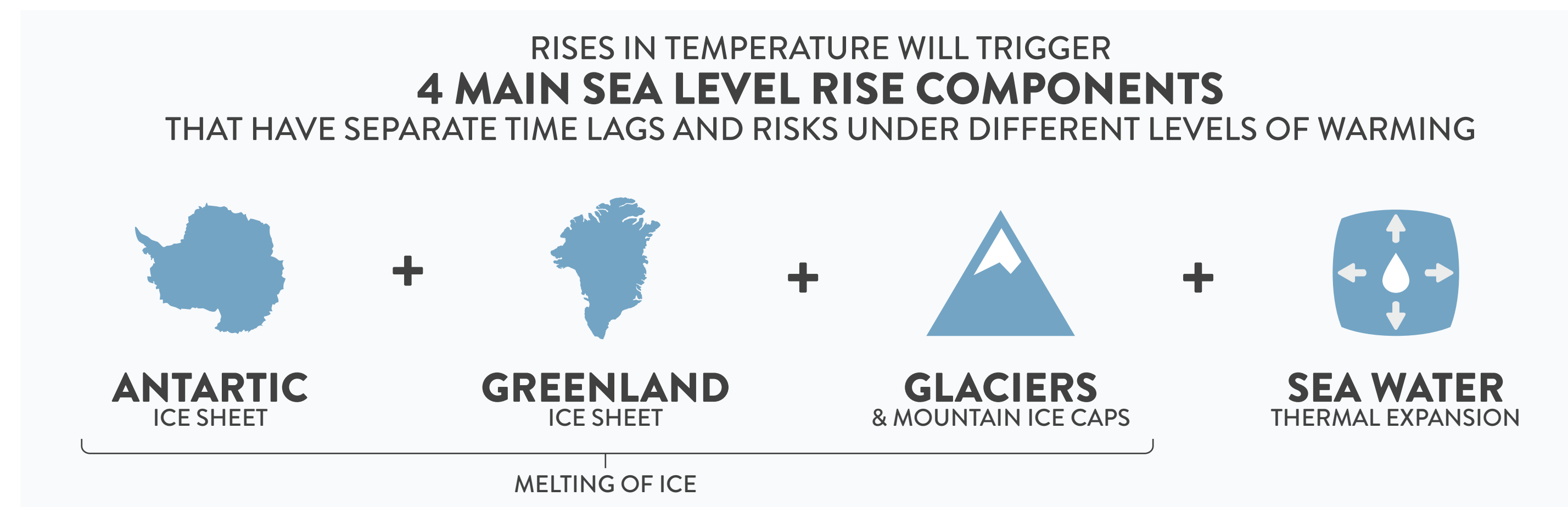
The timing of peaking CO₂ emissions under the Paris Agreement will be decisive for sea level rise over the next 300 years



Peaking global CO₂ emissions as soon as possible is crucial for limiting the risks of sea-level rise, even if global warming is limited to well below 2°C

The 2015 Paris Agreement aims at reducing climate-related risks by putting a limit to global mean temperature increase. Furthermore, global greenhouse gas emissions should peak as soon as possible and reach net-zero in the second half of the 21st century under the agreement. Sea level rise is one of the major impacts of climate change and will continue for long after emissions have ceased. Here we quantify the effect of near-term and long-term emissions constraints of the Paris Agreement on climate-driven sea level rise until 2300 using a contribution-based methodology

We estimate median sea-level rise between 0.7 and 1.2 m, if net-zero greenhouse gas emissions are sustained until 2300, varying with the pathway of emissions during this century. Temperature stabilization below 2°C is insufficient to hold median sea-level rise until 2300 below 1.5 m. We find that each 5-year delay in near-term peaking of CO₂ emissions increases median year 2300 sea-level rise estimates by ca. 0.2 m, and extreme sea-level rise estimates at the 95th percentile by up to 1 m. Our results underline the importance of near-term mitigation action for limiting long-term sea-level rise risks.



METHOD

Emission scenarios are constructed based on RCP2.6 updated by observed 2005-2014 CO₂ emissions. Only fossil and cement CO₂ emissions are modified.

Constructed scenarios vary in two parameters: the peak year and the reduction rate of CO₂ emissions. CO₂ emissions are linearly continued with the present day rate until peak year. CO₂ emissions decline by 0.3, 0.5 and 0.7 GtC/yr thereafter until zero CO₂ or net-zero greenhouse gas emissions are reached.

GHG EMISSIONS PEAKING YEAR

GHG EMISSIONS DECLINE RATES

0.7 0.5 0.3 GtC/yr

GMT trajectories are derived using the reduced-complexity climate and carbon cycle model MAGICC.

Sea-level rise (SLR) are derived using contribution-based semi-empirical model for future sea level rise from (Mengel et al. 2016).

For each SLR contribution, we draw from the calibrated sets of sea level functions, which incorporate the different observational datasets and long-term estimates.

We drive the selected sea level function with a global mean temperature pathway, randomly drawn from the 600 member global mean temperature ensemble for a specific scenario. The sampling is repeated 10 000 times.

SOURCE Committed sea-level rise under the Paris Agreement and the legacy of delayed mitigation action Mengel et. al. 2018 - Nature Communications

CLIMATE ANALYTICS

POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

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