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## ***No, damming the Golden Gate won't save the Bay Area from rising seas***

Andrew Gunther and Jeremy Lowe

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*Some regional leaders have suggested constructing a storm surge barrier across the Golden Gate to thwart rising seas. Noah Berger/Special to The Chronicle*

As climate-enhanced storms continue to pound the Gulf and Atlantic coasts, producing historic and too often deadly flooding, it's imperative that the Bay Area take note and start planning for the dangers that climate change will bring to California's coastal communities. The Bay Area likely won't face epic hurricanes like Ida or Sandy, but we will face storms that push massive amounts of seawater toward land. This will produce dangerous flooding throughout the Bay that only will be exacerbated in the coming years by sea-level rise.

But how best to respond?

Recently, it has been [suggested](#) that we study constructing a storm surge barrier across the Golden Gate. In concept, this enormous device would be raised prior to storms to prevent high water from entering the Bay.

At first glance, this seems an attractive solution, as we can focus our flood protection efforts and expenditures on one small stretch of shoreline, instead of protection tailored to the needs of each of our shoreline communities around the Bay.

Unfortunately, a Golden Gate barrier would only be an expensive, temporary fix that would cause irreversible damage to the Bay.

In the future, we would still have to rework our entire shoreline to achieve flood protection. As recently [described](#) by the Intergovernmental Panel on Climate Change, sea-level rise will accelerate in coming decades. To keep up with these rising seas and storm surges, by mid-century we'd need to raise the barrier frequently — on the order of every month with the highest tides, not just every few years due to storms. This would start to change San Francisco Bay from a vibrant estuary to a managed pond, generating major environmental impacts.

The Bay ecosystem would suffer from muted tides, accumulated wastewater discharge, and massive algal blooms which would kill fish and wildlife. Wetlands that protect many of our shorelines would be destroyed without tidal flows, thus increasing flood damage (this is already evident in the Oosterschelde estuary in the Netherlands, where over one-third of intertidal habitat has been lost since a storm surge barrier went into operation in 1986).

Wetlands also enhance water quality by filtering Bay waters. Their loss would worsen pollution and endanger protected species fish, birds and mammals found in San Francisco Bay, such as the California Ridgway's Rail, salt marsh harvest mouse and steelhead trout.

By the next century, projected sea level rise would require the barrier to stay up nearly full-time to provide flood protection, turning the Golden Gate into a dam. This would aggravate the difficult problems noted above. Shipping into and out of the Bay would be possible only by developing massive locks. Water exchange between the Bay and the ocean, which is essential to sustain fish and wildlife, dilute wastewater, and convey river waters to the sea, would be eliminated. These ecological changes would cause further damage upstream in our local rivers and the Delta.

As the sea continued to rise, the dam would have to be raised, and a vital part of the region's economy and quality of life would depend upon an ever-expanding collection of pumps, pipes, and locks maintained in perfect working order. These complex workings would create a higher risk of flooding by rivers during large rainstorms or by the sea due to a malfunctioning barrier.

The obvious response to this increased flood risk will be to raise levees around the edge of the Bay — precisely the action that the barrier was designed to prevent in the first place. And because the barrier would have damaged the wetlands that protect against erosion, the levees would now bear the full force of waves and would have to be even larger.

A much more sensible solution is for communities to bear the expense of planning the redesign of their shorelines to accept the rise of the ocean over time. By optimizing solutions now, we will minimize total cost over time. These solutions should include continued restoration of wetlands that can provide flood protection, construction of levees and seawalls where they are necessary, and the possible acquisition and change of use for particularly vulnerable low-lying areas. New infrastructure should be designed to accommodate the tides and storm surges of the future, and to meeting the needs of all communities in a just and equitable manner.

There are already projects being implemented around the Bay to adapt to sea level rise, and these efforts will be more effective as communities get increasingly involved in the future of their shoreline. Regional success will be enhanced by the sharing of innovative approaches, technical expertise and coordinated outreach to attract federal resources (goals of the [Bay Adapt](#) program).

By redesigning our shorelines, we can sustain for future generations the great benefits that our functioning estuary provides us today, including flood protection, clean water, thriving maritime commerce, wildlife habitat, access to nature for urban communities, and world-class recreation and tourism.

The Bay Area can be a coastal city that demonstrates how to adapt and thrive amid climate change. Or we can hold ourselves captive in a deteriorating 20th century landscape behind a dam trying to hold back the ocean.

It's not a hard choice.

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