REFERENCE LIST TO BE PROVIDED TO NRC STAFF
FOR WEST COAST SLR STUDY

8/5/10

Criteria for Reference List Selection

►Directly/closely related to NRC scope of work
► West-coast oriented
► Includes items cited in California public meetings (but not limited to)
► Published within last 10-15 years, newer is better
► Priority for CEC-funded projects, gray literature, and other material that NRC committee might not find by itself – NOT intended to be comprehensive science literature review (NRC's committee can do that for itself)
►Special focus on relevant items authored or funded by sponsoring agencies

Impacts & adaptation

Sea level Rise: An Increasing Risk to California Water Projects. Water Resources Impacts, American Water Resources Association. Vol. 11, No. 1, January 2009.

Ruggiero, P., 2008. Impacts of climate change on coastal erosion and flood probability in the US Pacific Northwest, Proceedings of Solutions to Coastal Disasters 2008, Oahu, HI.

Sea Level Rise in the Coastal Waters of Washington State. A Report by the University of Washington Climate Impacts Group and the Washington Department of Ecology. January 2008.

BCDC Draft Staff Report "Living with a Rising Bay: Vulnerability and Adaptation in SF Bay and on its shoreline" http://www.bcdc.ca.gov/proposed_bay_plan/bp_1-08_cc_draft.pdf

Revell et al. An Initial Assessment of the Effects of Sea Level Rise on Coastal Hazards in California. Presentation at 6th Annual California Climate Change Research Symposium 2009. (http://www.climatechange.ca.gov/events/2009_symposium/symposium_program.html)

The Impacts of Sea-Level Rise On the California Coast - Final Report. CEC report # CEC-500-2009-024-F. Matthew Heberger, Heather Cooley, and Pablo Herrera, Peter H. Gleick. September 2009. www.energy.ca.gov/2009publications/CEC-500-2009-024/CEC-500-2009-024-F.PDF.

(Over the past century, sea level has risen nearly eight inches along the California coast, and general circulation model scenarios suggest very substantial increases in sea level as a significant impact of climate change over the coming century. This study includes a detailed analysis of the current population, infrastructure, and property at risk from projected sea-level rise if no actions are taken to protect the coast. The sea-level rise scenario was developed by the State of California from medium to high greenhouse gas emissions scenarios from the Intergovernmental Panel on Climate Change (IPCC) but does not reflect the worst-case sea-level rise that could occur. We also evaluate the cost of building structural measures to reduce that risk. If development continues in the areas at risk, all of these estimates will rise. No matter what policies are implemented in the future, sea-level rise will inevitably change the character of the California coast.
We estimate that a 1.4 meter sea-level rise will put 480,000 people at risk of a 100-year flood event, given today's population. Among those affected are large numbers of low-income people and communities of color, which are especially vulnerable. A wide range of critical infrastructure, such as roads, hospitals, schools, emergency facilities, wastewater treatment plants, power plants, and more will also be at increased risk of inundation, as are vast areas of wetlands and other natural ecosystems. In addition, the cost of replacing property at risk of coastal flooding under this sea-level rise scenario is estimated to be nearly $100 billion (in year 2000 dollars). A number of structural and non-structural policies and actions could be implemented to reduce these risks. For example, we estimate that protecting some vulnerable areas from flooding by building seawalls and levees will cost at least $14 billion (in year 2000 dollars), with added maintenance costs of another $1.4 billion per year. Continued development in vulnerable areas will put additional areas at risk and raise protection costs. Large sections of the Pacific coast are not vulnerable to flooding, but are highly susceptible to erosion. We estimate that a 1.4 meter sea-level rise will accelerate erosion, resulting in a loss of 41 square miles (over 26,000 acres) of California's coast by 2100. A total of 14,000 people currently live in the area at risk of future erosion. Additionally, significant transportation related infrastructure and property are vulnerable to erosion. Statewide flood risk exceeds erosion risk, but in some counties and localities, coastal erosion poses a greater risk. This report also provides a comprehensive set of recommendations and strategies for adapting to sea-level rise.)

Vulnerability to Inundation and Climate Change Impacts in California: Coastal Manager' Attitudes and Perceptions.
Susanne C. Moser, John Tribbia, Marine Society Technology Journal, Vol. 40 No.4, Winter 2006/2007

More than information: what coastal managers need to plan for climate change. John Tribbia, Susanne C. Moser, Vol. 11, Issue 4, June 2008.

Projections

Increasing wave heights and extreme value projections: The wave climate of the U.S. Pacific Northwest. **Peter Ruggiero**, **Paul D. Komar**, **Jonathan C. Allan** Coastal Engineering, Vol. 57, No. 5. (18 May 2010), pp. 539-552.

Climate change projections of sea level extremes along the California coast. Daniel Cayan; Peter Bromirski; Katharine Hayhoe; Mary Tyree; Michael Dettinger; Reinhard Flick. 2008. Climatic Change

Climate Change Scenarios and Sea Level Rise Estimates for California -- 2008 Climate Change Scenarios Assessment – Final Report. CEC report # CEC-500-2009-014-F. Dan Cayan, Mary Tyree, Mike Dettinger, Hugo Hidalgo, Tapash Das,

Ed Maurer, Peter Bromirski, Nicholas Graham, Reinhard Flick. September 2009. www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-F.PDF

Projecting Future Sea Level - FINAL REPORT. CEC report # CEC-500-2005-202-SF. Dan Cayan, Peter Bromirski, Katharine Hayhoe, Mary Tyree, Mike Dettinger, Reinhard Flick. March 2006. www.energy.ca.gov/2005publications/CEC-500-2005-202/CEC-500-2005-202-SF.PDF. (This report is a supplemental report to the main PIER-funded report that is an attachment to the Climate Action Team Report to the Governor and Legislature.)

Climate Change Scenarios and Sea Level Rise Estimates for California - 2008 Climate Change Scenarios Assessment. CEC report #CEC-500-2009-014-D. Dan Cayan, Mary Tyree, Mike Dettinger, Hugo Hidalgo, Tapash Das, Ed Maurer, Peter Bromirski, Nicholas Graham, Reinhard Flick. March 2009. www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-D.PDF
(For the 2008 California Climate Change Assessment, to further investigate possible future climate changes in California, a set of 12 climate change model simulations was selected and evaluated. From the Intergovernmental Panel on Climate Change Fourth Assessment activities projections, simulations of twenty-first century climates under a B1 (low emissions) and an A2 (a medium-high emissions) emissions scenarios were evaluated. Six climate models were chosen. These emission scenarios and climate simulations are not " predictions," but rather are possible scenarios of plausible climate sequences that might affect California in the next century. Temperatures over California warm significantly during the twenty-first century in each simulation. Also the rise in global sea level, and by extension the rise of sea level along the California coast, increases. Along with this, there are marked increases in the frequency, magnitude, and duration of heat waves and sea level rise extremes. There is quite a strong inclination for higher warming in summer than winter and greater warming inland than along the coast. In several of the simulations there is a tendency for drier conditions to develop during mid-and late-twenty-first century in Central and Southern California, and along with this, a decline in winter wave energy along the California coast.)

Coastal geomorphology/erosion/sedimentation

Rates and Trends of Coastal Change in California and the Regional Behavior of the Beach and Cliff System. Cheryl J. Hapke, Dave Reid, Bruce Richmond. Journal of Coastal Research. May 2009. pp 603-615.

Ganju, N.K., and Schoellhamer, D.H., 2010, Decadal-timescale estuarine geomorphic change under future scenarios of climate and sediment supply: Estuaries and Coasts, v. 33, no. 1, p. 15-29.

California's Retreating Coastline: Where Do We Go from Here? Gary B. Griggs, *ams.confex.com/ams/pdfpapers/83241.pdf*

Storlazzi, C.D. and Griggs, G.B., 1998. THE 1997-98 EL NINO AND EROSION PROCESSES ALONG THE CENTRAL COAST OF CALIFORNIA. Shore and

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Griggs, G.B. and Brown, Kristin, 1998. EROSION AND SHORELINE DAMAGE ALONG THE CENTRAL CALIFORNIA COAST: A COMPARISON BETWEEN THE 1997-98 AND 1982-83 WINTERS. Shore and Beach 66:3: 18-23.

Storlazzi, C.D. and Griggs, G.B. 2000. THE INFLUENCE OF EL NINOSOUTHERN OSCILLATION (ENSO) EVENTS ON THE EVOLUTION OF CENTRAL CALIFORNIA'S SHORELINE. Geological Society of America Bull. 112:2:236-249

Revell, D.L. and Griggs, G.B., 2007. Regional shoreline and beach changes in the Santa Barbara sandshed. Proc. Coastal Sediments 2007. ASCE

Griggs, G.B., 1999. CALIFORNIA'S COASTLINE: EL NINO, EROSION AND PROTECTION. California's Coastal Natural Hazards, CSBPA Conference: pp36-55. Ed. By Lesley Ewing and Douglas Sherman. USC Sea Grant Program

Cliff Erosion and Bluff Retreat Along the California Coast. Griggs, G.B., Runyan, K. Proceedings, Oceans 2003. Vol. 3, pp 1219-1227.

Final Draft Report. California Coastal Erosion Response to Sea level Rise – Analysis and Mapping.
Prepared by Philip Williams & Associates, March 11, 2009, for Pacific Institute.

California Coastal Erosion Response to Sea Level Rise - Analysis and Mapping (Final Draft Report Subject to Revision). CEC publication # PWAOPC-1000-2009-013. PWA - Philip Williams & Associates Ltd., Pacific Institute, California Ocean Protection Council. June 2009. www.energy.ca.gov/2009publications/PWAOPC-1000-2009-013/PWAOPC-1000-2009-013.PDF

(This report documents future coastal erosion hazards and the methodology used to estimate potential erosion hazards for the California coast from Santa Barbara to the Oregon border. In addition, Philip Williams Associates compiled a statewide base flood elevation layer to support a flood analysis by the Pacific Institute. This erosion methodology is applicable to others areas along the west coast of the United States and was developed to be modular so that updated estimates could be more rapidly accomplished with improved data and refined methods.)

Inundation/flooding

Climate and floods still govern California levee breaks. J.L. Florsheim, M.D. Dettinger. Geophysical Research Letters, Vol. 34, L22403, 10.1029/2007GL031702, 2007.

Flooding on California's Russian River: Role of atmospheric rivers. F. Martin Ralph; Paul J. Neiman; Gary A. Wick; Seth I. Gutman. 2006. GEOPHYSICAL RESEARCH LETTERS

(Experimental observations collected during meteorological field studies conducted by the National Oceanic and Atmospheric Administration near the Russian River of coastal northern California are combined with SSM/I satellite observations offshore to examine the role of landfalling atmospheric rivers in the creation of flooding. While recent studies have documented the characteristics and importance of narrow regions of strong meridional water vapor transport over the eastern Pacific Ocean (recently referred to as atmospheric rivers), this study describes their impact when they strike the U.S. West Coast. A detailed case study is presented, along with an assessment of all 7 floods on the Russian River since the experimental data were first available in October 1997. In all 7 floods, atmospheric river conditions were present and caused heavy rainfall through orographic precipitation. Not only do atmospheric rivers play a crucial role in the global water budget, they can also lead to heavy coastal rainfall and flooding, and thus represent a key phenomenon linking weather and climate.)

Potential Inundation Due to Rising Sea Levels in the San Francisco Bay Region. CEC report # CEC-500-2009-023-D. Noah Knowles. March 2009. www.energy.ca.gov/2009publications/CEC-500-2009-023/CEC-500-2009-023-D.PDF

(An increase in the rate of sea level rise is one of the primary impacts of projected global climate change. To assess potential inundation associated with a continued acceleration of sea level rise, the highest resolution elevation data available were assembled from various sources and mosaiced to cover the land surfaces of the San Francisco Bay region. Next, to quantify high water levels throughout the Bay, a hydrodynamic model of the San Francisco Estuary was driven by a projection of hourly water levels at the Presidio. This projection was based on a combination of climate model outputs and empirical models and incorporates astronomical, storm surge, El Nino, and long-term sea level rise influences. Based on the resulting data, maps of areas vulnerable to inundation were produced, corresponding to specific amounts of sea level rise and recurrence intervals. These maps portray areas where inundation will likely be an increasing concern. In the North Bay, wetland survival and developed fill areas are at risk. In Central and South bays, a key feature is the bay-ward periphery of developed areas that would be newly vulnerable to inundation. Nearly all municipalities adjacent to South Bay face this risk to some degree. For the Bay as a whole, as early as 2050 under this scenario, the one-year peak event nearly equals the 100-year peak event in 2000. Maps of vulnerable areas are presented and some implications discussed.)

Data & observations

Trends in U.S. Tidal Datum Statistics and Tide Range. Reinhard E. Flick, Joseph F. Murray, Lesley C. Ewing. ASCE Journal of Waterway, Port, Coastal, and Ocean Engineering: Vol. 129, No. 4, July/August 2003, pp 155-164

Sea Level Rise in the Northeastern Pacific Ocean from Tide Gauge Records, UCLA MS thesis, Julie Stephenson, 2005

Hapke, C.J., Reid, D., Richmond, B.M., Ruggiero, P., and List, J., 2006, National assessment of shoreline change: Part 3: Historical shoreline changes and associated coastal land loss along the sandy shorelines of the California coast: U.S. Geological Survey Open-file Report 2006-1219.

Draft – San Joaquin River Delta base Flood Elevation Refinement Stage Frequency Analysis (Rindge Pump Gage Station, Burns Cutoff Gage Station) prepared for San Joaquin Area Flood Control Agency by Peterson Brustad, Inc. June 23, 2010.

Storminess variability along the California coast: 1858-2000. Peter D Bromirski;

Reinhard E Flick; Dan R Cayan. 2003. Journal of Climate

(The longest available hourly tide gauge record along the West Coast (U.S.) at San Francisco yields meteorologically forced nontide residuals (NTR), providing an estimate of the variation in ""storminess" from 1858 to 2000. Mean monthly positive NTR (associated with low sea level pressure) show no substantial change along the central California coast since 1858 or over the last 50 years. However, in contrast, the highest 2% of extreme winter NTR levels exhibit a significant increasing trend since about 1950. Extreme winter NTR also show pronounced quasi- periodic decadal-scale variability that is relatively consistent over the last 140 years. Atmospheric sea level pressure anomalies (associated with years having high winter NTR) take the form of a distinct, large-scale atmospheric circulation pattern, with intense storminess associated with a broad, southeasterly displaced, deep Aleutian low that directs storm tracks toward the California coast.)