# Climate and Sea Level Rise in the Santa Ana River Watershed

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## Key Findings

- Climate change will contribute to global sea level rise (SLR) through melting of glaciers and ice caps and thermal expansion of ocean waters, both of which increase the volume of water in the oceans.
- Regional SLR may be higher or lower than global SLR due to effects of regional ocean and atmospheric circulation.
- Average sea levels along the Southern California coast is projected to rise by 5-24 inches by 2050 and 16-66 inches by 2100.
- SLR is likely to inundate beaches and coastal wetlands and may increase coastal erosion. Effects on local beaches depend on changes in coastal ocean currents and storm intensity, which are highly uncertain at this time.
- SLR will increase the area at risk of inundation due to a 100-year flood event.
- Existing barriers are sufficient to deter seawater intrusion at Talbert and Alamitos gaps under a 3-foot rise in sea levels. However, operation of barriers under SLR may be constrained by shallow groundwater concerns.

## Additional Considerations

- Results were obtained from previous analysis, no additional modeling was done.

## Results

**Will climate change contribute to sea level rise (SLR)?**

Increasing temperatures will melt ice sheets and glaciers and cause thermal expansion of ocean water, both of which will increase the volume of water in the oceans and thus contribute to global mean sea level rise (SLR). Regional SLR may be higher or lower than global mean SLR due to regional changes in atmospheric and ocean circulation patterns. Figure 1 shows the range of projected global mean SLR by 2100. Regional mean sea level along the Southern California coast is projected to rise by 40-300 mm (1.5-12 in) by 2030, 125–610mm (5-24 in) by 2050, and 405-1675 mm (16-66 in) by 2100.

**How will climate change and SLR affect coastal communities and beaches in Southern California?**

Inundation due to SLR is likely to reduce the area of beaches and wetlands along the Southern California coast. In addition, SLR is likely to increase erosion of sea cliffs, bluffs, sand bars, dunes, and beaches along the California coast. However, the overall effects of climate change on local beaches will depend on changes in coastal ocean currents and storm intensities, which are less certain at this time.

SLR is likely to increase the coastal area vulnerable to flooding during storm events. Figure 2 shows the areas of Orange County that are currently vulnerable to inundation due to a 100-year flood event (blue) and areas that will be vulnerable to inundation with a 1400 mm (55 in) rise in mean sea level (source: http://cal-adapt.org/sealevel/).

**Will SLR increase seawater intrusion into coastal aquifers?**

Detailed analysis carried out by Orange County Water District found that the Talbert Barrier would be effective at preventing seawater intrusions through the Tablert Gap under a 3-foot sea level rise. In the case of the Alamitos Barrier, seawater intrusion through the Alamitos Gap would likely be prevented once current plans to construct additional injection wells are implemented. At both barriers, however, shallow groundwater concerns could limit injection rates and thus reduce the effectiveness of barriers at preventing seawater intrusion under rising sea levels.

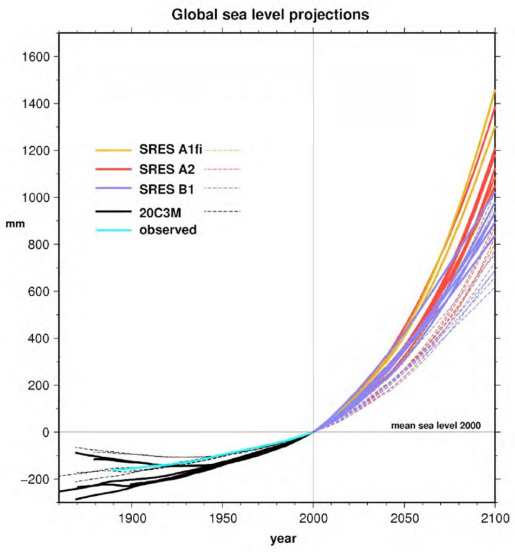


Figure 1 - Projections of global mean sea level rise based on selected climate projections.

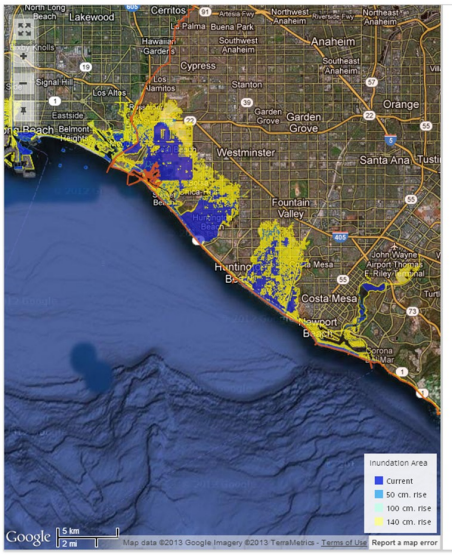


Figure 2 - Area at risk of inundation from 100-year flood event under current conditions (blue) and under 1400 mm sea level rise (yellow)

Link to full technical report—http://www.usbr.gov/lc/socal/basinstudies/OWOW.html