



Sea Level Rise (SLR) Talking Points

SLR Observations

- Global sea level has historically risen over time. Since the last glacial maximum about 16, 000 years ago, it has been raised approximately 120 m (400 ft) (Fairbanks 1989).

Global factors impacting sea level rise:

- Thermal expansion of the ocean—when sea water heats up, it expands
- Melting of global ice—the melting of glaciers and grounded ice caps will increase the mass (amount) of sea water

Local factors impacting sea level rise:

- Local atmospheric circulation—local currents, wind, waves and phenomenon such as El Nino impact SLR on a regional scale
- Vertical land movement—earthquakes, regional subsidence or uplift impact SLR. Relative SLR is the sum of global SLR and the change in vertical land movement.

Global SLR Projections

- Intergovernmental Panel on Climate Change—established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO), comprised of thousands of scientists. The leading international body for the assessment of climate change.
 - Issued the Fourth Assessment (AR4) in 2007. Contains projections of global SLR for six different emission scenarios. These range from “high” emission scenarios in which future economic growth is uneven, with large income gaps between industrialized nations and the developing world; to “low” emission scenarios where future growth is sustainable and environmental consciousness high.
 - Each emissions scenario was modeled using multiple global climate models to give projected temperature and SLR changes. Multiple models were used due to scientific uncertainty. Results were generated by consensus and as an envelope of likely projections and a mean projection.

California SLR Projections and Policy Guidance

- Cayan, *et al* (2008)—projected SLR in coastal California waters. Based upon the lowest and highest emission scenarios from the IPCC and included ice sheet loss and dam storage, which were omitted by the IPCC.
- National Oceanic and Atmospheric Administration
 - Calculated 7.92 inches of SLR at Golden Gate Bridge in San Francisco from 1897 – 2006.

- 2008 Executive Order S-13-08 of Governor Schwarzenegger:
 - Directed state agencies to develop a climate adaptation strategy and consider a range of sea-level rise scenarios for the years 2050 and 2100 in order to assess project vulnerability and reduce expected risks, and increase resiliency to sea-level rise.
 - Established the California Climate Action Team (CAT) to coordinate statewide efforts to reduce emissions and adapt to climate change.
 - Requested the National Academy of Sciences (NAS) to study SLR specific to the West Coast of the US. Results expected in 2012.
- California Ocean Protection Council (OPC)—established by statute in 2004 to coordinate activities of ocean-related state agencies.
 - December 2009- Provided funding for the CAT to write the California Climate Adaptation Strategy
 - **October 2010- State of California SLR Interim Guidance Document**
 - Guidance developed by a state agency working group with input from the OPC’s Science Advisory Team to assist state agencies in the incorporation of SLR into planning decisions prior to release of the NAS report.
 - Recommends useage of SLR ranges provided in 2009 *Proceedings of National Academy of Sciences* (Vermeer and Rahmstorf 2009) adjusted to use 2000 as a baseline.
 - Recommends considering storms and other extreme events, as well as changing shorelines.
 - **March 2011- Revised Resolution of the OPC on SLR**
 - State agencies should follow the recommendations in the Interim Guidance Document on SLR. Non-state entities implementing projects or programs using state funding or on state property, including on lands granted by the Legislature, should also follow these recommendations
 - Assess vulnerabilities over a range of SLR projections, including analysis of the highest SLR values presented in the state guidance document and not solely use SLR values within the lower third of the range of SLR projections;
 - Avoid making decisions based on SLR projections that would result in high risk; and
 - Coordinate and use the same SLR projections when working on the same project or program.
 - **June 2012- National Research Council Report on West Coast SLR**
 - The report estimates that global sea level will rise 3–9 in by 2030 relative to 2000, 7–19 in by 2050, and 20–55 in by 2100. The

ranges reflect uncertainties related to the fit of the data; the level of future greenhouse emissions, which affects the steric component; and any future changes in the rate of ice flow, which affects the total ice contribution. These uncertainties, and hence the ranges, grow with the length of the projection period.

- The committee’s global projections for 2030 and 2050 are similar to the Vermeer and Rahmstorf (2009) projections for the same periods, but they have a wider range. For 2100, the committee’s upper end of maximum sea level rise is lower than Vermeer and Rahmstorf’s projection.
- United States Army Corps of Engineers issued federal agency guidance that is currently consistent with that of the State of California.

Use of SLR Values for Coastal Regional Sediment Management Plan

- Consistent with the October 2010 *State of California SLR Interim Guidance Document* and March 2011 OPC resolution, the CRSMP will use the SLR values presented by Vermeer and Rahmstorf (2009).
- In summary the SLR projections were:
 - 7 inches by 2030
 - 14 inches by 2050
 - 23 – 27 inches by 2070
 - 40 – 55 inches by 2100

Sea-Level Rise Projections using 2000 as the Baseline

Year		Average of Models	Range of Models
2030		7 in (18 cm)	5-8 in (13-21 cm)
2050		14 in (36 cm)	10-17 in (26-43 cm)
2070	Low (B1 Emission Scenario)	23 in (59 cm)	17-27 in (43-70 cm)
	Medium (A2 Emission Scenario)	24 in (62 cm)	18-29 in (46-74 cm)
	High (A1FI Emission Scenario)	27 in (69 cm)	20-32 in (51-81 cm)
2100	Low (B1 Emission Scenario)	40 in (101 cm)	31-50 in (78-128 cm)
	Medium (A2 Emission Scenario)	47 in (121 cm)	37-60 in (95-152 cm)
	High (A1FI Emission Scenario)	55 in (140 cm)	43-69 in (110-176 cm)

Table 1. Excerpted from October 2010 State of California SLR Interim Guidance Document

Note: These projections may underestimate actual SLR because they do not account for catastrophic ice melting, nor include a safety factor in the event of underestimation. For dates after 2050, three different values for SLR are shown - based on low, medium and high future greenhouse gas emission scenarios. These values are based on the IPCC emission scenarios as follows: B1 for the low projections, A2 for the medium projections and A1FI for the high projections.

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