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San Francisco Bay Conservation and Development Commission



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A Climate Change Strategy for the San Francisco Bay Region

“The world we have created today, as a result of our thinking thus far, has problems that cannot be solved by thinking the way we thought when we created them.”
–Albert Einstein

Introduction

Over the past year, the San Francisco Bay Conservation and Development Commission (BCDC) has become increasingly concerned that continued sea level rise from global warming will have profound impacts in the San Francisco Bay region, largely because over 200 square miles of low-lying filled land borders the Bay. Because BCDC was created primarily to regulate Bay fill projects with the goal of preventing the Bay from becoming even smaller from unnecessary landfill projects, BCDC is neither legally responsible for dealing with this dramatic change of conditions that is making the Bay larger nor does BCDC have any explicit legal authority to address this problem. Nevertheless, the Commission has taken the initiative to formulate a broad outline of a comprehensive strategy for addressing climate change in the Bay region and identified changes that are needed in state law so that BCDC can play a productive role in implementing such a strategy.

This report is being provided to the public so that all interested parties can be aware of the ideas expressed in BCDC’s suggestions for a regional strategy and have an opportunity to engage in a thoughtful discussion on the critical issue of how government, businesses, the academic community, community organizations and the general public can most productively work together to address global warming in the Bay Area.

Meeting a New Challenge

Background

San Francisco Bay is the largest estuary on the west coast of the North and South American continents. When the California gold rush began in 1849, the open waters and bordering wetlands of the Bay covered 787 square miles, and this magnificent natural harbor teemed with wildlife. But the Bay was shallow; two-thirds of it was less than 12 feet deep. The unfortunate result was that as the new State of California began

to grow, the Bay began to shrink. Shallow tidal areas were diked off from the open Bay to create salt ponds, farmland and duck hunting clubs. Municipalities used the Bay shoreline as their preferred location for garbage dumps. Siltation from hydraulic gold mining in the Sierra foothills washed into the Bay and filled wetlands. Numerous land reclamation operations were undertaken to create dry real estate where Bay waters once flowed.

By the middle of the 20th century, the Bay's open waters had been reduced to 548 square miles and nearly a third of the Bay—239 square miles—was gone. In 1959, the U.S. Army Corps of Engineers published a report which concluded that it was economically feasible to reclaim another 325 square miles—60 percent of the remaining Bay—by 2020. The Bay Area public rejected the notion that the Bay should be allowed to become little more than a wide river. Working together, in 1965, Bay Area citizens convinced the California Legislature to establish a new state agency—the San Francisco Bay Conservation and Development Commission (BCDC)—and to empower the agency to regulate new development in the Bay and along its shoreline so that any future fill placed in the Bay would be largely limited to water-oriented uses that could not be accommodated on existing land.

BCDC has been highly effective in achieving this public policy goal. By limiting the use and size of new landfills and requiring mitigation in the form of wetland creation, BCDC has reversed the shrinkage of the Bay; it is now nearly 19 square miles larger than it was in 1965. With BCDC's support, 26,000 acres of privately-owned salt ponds have been purchased by the public to improve their habitat value and convert some of the ponds to intertidal wetlands, resulting in a further expansion of the Bay's size.

Global Climate Change

In March 2006, the California Environmental Protection Agency published a "Climate Action Team Report to the Governor and the Legislature," which evaluated three scenarios for reducing the amounts of greenhouse gases released into the atmosphere over the next century. Depending on whether and how much these emissions can be brought under control, the report projects that by 2100 average temperatures in California will rise between 3 and 10.5 degrees Fahrenheit.

One of the most publicized impacts of global warming is a predicted acceleration of sea level rise. This increase would increase the historic rate of sea level rise, which has been measured in San Francisco Bay for over 140 years. Between 1900 and 2000, the level of the Bay increased by seven inches. Depending which end of the range of projected temperature increases comes about, the California Climate Action Team found that water levels in San Francisco Bay could rise an additional five inches to three feet, or nearly one meter by the end of this century.

Using GIS data, BCDC has prepared illustrative maps showing that a one-meter rise in the level of the Bay could flood over 200 square miles of land and development around the Bay. BCDC is working in partnership with the Pacific Institute, with financial support from Caltrans, to determine the value of the development threatened with inundation. Initial estimates indicate that over \$100 billion worth of public and private development could be at risk.

The Challenge

To prevent San Francisco Bay from continuing to get smaller, the Legislature created BCDC and empowered it to exercise regulatory control over development in the Bay. After four decades of existence, BCDC has been accomplishing the public policy goal set out by the Legislature. However, the greatest threat to the Bay Area over the next century is that global climate change will make the Bay larger.

Under current law, BCDC has no authority to prevent development in areas likely to be flooded by sea level rise, no explicit authority to require that levees be built or any other action to be taken to protect shoreline development and no legal responsibility for reducing greenhouse gas emissions to slow the rate of sea level rise.

Fortunately, the Bay Area Air Quality Management District (BAAQMD), which has the primary legal responsibility for dealing with air pollution in the region, has initiated an aggressive program to reduce greenhouse gas emissions. About half of the carbon dioxide emissions in the region are generated by the transportation sector, primarily by cars and light trucks on the region's highways. Reducing these emissions requires some combination of building new vehicles that are much cleaner and reducing reliance on the private automobile as the primary mode of transportation in the region. To help achieve the latter goal, the Metropolitan Transportation Commission (MTC), the region's transportation planning and financial authority, and the Association of Bay Area Governments (ABAG), the regional council of local governments, are working together on strategies aimed at assuring that future growth in the region is more compact, more centered on transit corridors and more sustainable. MTC and ABAG have also joined with the air district to address climate change through a coordinating council called the Joint Policy Committee (JPC). BCDC has recently joined the JPC in a non-voting capacity.

This partnership of four regional agencies is encouraging and essential. But cooperation alone has its limitations. None of the four agencies has the authority to prohibit development in flood-prone areas, none even has the authority to require that levees be constructed to protect low-lying areas, and the BAAQMD does not have the authority to regulate emissions from vehicles. That responsibility seems to rest with the California Air Resources Board, but a coalition of automobile manufacturers have sued the State to challenge the validity of that authority.

BCDC is the only agency in this partnership with any authority to regulate land use, but BCDC's jurisdiction extends only over the Bay and a narrow strip along the immediate shoreline where the Commission's authority is quite limited. Local government has the most comprehensive authority over land use. There are 110 local governments in the Bay Area, 26 of which front on the Bay. Clearly, to deal most effectively with climate change and sea level rise in the Bay Area, a new partnership must be forged which draws on the best capabilities of federal, state and regional agencies, local governments, private enterprise and non-governmental organizations.

Meeting the Challenge with a New Bay Plan A bold, new plan for the Bay is needed to meet the challenges of climate change head-on. The goal of the plan should not be to protect and restore the Bay. Instead, the plan should be a design for a Bay that will have different sea level elevations, different salinity levels, different species and different chemistry than the Bay has today. The plan should be a pro-active adaptive management strategy aimed at putting conditions in place that can respond in a desired way to changes that will come about in the future as a result of climate change.

The first step in preparing this plan should be to determine more precisely which shoreline areas are vulnerable to flooding from sea level rise. Next, the flood-prone areas that are already occupied by high value development that are too valuable not to protect should be identified and a regional flood protection strategy should be prepared to ensure that the needed dikes, levees and other protective devices will be built. There is a double challenge when building levees in the Bay Area. The levees have to be big enough and strong enough to hold back rising seas, storm surges and floods, and they have to be able to do all this during an earthquake.

The next flood-prone areas to be identified are those where it may be more cost-effective to remove existing development than to protect low-value structures. Making these choices will be difficult, particularly if the areas contain significant environmental, aesthetic, social, cultural or historic resources or where the removal would raise environmental justice issues.

The third category of low-lying areas in need of study encompasses those that are planned for development but have not yet been built. It may prove to be better to abandon these plans than to allow the development to be built and then face the cost of trying to protect it from inevitable flooding. Many such areas exist at the eastern edge of the Bay Area and in the Sacramento-San Joaquin Delta. Also, another probable impact of climate change is that more precipitation in the Sierra Nevada will fall as rain rather than snow, and the snow pack will melt earlier in the spring. In turn, this will reduce late spring and summer runoff into the Delta, allowing salt water to extend farther into the Delta than it does now. Sea level rise and higher flood flows resulting from climate change, as well as earthquake risk, will also increase the probability of catastrophic failure of levees. These conditions could result in the Delta becoming a more estuarine ecosystem. Therefore, the Bay Area's planning should be closely coordinated with the planning for the Delta.

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Pulling existing development back from the Bay shoreline and foregoing planned development of low-lying areas can provide an opportunity to expand the restoration of tidal wetlands. Tidal wetlands can play a key role in a climate change strategy. Wetlands are like sponges that soak up flood waters, and they sequester carbon. Thus, they are both adaptive to climate change and help mitigate its impacts.

[About The Bay and BCDC](#)

This plan should be prepared by a regional agency partnership that takes full advantage of the unique strengths, expertise and experiences of BCDC, MTC, ABAG and the BAAQMD, in cooperation with local governments, with the JPC providing the overarching management of the development and implementation of the plan. This plan could be completed in eight years as shown below. Although this schedule is ambitious, any delay will simply allow the problems the region is facing to become acute crises.

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An Eight-Year Work Program

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- In **year one**, BCDC prepares a detailed map of the areas around the Bay and the Suisun Marsh likely to be inundated by sea level rise within the next 50 years¹. BCDC's permit jurisdiction is expanded to encompass the area shown on the map.
- In **years two and three**, ABAG determines the economic value of all resources within the area likely to be flooded, the cost of protecting high-value resources, and the cost of removing or relocating lower-value resources. ABAG's determination must be approved by the JPC prior to final approval by ABAG.
- In **years four and five**, BCDC prepares a plan for the Bay that will protect the most important natural and man-made resources from inundation and enhance the biological productivity of the Bay estuary. BCDC's plan must be approved by the JPC prior to final approval by BCDC, after which all BCDC, MTC, ABAG and BAAQMD regulatory, planning and funding decisions must be consistent with the plan.
- In **years six through eight**, each Bayfront local government prepares:

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1. a sea level rise protection program that identifies needed levees and other infrastructure;
2. a relocation and resource enhancement program; and
3. a sustainability program that will offset greenhouse gas emissions from new development. Programs #1 and #2 must be approved by the JPC. Program #3 must be approved by the BAAQMD.

State Legislation

To allow this eight-year work program to be carried out and comprehensive regional strategy developed and implemented to address climate change in the Bay Area, state law should be enacted to require and authorize the following to be accomplished:

1. BCDC's permit and planning jurisdiction should be expanded eastward so that it includes all of the Bay and waterfront area along the Bay/Delta shoreline of Solano County and Contra Costa County to enable BCDC to more effectively participate in the formulation and implementation of regional public policy decisions that have been endorsed by the Joint Policy Committee.
2. Within a year, BCDC should be required to prepare a detailed map that depicts the areas that are most likely to be inundated around San Francisco Bay and the Suisun Marsh within the next 50 years as a result of projected sea level rise. The map should reflect scientific consensus on the highest rates of sea level rise expected within the scenario that reflects current global emission trends. BCDC should be required to update this map at least once every ten years.

Upon the completion of this map, BCDC's permit jurisdiction should be expanded to encompass the area shown on the map, and any proposed new development that is within the area likely to be inundated by sea level rise should be required to obtain approval both from the local government and from BCDC. Until the JPC has certified a new Bay plan as described in #5 below, BCDC should be allowed to approve a proposed development only if either: (a) the proposed development is located within an existing highly-developed area that will have to be protected from sea level rise even if the new development were not built; or (b) the proposed development includes measures that are adequate to protect it from sea level rise.

3. Within two years after the completion of the map described in #2 above, ABAG should be required to complete the following economic determination of:
 - a. The economic value of all natural resources, along with all existing and permitted man-made resources ², within the area expected to be impacted by sea level rise;
 - b. The cost of protecting these resources from inundation through the construction of seismically-safe levees or sea walls, raising the elevation of infrastructure or implementing other shoreline protection strategies; and
 - c. The cost of removing or relocating the resources that are projected to be inundated in those areas where ABAG has determined that the cost of protection exceeds the value of the resources.

ABAG should be required to update this determination within two years after each of BCDC's update of the map described in #2 above.

4. Within two years of the completion of the determination described in #3 above, BCDC should be required to prepare a plan that describes a 50-year vision for San Francisco Bay and the Suisun Marsh that accommodates projected sea

level rise by identifying:

- a. the most significant structural, environmental, aesthetic, social, cultural and historic resources that must be protected from inundation; and
 - b. those areas that are inappropriate for protection from inundation. In addition to using an economic cost-benefit analysis to identify these areas, a primary goal of the identifications should be to enhance the biological productivity of the San Francisco Bay estuary while addressing environmental justice issues. BCDC should be required to fully integrate its planning for the Bay and the Suisun Marsh with the planning by the Department of Water Resources and whatever entity emerges as the primary Delta planning authority. The Suisun Marsh Charter Group should be required to address the impacts of climate change, potential catastrophic levee failure and salinity increases in its planning, and such planning should be incorporated into the plans prepared for San Francisco Bay by BCDC and for the Delta by its respective planning authority.
5. To ensure that ABAG's economic analysis and BCDC's planning policies are fully integrated with the region's plans and programs dealing with transportation, air quality, housing, employment, seismic hazards, water quality and general land use, the determination described in #3 above and the plan described in #4 above should be reviewed and approved by the regional Joint Policy Committee prior to final adoption of the determination by ABAG and the plan by BCDC. The JPC should review and approve each update of ABAG's determination and BCDC's plan.

Upon approval of the plan by BCDC, all transportation planning and funding decisions by MTC, all land use planning and funding decisions by ABAG, all air quality regulatory and funding decisions by the BAAQMD, and all planning and regulatory decisions by BCDC should be required to be consistent with the plan.

6. Within three years after the final regional certification of the plan described in #4 above, each local government having jurisdiction over areas which the map described in #2 above indicates will be subject to inundation from sea level rise should be required to prepare:
- a. A local sea level rise protection program that identifies the levees, seawalls, recon-struction and other infrastructure and activities that will have to be constructed or carried out to safeguard those areas and resources that the regional plan identifies as being in need of protection from inundation;
 - b. A local relocation and resource enhancement program that identifies: (1) the activi-ties that will have to be carried out to remove or relocate facilities from those areas that the regional plan identifies as being inappropriate for protection; and (2) the activities and programs that will have to be carried out to achieve environmental enhancement in those areas that the regional plan identifies as being most suitable for these purposes; and
 - c. A local sustainability program that specifies the programs, activities, regulations and other means the local government will undertake to ensure that any new development authorized anywhere within the local jurisdiction will not result in a net increase in the amount of greenhouse gases being emitted into the atmosphere.
Each local government should be required to update each of its three local programs within three years after each update and re-certification of the plan described in #4 and #5 above.

7. Each local government should be required to submit its sea level rise protection program and relocation and resource enhancement program to the Joint Policy Committee, which should be required to evaluate each program to determine whether they are adequate. Each local government should also be required to submit its sustainability program to the BAAQMD, which should be required to evaluate it to determine whether it is adequate. Until the JPC and the BAAQMD determine that all three of each local government's programs are adequate, any proposed new development that is within an area that the map described in #2 above indicates is likely to be inundated by sea level rise, should be required to obtain approval both from the local government and from BCDC.

BCDC should be allowed to approve a proposed development only if it meets the following three criteria:

- a. the BAAQMD has determined that the development will not result in a net increase in the amount of greenhouse gases being emitted into the atmosphere;
 - b. if the development is proposed within an area that the plan described in #3 above indicates should be protected from inundation, the development can be approved; and
 - c. if the development is proposed within an area that the plan described in #4 above identifies as being inappropriate for protection from inundation, the development should be approved only if the project is essential to meet an immediate overriding regional need and the project is designed so either it can accommodate predicted water level increases (e.g., by being built on pilings or being able to float) or it will be constructed in a manner that makes it economically feasible and physically possible to relocate or retire the development from use before sea level rise inundates the development.
8. If a state agency that is not required to gain local approval for its activities proposes to undertake a project within an area that the map described in #2 above indicates will be subject to inundation from sea level, the state agency should be required to get a permit from BCDC. If the JPC has approved the sea level rise protection program and the relocation and resource enhancement program, and the BAAQMD has approved the sustainability program for the jurisdiction in which the project would take place, BCDC should be required to base its permit decision on whether the project would be consistent with the three programs. If any of the three local programs has not yet been approved, BCDC should be allowed to approve the proposed development only if it meets the following three criteria:
 - a. the BAAQMD has determined that the development will not result in a net increase in the amount of greenhouse gases being emitted into the atmosphere;
 - b. if the development is proposed within an area that the plan described in #4 above indicates should be protected from inundation, the development can be approved; and
 - c. if the development is proposed within an area that the plan described in #4 above identifies as being inappropriate for protection from inundation, the development should be approved only if the project is essential to meet an immediate overriding regional need and the project is designed so either it can accommodate predicted water level increases or it will be constructed in a manner that makes it economically feasible and

physically possible to relocate or retire the development from use before sea level rise inundates the development.

9. BCDC should be required to amend its federally-approved state coastal management pro-gram to incorporate all of the above provisions so that federal projects and activities are subject to the same public policy objectives as are state, local and private projects and activities.
10. State funding should be appropriated to provide the financial support needed to prepare the map described in #2 above, the determination described in #3 above, and the plan described in #4 above, to complete the certification described in #5 above, and to carry out the entire planning and regulatory program described above. State funding should also be appropriated to ABAG to implement the plan described in #4 above in the form of grants: (a) to local governments to prepare local sea level rise protection programs, local relocation and resource enhancement programs and a local sustainability program; and (b) to local governments and state agencies to implement approved local programs. This cost of carrying out all these initiatives will be so high that it will likely be necessary for the California Legislature to put a bond measure on the ballot to pay for these costs, along with similar costs for other parts of the California coast.

For further information or to comment on this proposal, please contact BCDC's Executive Director, Will Travis, (415/352-3653 travis@bcdc.ca.gov)

¹ It is particularly difficult to develop a thoughtful strategy for dealing with sea level rise in the Bay when the temperature increase scenarios used by the California Climate Change Center yield possible increases in water level in San Francisco Bay over the next 100 years that have a tenfold difference between the lowest and highest potential increases. The uncertainties inherent in planning for the future can be reduced by half by developing a strategy with a 50-year time horizon and updating the strategy every ten years to incorporate emerging information. A 50-year planning horizon is short enough to offer more certainty, yet long enough to amortize most capital investments made in accordance with the strategy.

² The man-made resources to be identified should include the complete range of all built infrastructure, including buildings, road and rail networks, airports, waste treatment facilities, parks, utilities and any other public or private physical structure, facility or improvement that could be damaged or suffer a loss in economic value if exposed to inundation or would result in costs to society if flooded, such as landfills and contaminated lands.

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