Simulations show likely amount of sea level rise in coastal cities around the world

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Credit: Tiago Fioreze / Wikipedia

(Phys.org)—An international team of researchers has run multiple global climate computer simulations multiple times and has used the simulation results to estimate the local impact of rising sea levels on coastal cities around the globe. In their paper published in *Proceedings of the National Academy of Sciences*, the group outlines the first serious attempt to account for multiple factors in making predictions about sea level rise

amounts around the world.

Contrary to what might seem obvious, sea levels do not rise in a uniform manner—levels may rise more in parts of Asia, for example, than along the California coast. These differences are due to factors such as ocean currents and the location of melting ice. Thus, as the planet heats up and more ice melts, resulting in higher sea levels, some coastal areas will see higher levels than others. In this new effort, the researchers sought to predict how much rise individual coastal cities are likely to experience as global temperatures reach two landmarks—2 °C and 5 °C higher than pre-industrial levels.

To make their estimations, the researchers ran approximately 24 computer simulations approximately 5000 times—the models accounted for such factors as temperature rise of the air and ocean, ocean currents and the impact of melting ice. The models offered results very similar to those previously made by other researchers regarding global sea rising amounts, but they also offered estimates locally, showing, for example, that many parts of South and South East Asia are likely to see higher rises than other parts of the world. They also showed that the more levels rise, the faster the rise becomes if the factors contributing to global warming are not changed.

If things continue on their current path, the researchers suggest, global temperatures are likely to become 2 °C higher than pre-industrial levels by 2040 or 2050 and 5 °C higher by 2100. If these milestones are reached, the simulations suggest, the Earth would experience a global sea rise of approximately six inches by mid-century and two feet by the end of the century. If that happened, the models suggest the East Coast of the U.S. would experience a sea rise of a foot by mid-century and cities like Lagos, Manilla and Ho Chi Minh City would experience a rise as much as three feet by the end of the century; New York City could see a rise of more than three and a half feet.

More information: Svetlana Jevrejeva et al. Coastal sea level rise with warming above 2 °C, *Proceedings of the National Academy of Sciences* (2016). DOI: 10.1073/pnas.1605312113

Abstract

Two degrees of global warming above the preindustrial level is widely suggested as an appropriate threshold beyond which climate change risks become unacceptably high. This "2 °C" threshold is likely to be reached between 2040 and 2050 for both Representative Concentration Pathway (RCP) 8.5 and 4.5. Resulting sea level rises will not be globally uniform, due to ocean dynamical processes and changes in gravity associated with water mass redistribution. Here we provide probabilistic sea level rise projections for the global coastline with warming above the 2 °C goal. By 2040, with a 2 °C warming under the RCP8.5 scenario, more than 90% of coastal areas will experience sea level rise exceeding the global estimate of 0.2 m, with up to 0.4 m expected along the Atlantic coast of North America and Norway. With a 5 °C rise by 2100, sea level will rise rapidly, reaching 0.9 m (median), and 80% of the coastline will exceed the global sea level rise at the 95th percentile upper limit of 1.8 m. Under RCP8.5, by 2100, New York may expect rises of 1.09 m, Guangzhou may expect rises of 0.91 m, and Lagos may expect rises of 0.90 m, with the 95th percentile upper limit of 2.24 m, 1.93 m, and 1.92 m, respectively. The coastal communities of rapidly expanding cities in the developing world, and vulnerable tropical coastal ecosystems, will have a very limited time after midcentury to adapt to sea level rises unprecedented since the dawn of the Bronze Age.