

1-1-2013

The Challenges of Adapting to Climate Change in San Francisco Bay

Tim Eichenberg

Follow this and additional works at: https://repository.uchastings.edu/hastings_environmental_law_journal

 Part of the [Environmental Law Commons](#)

Recommended Citation

Tim Eichenberg, *The Challenges of Adapting to Climate Change in San Francisco Bay*, 19 HASTINGS WEST NORTHWEST J. OF ENVTL. L. & POL'Y 393 (2018)

Available at: https://repository.uchastings.edu/hastings_environmental_law_journal/vol19/iss2/18

This Article is brought to you for free and open access by the Law Journals at UC Hastings Scholarship Repository. It has been accepted for inclusion in Hastings Environmental Law Journal by an authorized editor of UC Hastings Scholarship Repository.

The Challenges of Adapting to Climate Change in San Francisco Bay

*Tim Eichenberg**

- I. THE IMPACTS OF CLIMATE CHANGE ON COASTAL COMMUNITIES AND SAN FRANCISCO BAY
- II. THE REGULATORY AUTHORITY NEEDED TO ADDRESS CLIMATE CHANGE IMPACTS
- III. SAN FRANCISCO BAY PLAN CLIMATE CHANGE AMENDMENTS
- IV. CLIMATE POLICY HIGHLIGHTS
- V. LESSONS LEARNED
- VI. SUMMARY

When gold was discovered in California, thousands of forty-niners left their schooners in San Francisco to seek gold in the Sierra foothills. The abandoned vessels became warehouses, offices, restaurants and even jails. Eventually they rotted away and, as the land was filled around them in the harbor, they became much of what is now the downtown financial district.¹ Thus began the filling of San Francisco Bay.

As the flood of fortune-seekers spread across San Francisco Bay, towns like Oakland and Sausalito sprang up overnight, using the Bay for landfills and commercial and residential development. The California Legislature conveyed approximately half the Bay to local governments, landowners, and developers to encourage further development, and large portions of the Bay were diked-off to create salt ponds, farms, and duck clubs (also called managed wetlands). By 1960, one-third of the Bay had been filled, and 90% of its wetlands destroyed.

* Adjunct Professor of Law, Vermont Law School, and former Chief Counsel, San Francisco Bay Conservation and Development Commission. This piece is an abbreviated version of a more lengthy article being prepared on this subject and is based in part on a previously published article in the *Golden Gate Environmental Law Journal* entitled, *Climate Change and the Public Trust Doctrine: Using an Ancient Doctrine to Adapt to Rising Sea Levels in San Francisco Bay*, 3 *GOLDEN GATE ENVT. L. J.* 2 (Spring 2010), by Tim Eichenberg, Sean Bothwell, and Darcy Vaughn.

1. HAROLD GILLIAM, *SAN FRANCISCO BAY* 62 (1957).

After a plan was released to reduce the Bay to a mere river,² three dynamic women from Berkeley decided to take action. They created a new organization called “Save the Bay,”³ and in 1965 successfully lobbied for legislation to create the San Francisco Bay Conservation and Development Commission (BCDC), which became the nation’s first coastal management agency. BCDC’s chief mission was to stop the filling of San Francisco Bay and ensure that the public had access to the shoreline.

By all accounts, BCDC has accomplished its twin goals of reducing bay fill and providing public access. Prior to 1965, about four square miles of San Francisco Bay were filled each year.⁴ Today, just a few acres are filled annually and only for public access and water-oriented uses. The Bay is now more than 17,000 acres larger than it was when BCDC was established, and public access to the shoreline has increased from four miles in 1965 to more than 125 miles today.⁵

But today the Bay is confronted with another, even more daunting challenge—global climate change and sea level rise. It is projected that the Bay may rise between sixteen and fifty-five inches during the next century. This would threaten 270,000 Bay Area residents and \$62 billion worth of shoreline development—nearly twice the development threatened in the rest of the State—including both international airports, Silicon Valley, much of the freeway system, and the Bay’s entire estuarine ecosystem.⁶

BCDC was created to stop the filling of the Bay, not to address the challenges presented by a bay expanding from rising sea levels due to climate change. In fact, the term “climate change” was not even mentioned in BCDC’s authorizing legislation until 2008, when it was amended to direct the agency to create a regional strategy to address “the impacts of, and adapt[ation] to, the effects of sea level rise and other impacts of global

2. RICE ODELL, *THE SAVING OF SAN FRANCISCO BAY: A REPORT ON CITIZEN ACTION AND REGIONAL PLANNING*, THE CONSERVATION FOUNDATION 8 (1972); San Francisco Bay Conservation & Dev. Comm’n, *History of the San Francisco Bay Conservation and Dev. Comm’n* (hereinafter, *History of BCDC*), available at <http://www.bcdc.ca.gov/history.shtml> (last visited Feb. 3, 2013).

3. The three women were Mrs. Catherine Kerr, Mrs. Sylvia McLaughlin, and Mrs. Esther Gullick. Mrs. Kerr’s husband, Clark Kerr, was the president of the University of California. ODELL, *supra* note 2, at 10-11.

4. *History of BCDC*, *supra* note 2.

5. SAN FRANCISCO BAY CONSERVATION & DEV. COMM’N 2011 ANNUAL REPORT, available at <http://www.bcdc.ca.gov/reports/2011%20BCDC%20Annual%20Report.pdf>.

6. S.F. BAY CONSERVATION & DEV. COMM’N, *LIVING WITH A RISING BAY: VULNERABILITY AND ADAPTATION IN SAN FRANCISCO BAY AND ON THE SHORELINE*, DRAFT STAFF REPORT 59 (2009), revised Sept. 23, 2011, available at http://www.bcdc.ca.gov/proposed_bay_plan/bp_1-08_cc_draft.pdf.

climate change on the San Francisco Bay and affected shoreline areas.”⁷ However, the amendment gave BCDC no additional authority to address the issue. Nor is the agency’s task made easier by jurisprudence extending the Fifth Amendment of the United States Constitution (the Takings Clause) to limit environmental and land-use regulations necessary to mitigate the impacts of climate change and sea level rise, as noted by many of the speakers at the 15th Annual Takings Conference where this paper was presented.

The predicament faced in San Francisco Bay is not unique; it is being confronted in bays and estuaries throughout the nation. Therefore, BCDC’s experience in adopting new policies to address rising sea levels in San Francisco Bay—which have been called historic—can provide useful lessons to other regions grappling with strategies to adapt to rising seas.⁸

I. The Impacts of Climate Change on Coastal Communities and San Francisco Bay

Climate change will have profound effects on the uses, boundaries, ecosystem, and infrastructure in and around San Francisco Bay during the next 100 years. By 2100, it is projected that average temperatures in California could rise between three and 10.5 degrees Fahrenheit,⁹ raising water levels in the Bay as much as sixty-nine inches and drastically changing the Bay’s shoreline.¹⁰ As part of its effort to educate the public about the effects of sea level rise on the Bay, BCDC produced maps showing that a one-meter rise in the level of the Bay could inundate 200 square miles of low-lying shoreline areas, including some of the region’s most valuable infrastructure and economic centers—such as the San Francisco and Oakland International Airports, portions of Silicon Valley, and much of the area between Richmond and San Pablo.¹¹

The combination of higher baseline mean sea levels, changes in river flows, and weather patterns are also likely to increase the frequency and duration of extreme sea level events and storm surges, threatening existing flood-control structures and prompting the construction of larger levees and

7. AB 2094 (enacted September 29, 2008), introduced by then-Assembly-member Mark DeSaulnier.

8. John Upton, *Bay Area Adopts Historic Climate-Change Rules*, THE BAY CITIZEN, (Oct. 6, 2011), available at <https://www.baycitizen.org/news/development/bay-area-adopts-sea-level-rise-building/>.

9. CLIMATE ACTION TEAM, CAL. ENVTL. PROT. AGENCY, DRAFT BIENNIAL REPORT 1.5 (2009), available at <http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF>.

10. *Id.* at 1.10.

11. See S.F. BAY CONSERVATION & DEV. COMM’N, *supra* note 6, at 59.

sea walls at the expense of the Bay's shoreline ecosystems. Much of the existing public access to and along the shoreline is also likely to flood by the year 2050.¹² The proliferation of seawalls and other erosion-control devices to protect existing development and low-lying areas may further exacerbate detrimental impacts on habitat, public access, and unprotected areas of the Bay.¹³ The cost of building static structures to protect against a fifty-five-inch rise in sea level by the end of the century could reach \$14 billion in California alone.¹⁴

II. The Regulatory Authority Needed to Address Climate Change Impacts

Within the Bay and below mean high tide, BCDC has considerable authority to address the impacts of climate change and sea level rise.¹⁵ The McAteer-Petris Act requires projects proposed within the Bay and certain waterways to demonstrate that the "public benefits . . . clearly exceed public detriment," that no alternative upland locations are available, and that any fill is the "minimum necessary." Harmful effects on water quality, the volume or circulation of water, marshes, fish, and wildlife must be "minimized," and sound safety standards are required to protect persons and property against unstable geologic or soil conditions, floods, and storm waters.¹⁶

These provisions provide ample authority for BCDC to mitigate a wide array of impacts from climate change and sea level rise that occur in the Bay below mean high tide, as well as within marshes, saltponds, and managed wetlands. For example, BCDC can require projects built on tidelands and submerged lands to be designed to withstand rising sea levels, require dredging or Bay fill to minimize impacts, and require water-oriented uses to be designed to protect persons and property from flooding. The agency's authority below mean high tide also is enhanced by the public trust doctrine, which supports the protection of recreation, navigation, commerce,

12. *Id.* at 18.

13. See Meg Caldwell & Craig Holt Segall, *No Day at the Beach: Sea Level Rise, Ecosystem Loss, and Public Access Along the California Coast*, 34 *ECOLOGY L. Q.* 533, 539-42 (2007).

14. *Id.*

15. CAL. GOV'T CODE § 66610(e) (Westlaw 2010) (listing certain waterways, including areas subject to tidal action and marshlands up to five feet above mean sea level).

16. CAL. GOV'T CODE § 66605(a)-(e) (Westlaw 2010).

open space, and the environment from the impacts of climate change and sea level rise within the Bay.¹⁷

However, most development occurs above mean high tide, where BCDC can only deny a permit for the failure to provide “maximum feasible public access, consistent with the proposed project, to the bay and its shoreline;” and even this limited authority applies only within a narrow 100-foot shoreline band.¹⁸ This makes it very difficult for BCDC to protect the shoreline from the impacts of rising sea levels and climate change on dry land, except to ensure that public access is constructed to accommodate flooding, alternative accessways are provided if public access is inundated, permits are denied where projected sea level rise would destroy or harm public access, and that fees are provided to mitigate impacts on public access. Moreover, projects located in the shoreline band are above mean high tide and therefore generally not subject to public trust protections (unless on filled tidelands), and also are subject to constitutional limitations imposed by the Fifth Amendment Takings Clause.

To more effectively address the impacts of sea level rise and climate change, an agency with limited shoreline authority like BCDC would need to either expand its jurisdiction landward or increase its land-use authority, or both, and this would require new legislation. Without additional authority and jurisdiction, BCDC remains unable to take many actions necessary to effectively address the impacts of climate change—such as prohibiting development in flood-prone areas, requiring development to be set-back a safe distance from the shoreline, requiring flood protection for development in vulnerable areas, ensuring that uplands are available for marsh migration, and regulating greenhouse gas emissions. However, expanding the jurisdiction and authority of an agency like BCDC is a difficult and perhaps politically infeasible proposition because the agency is located in an urban bay and estuary with nine counties and fifty-five local government jurisdictions likely to vigorously resist relinquishing local control over shoreline development. Although BCDC’s Bay jurisdiction will move inland as sea levels rise in the Bay,¹⁹ in the interim local governments will continue to retain the bulk of land use authority above mean high tide; and those governments generally lack the resources and in some cases the will, to take decisive action to adapt to the impacts of climate change and sea level rise.

17. See Tim Eichenberg, Sean Bothwell, and Darcy Vaughn, *Climate Change and the Public Trust Doctrine: Using an Ancient Doctrine to Adapt to Rising Sea Levels in San Francisco Bay*, 3 GOLDEN GATE U. L. REV. 234, 267-269 (2010).

18. CAL. GOV’T CODE § 66632.4. The Commission can also deny a project that is inconsistent with a priority use designation. CAL. GOV’T CODE § 66611.

19. Eichenberg, *supra* note 17, at 264.

III. San Francisco Bay Plan Climate Change Amendments

To address this dilemma, BCDC initiated an amendment to the San Francisco Bay Plan in 2008. BCDC initially prepared the Bay Plan in 1965 to address a broad array of issues including water quality, dredging, shoreline erosion, safety of fills, public access, appearance, design, and scenic views.²⁰ The 2008 draft Bay Plan amendments proposed a new section on climate change, and changes to existing findings and policies on tidal marshes and tidal flats, safety of fills, shoreline protection and public access.

The draft amendments proposed incorporating sea level rise projections into the project design, planning, and permitting process; preparing risk assessments for large projects based on the 100-year flood level and future sea level rise projections; and developing a regional climate change adaptation strategy with other regional, state, and federal agencies, local governments, and the general public to identify areas that should be protected, areas where development should be removed, and areas where sea level should be allowed to migrate inland.²¹ The draft amendments discouraged new development in areas vulnerable to flooding until such a regional strategy was developed, and advocated a precautionary approach to development in potential inundation zones.²² The amendments also proposed limiting new development that would either require the construction of shoreline protection devices like sea walls for the life of the project, or were not set-back from the edge of the shore above the 100-year flood level taking into account future sea level rise for the expected life of the project.²³

When BCDC drafted the new policies in 2008, it immediately encountered a host of conflicting stakeholder concerns. Environmental organizations were concerned that the draft policies did not adequately prevent the loss of habitat and beaches; the business community was concerned that the policies would reduce development opportunities and establish more burdensome regulation; local governments were concerned that the policies threatened local control; environmental justice advocates were concerned that the policies would lead to disinvestment and the abandonment of their communities; and labor organizations were concerned that the policies would lead to fewer jobs and economic opportunities.

20. S.F. BAY CONSERVATION AND DEV. COMM'N, S.F. BAY PLAN, http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan.shtml (last visited Mar. 19, 2013).

21. WILL TRAVIS & JOSEPH LACLAIR, S.F. BAY CONSERVATION & DEV. COMM'N, DRAFT STAFF REPORT AND REVISED PRELIMINARY RECOMMENDATION FOR PROPOSED BAY PLAN AMENDMENT 1-08 CONCERNING CLIMATE CHANGE 9 (Oct. 1, 2009), *available at* http://www.bcdc.ca.gov/proposed_bay_plan/bpa_1-08_cc_staff-rpt_11-05.pdf.

22. *Id.* at 11.

23. TRAVIS & LACLAIR, *supra* note 21, at 11.

BCDC staff tried to address these conflicting interests, and over the next two-and-a-half years, the climate policies continued to evolve. In 2009, BCDC issued a report entitled *Living with a Rising Bay*, dealing with San Francisco Bay's vulnerability to sea level rise,²⁴ and the State adopted the Climate Adaptation Strategy (CAS) recommending that projects in undeveloped, low-lying areas be discouraged.²⁵ Environmental organizations pushed to prohibit projects in such vulnerable areas in line with the CAS recommendations. Citing the inundation maps, the business community launched an intense lobbying and media campaign that riled up local governments and the environmental justice community, alleging that the policies were a BCDC "power grab."²⁶ BCDC staff and commissioners reached out to local governments in every county along the Bay, and conducted thirty-five community meetings and workshops in an effort to ease the concerns. Shuttle diplomacy was conducted between environmental representatives and the business community to try to resolve significant disagreements. The draft policies were revised and compromises were made to achieve a consensus on what was needed to protect the Bay and its shoreline. On October 6, 2011, three years after they were drafted, the Commission voted unanimously to adopt the revised policies.²⁷

IV. Climate Policy Highlights

BCDC's new climate policies establish a range of sea level rise projections (10-17 inches by 2050, and 31-69 inches by 2100),²⁸ and require risk assessments to be prepared to ensure that large projects are designed to be resilient to these or to other sea level rise projections established by the best scientific data available.²⁹ New projects on fill must be set-back to avoid flooding, elevated above expected flood levels, designed to tolerate flooding, or address flooding risks by other means.³⁰ Shoreline protection devices such as seawalls must be designed to withstand sea level rise

24. See S.F. BAY CONSERVATION & DEV. COMM'N *supra* note 6.

25. See CLIMATE ACTION TEAM, *supra* note 9.

26. J.K. Dineen, *Power grab threatens development: Bay commission, citing rising sea, seeks to expand turf*, S.F. BUS. TIMES, (Oct.17, 2010), available at <http://www.bizjournals.com/sanfrancisco/stories/2010/10/18/story1.html>.

27. S.F. BAY CONSERVATION AND DEV. COMM'N, CLIMATE CHANGE BAY PLAN AMENDMENT, http://www.bcdc.ca.gov/proposed_bay_plan/bp_amend_1-08.shtml (last visited Mar. 20, 2013).

28. S.F. BAY CONSERVATION AND DEV. COMM'N, S.F. BAY PLAN, CLIMATE CHANGE FINDING C, http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan.shtml (last visited Mar. 20, 2013).

29. *Id.* at CLIMATE POLICY 2 AND 3.

30. *Id.* at SAFETY OF FILLS POLICY 4.

projections, and utilize natural features and upland vegetation where feasible.³¹ The new policies “encourage” resilient development, such as transit-oriented development, redevelopment, remediation, and restoration, if regional climate benefits outweigh risks; and support the preservation of areas suitable for habitat enhancement and wetlands migration.³² Public access must be designed to remain viable for the life of the project or provide alternative access,³³ and a stakeholder process is called for to establish a “regional strategy” to protect critical shoreline and natural areas, enhance wetland migration, and plan adaptation strategies.³⁴

Although the new policies will help address the impacts of climate change and sea level rise in the Bay, the political process resulted in some significant compromises. Draft language was removed to “discourage” and “limit” development in low-lying areas. Instead, resilient infill and transit-oriented development, and the preservation of undeveloped low-lying areas are “encouraged.” In addition, the application of the new climate policies outside BCDC’s jurisdiction (essentially landward of the 100-foot shoreline band) was waived under the Coastal Zone Management Act (CZMA) and the California Environmental Quality Act (CEQA).

The CZMA and CEQA waivers were two of the most controversial changes made to the draft policies. The CZMA waiver means that the climate policies, such as the requirement to prepare risk assessments, will not be applied to federal or federally permitted activities lying outside BCDC’s jurisdiction as authorized by federal law even if those activities affect Bay resources (although other Bay Plan policies will continue to apply).³⁵ The CEQA waiver was intended to exempt application of the climate policies to environmental documents prepared for projects located outside BCDC’s jurisdiction,³⁶ although it is questionable whether policies in the Bay Plan can legally alter CEQA’s statutory requirements. Both waivers were deemed necessary to demonstrate BCDC’s good faith that the policies were not intended to extend its jurisdiction or burden development with unnecessary red tape.

Other significant changes involved replacing draft language that “prohibited” new projects in vulnerable areas that require shoreline

31. *Id.* at SHORELINE PROTECTION POLICY 1.

32. *Id.* at CLIMATE POLICY 7.

33. *Id.* at PUBLIC ACCESS POLICY 6.

34. *Id.* at CLIMATE POLICY 6.

35. The authority to review federal and federally-permitted activities outside the coastal zone that affect the land and water resources and land uses of the coastal zone is granted to California and all 34 states and territories with approved coastal management programs under the CZMA. 16 U.S.C. § 1456(c).

36. As required under CEQA Guidelines § 15125(d). PUB. RES. CODE § 21080.

protection, with language that allows shoreline protection for existing and proposed development that is consistent with other Bay Plan policies. A requirement to “guarantee” that the public will not be financially burdened by development in vulnerable areas was also revised, and replaced with language requiring “a financial strategy to *minimize* public burdens.” Draft language to “preserve, enhance or permanently protect” undeveloped, vulnerable, shoreline habitats to allow for inland migration was also revised, and replaced with policies calling for “special consideration” to be given to “encourage” the preservation and enhancement of significant undeveloped vulnerable habitat areas. Finally, a non-binding finding promoting use of the “precautionary approach” was removed.

V. Lessons Learned

Like most exercises in negotiating public policies that prescribe present actions to address future conditions, some valuable lessons were learned. First and foremost, never underestimate the human tendency to shoot the messenger. Publishing BCDC’s inundation maps was an important wake-up call for the Bay Area, but one that many people did not want to acknowledge, and the agency that prepared the maps was a convenient target for people’s frustration. In this case, the messenger (BCDC) was accused of attempting to extend its authority over areas depicted in blue in the inundation maps, many of which extended miles inland.³⁷

The fact that BCDC had absolutely no authority to extend its own jurisdiction, and was seeking no additional authority, was lost in the noise.³⁸ BCDC historically has had good relations with local governments and the business community, in part because many of their representatives sit on the Commission. In fact, the chair of the Commission at the time the climate change amendments were being considered was a business leader.

37. An anonymous and undated memo entitled “Does 100 feet = 1 Miles (Or More): The Facts and Law Regarding the Regulatory Reach of BCDC’s Bay Plan,” was distributed widely during consideration of the draft policies accusing BCDC staff of misleading the public by claiming that the draft policies would have no effect outside its jurisdiction and that they were advisory only under CEQA. Memorandum, anonymous (undated) (on file with author).

38. As noted above, the only exception applies to federal projects and those that require federal permits located outside BCDC’s jurisdiction which can be reviewed for consistency with BCDC’s enforceable policies under the federal Coastal Zone Management Act if those projects affect the Bay and its resources. 16 U.S.C. § 1456(c). *See supra* note 35 and accompanying text. This federal authority applies to all state coastal management agencies like BCDC and predated the initiation of the climate policies by more than 30 years.

Nevertheless, development and business interests spent nearly \$500,000 lobbying against the proposed climate policies.

The toxic effect of words like “limit,” “discourage,” and “precautionary” was surprising, even though the words used were suggestions and recommendations, not prescriptions. There was even considerable opposition to suggestions on how the impacts of climate change on the Bay could be mitigated or addressed. For example, there were objections to the suggestion that building on undeveloped low-lying areas vulnerable to storms and wave-run up was not a good idea in view of rising sea levels. To placate these objections, the draft policy suggesting that such development should be discouraged was removed, even though BCDC had no authority, and was seeking no authority, to prohibit such development.

Another lesson learned was that public hearings were insufficient to fully inform stakeholders. BCDC sent out notices to all interested parties that new policies to address climate change and sea level rise were being considered, but few people showed up for the Commission meetings. Shortly before the Commission was scheduled to vote, however, development and business interests launched an intensive lobbying campaign alleging that BCDC was trying to ram through policies that would undermine local government control, extend the reach of BCDC’s authority, and destroy jobs and economic opportunities in the Bay Area. As a result, business and local government representatives, the environmental justice community, and labor organizations inundated BCDC with letters and public comments asking the Commission to delay consideration of the policies until all affected parties were fully informed and had an opportunity to express their views.

Responding to the concerns, The Commission pulled back the scheduled vote and BCDC’s Executive Director Will Travis (now retired), BCDC staff, and several commissioners met with nearly every city council, board of supervisors, and business and civic organization in the Bay Area that had expressed reservations about the draft policies. As each concern and objection was explained and addressed, opposition to the policies began to subside. The lesson learned was that simply scheduling hearings before BCDC to discuss and consider the draft policies was not enough to fully inform all concerned stakeholders, and that a more proactive outreach effort was needed from the beginning.

Another lesson learned—or perhaps relearned—was that BCDC’s limited jurisdiction and authority over historic concerns related to Bay fill and public access, is ill-suited to address the effects of climate change and sea level rise on an expanding Bay. Broad partnerships with all concerned stakeholders, local governments, and other state, federal, and regional agencies are absolutely necessary if the Bay Area is to establish an effective strategy to address these effects. Of course, timing also is critical. In retrospect, proposing measures that could discourage development during

one of the worst economic downturns since the great depression was probably not the best timing.

VI. Summary

Despite its limitations, the process of amending the Bay Plan initiated valuable, productive, and necessary conversations about approaches to adapting to the effects of climate change; achieved an important consensus on long-range sea level rise projections for San Francisco Bay; and initiated a stakeholder process to establish a strategy to make tough decisions on where to allow new development and infill, where to protect existing development, and where to retreat and allow the Bay to migrate inland. In the final analysis, all Bay Area stakeholders must deal with these issues—not a single government agency. BCDC did the best it could with its limited jurisdiction and authority designed to address very different problems than those facing the Bay today. Some were surprised that a region as progressive as the Bay Area was not more receptive to innovative tools used in other jurisdictions to address threats from climate change and rising sea levels such as the use of the public trust doctrine, policies to allow wetlands to migrate inland, rolling easements, disincentives to development in hazardous areas, and requiring armoring waivers.³⁹ Consequently, new legislation and regulatory authority may ultimately be necessary to enact stronger measures to address these impacts if the new climate change policies prove ineffective to address the many challenges facing the Bay, and the comprehensive regional strategy called for to adapt to rising sea levels is not developed in a timely manner.

39. For a discussion of some of these tools see, Eichenberg, *supra* note 17; James G. Titus, *Rising Seas, Coastal Erosion and the Takings Clause: How To Save Wetlands and Beaches Without Hurting Property Owners*, 57 MD. L. REV. 1279, 1368 (1998); and *Rolling Easements*, EPA (June 2011), available at <http://water.epa.gov/type/oceb/cre/upload/rollingeasementsprimer.pdf>.

* * *