



## MEMORANDUM

TO: California Ocean Protection Council  
FROM: Cat Kuhlman, Executive Director, Ocean Protection Council  
DATE: September 13, 2012  
RE: National Research Council sea-level rise report and recommendations on incorporating results into the Sea-level Rise Guidance Document

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### Overview of the National Research Council report

Sea level rose during the 20th century, and observations and projections suggest that it will rise at a higher rate during the 21st century. Global mean sea level is rising primarily because global temperatures are rising, causing ocean water to expand in volume and land ice to melt. However, sea-level rise is not uniform; it varies from place to place. Along the California coast, global mean sea-level rise is further influenced by regional factors, such as atmospheric and ocean circulation patterns in the Pacific Ocean, the gravitational and deformational effects of land ice mass changes, and tectonics along the coast.

In recognition of the local and regional variability of sea-level rise, California Executive Order S-13-08 requested the National Research Council (NRC) evaluate sea-level rise globally and along the coast of California for 2030, 2050, and 2100. The states of Washington and Oregon, the U.S. Army Corps of Engineers, the National Oceanic and Atmospheric Administration, and the U.S. Geological Survey subsequently joined California in sponsoring this study, thus expanding the study to the coasts of Oregon and Washington as well. The NRC released the report [“Sea-level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future”](#) in June 2012<sup>1</sup>.

In 2010, the state developed an [interim sea-level rise guidance document](#) to inform and assist state agencies as they develop approaches for incorporating SLR into planning decisions prior to the release of the NRC report and other technical reports<sup>2</sup>. The sea-level rise projections in the NRC report are generally consistent with this 2010 State of California Sea-level Rise Interim Guidance Document<sup>3</sup> (2010 interim SLR guidance document). Because the 2012 NRC report incorporates more local and regional factors, there is more uncertainty in the estimates. The ranges of sea-level rise projected for the years 2030 and 2050 are nearly twice as large but overlap the ranges provided in the 2010 interim SLR guidance document. Uncertainty in the estimates increase as the projection period lengthens, both the 2012 NRC and the 2010 interim SLR guidance document project wider ranges of sea-level rise for 2100 than for 2030 and 2050. There is significant overlap in the projected range of sea-level rise for 2100 between the 2012 NRC report and the 2010 interim SLR guidance document. The lowest projections for sea-level

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<sup>1</sup> The report, including an 8 page summary, can be found at [http://www.nap.edu/catalog.php?record\\_id=13389](http://www.nap.edu/catalog.php?record_id=13389)

<sup>2</sup> As mandated in California Executive Order S-13-08.

<sup>3</sup> The Sea-level Rise Interim Guidance Document uses sea-level rise projections from Vermeer, M. and S. Rahmstorf, 2009, Global sea level linked to global temperature, *Proceedings of the National Academy of Sciences*, 106.

rise for 2100 in the NRC report are lower than the lowest projections used in the 2010 interim SLR guidance document and the highest NRC projections are somewhat lower than those referenced in the 2010 interim SLR guidance document, but they are both considerably greater than those from the 2007 Intergovernmental Panel on Climate Change Report.

Another key aspect of the NRC findings is that land elevation changes, including those associated with tectonic activity, is a key determinant of local sea-level rise. For areas north of Cape Mendocino, the ocean plate is descending below North America at the Cascadia Subduction Zone, causing coastal areas to rise. As a result, the projected rise is lower than the global average in California north of Cape Mendocino, Oregon and Washington. In contrast, areas south of Cape Mendocino are generally subsiding, so the NRC projection is for this coastal region to experience sea-level rise that exceeds somewhat the global rate.

**Table 1: Comparison of the California SLR Guidance Document (October 2010) and National Research Council 2012 Report. SLR values in cm, relative to 2010.**

Time Period	2010 State SLR Guidance Document	2012 NRC	
		North of Cape Mendocino	South of Cape Mendocino
2000-2030	13-21	-4 to 23	4 to 30
2000-2050	26-43	-3 to 48	12 to 61
2000-2100	78-128 (low emissions) 95-152 (medium) 110-176 (high)	10 to 143	42 to 167

### Updating the 2010 Sea-level Rise Guidance Document

In 2010, the state developed an [interim sea-level rise guidance document](#) to inform and assist state agencies as they develop approaches for incorporating SLR into planning decisions prior to the release of the NRC report and other technical reports. The Sea-Level Rise Task Force (SLR Task Force) of the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT), led by the OPC, developed the document. The SLR Task Force worked with the California Ocean Science Trust (whose Executive Director is the OPC Science Advisor) to ensure that the document was informed by the best available science. A subcommittee of select experts from the OPC’s Science Advisory Team (OPC-SAT)<sup>4</sup> responded to questions posed by the SLR Task Force and their responses informed the policy recommendations found in the guidance document.

<sup>4</sup> Two members of the OPC Science Advisory Team- Dr. Dan Cayan, Scripps Institution of Oceanography and U.S. Geological Survey; and Dr. Gary Griggs, UCSC Institute of Marine Science- also served as NRC committee members.

Now that the NRC report has been released, staff intends to work with the CO-CAT, SLR Task Force, and the OPC-SAT subcommittee to revise the Sea-level Rise Guidance Document to incorporate the most recent information from the NRC report. Since the ranges of sea-level rise projections in the 2012 NRC report are approximately twice as wide as those in the 2010 state guidance document, one issue that will continue to be important is how to make decisions in the face of uncertainty regarding the amount of sea-level rise that will occur within specific time periods. The 2010 guidance and the [2011 OPC Resolution on Sea-level Rise](#) both encourage the use of scenario planning in which a range of future sea-level rise amounts is used to assess vulnerabilities, and the use of a risk framework in which adaptive capacity and consequences are considered.