



Photo: Noah Berger



Photo: Karl Nielsen



## 5 | Environment

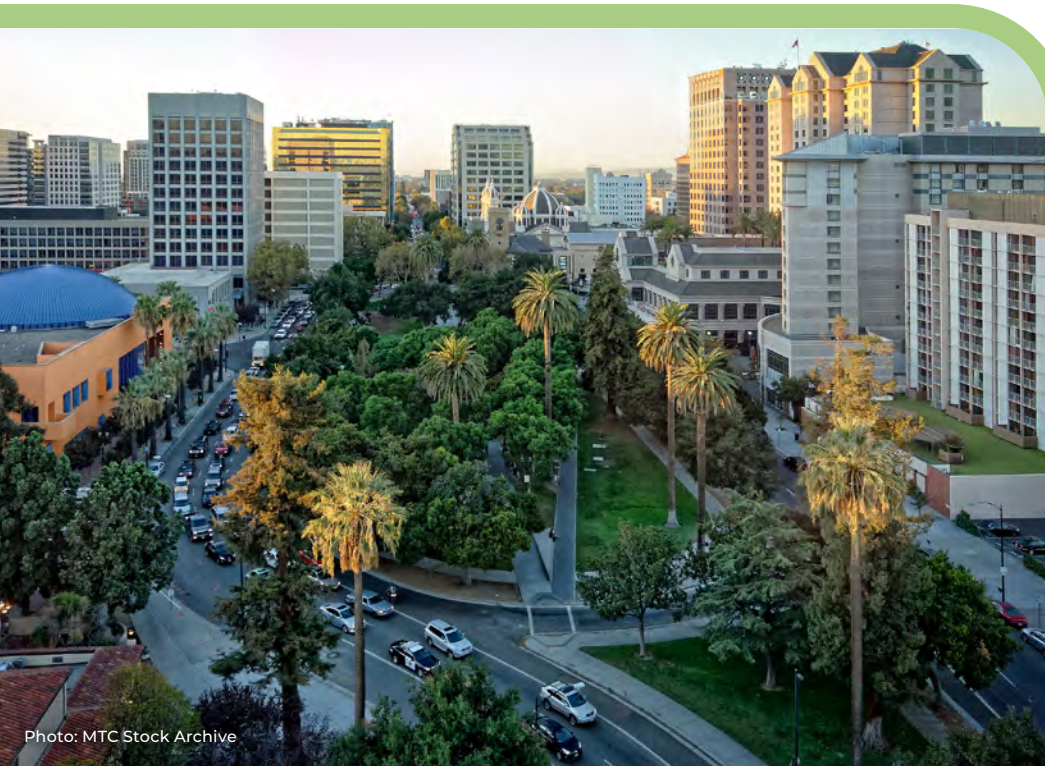


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## A LONG-RANGE VISION FOR THE ENVIRONMENT

A healthy natural environment is the foundation for a thriving society. Without fresh air to breathe, clean water to drink, access to nature, and protection from hazardous threats, investments in transportation, housing and economic systems can only go so far to ensure a good quality of life.

What's more, public health orders that confined many to their own neighborhoods throughout 2020 revealed an acute need for more open space. From parks and trails to outdoor dining, quality outdoor spaces near home are more essential for health and recreation than ever before.

For many, the natural beauty and scenic destinations in all nine Bay Area counties are the primary reason to live in the area. Yearlong temperate weather; fresh food from local farms; and easy access to beaches, forests and mountains have lured residents and visitors alike to the region for centuries. All residents should be able to enjoy these natural riches, but currently access to open space is not shared equally. Threats like climate change and earthquakes also loom large over the region. Bold and timely actions during the next 30 years can ensure that the natural environment is protected from hazards and shared more equitably among the residents who rely on it. California and the Bay Area are leaders in environmental awareness and advocacy, and with thoughtful policies and investments that center equity, governments and their partners can ensure the continued beauty, health and prosperity of the land, water, air and people of the Bay Area.

Photo: Ben Botkin

## Planning for Resilience to Environmental Uncertainty

Plan Bay Area 2050 prioritizes the preservation and improvement of land, air and water in Bay Area communities through strategies that conserve and better use current resources, mitigate climate change effects, and adapt to hazardous climate or seismic events. Near-, medium-, and long-term strategies are all crucial to realizing a vision of an equitable and resilient natural environment in the face of uncertainty. This chapter's strategies fall under three themes to ensure that the Bay Area is environmentally — and equitably — thriving in 2050:

- 1. Expand access to parks and open space:** Plan Bay Area 2050 proposes strategies to expand and modernize the Bay Area's open spaces. These spaces range from ecosystem-critical conservation lands to community-building gathering spaces like parks, trails and recreation facilities. Urban growth boundaries established by local jurisdictions as of 2020 would be maintained as housing strategies support growth within an existing urban footprint.
- 2. Reduce climate emissions from vehicles:** The plan seeks to mitigate emissions and reduce future climate impacts at the employer level by expanding commute trip reduction programs at major employers. On an individual level, the plan encourages Bay Area residents to drive less through transportation demand management initiatives. When people do choose to drive, Plan Bay Area 2050's strategy to expand clean vehicle initiatives could help them purchase and power their cars with the most environmentally friendly options.
- 3. Reduce risks from hazards:** The plan puts forward strategic adaptation measures to address inevitable climate change and other natural hazards. Seismic and wildfire impacts are addressed by providing means-based financial support to retrofit residential buildings. Energy upgrades to enable carbon neutrality in all commercial and public buildings help to ensure health and safety for everyone. Finally, Plan Bay Area 2050 would fund adaptation measures that protect residents from the dangers of sea level rise.



### ADVANCING EQUITY THROUGH ENVIRONMENT

In an equitable future, all Bay Area residents, regardless of race, age or income, would have access to open space, clean air and water, safe housing, and a full suite of sustainable transportation choices. Climate change's effects grow more hazardous with each additional degree in global temperature, and they are felt most acutely by underserved communities of color and people with lower incomes — people who often already face uncertain housing situations and health risks before any shock to the region hits.

Equitable environmental strategies must account for past injustices and seek to improve housing stability for those most at risk of displacement due to environmental causes, ensuring the most vulnerable communities are prepared to withstand a range of future environmental shocks. Plan Bay Area 2050 proposes long-term strategies and means-based support to protect those most at risk from environmental hazards and the effects of climate change, including retrofitting residential buildings against wildfires and earthquakes and protecting vulnerable communities from sea level rise.



## STRATEGIES Expand Access to Parks and Open Space

COVID-19 has exposed just how valuable access to parks and open space can be. Historically, access to parks and open space has been more limited in neighborhoods where low-income people of color live than in wealthier, whiter neighborhoods, largely due to housing and land use decisions. Parks in well-resourced, historically exclusionary areas are more numerous and of higher quality. The need to protect and expand open space, particularly in places with dense housing or limited access to quality parks, has never been clearer.

Whether for exercise, relaxation or socialization, the ease with which a person can access safe, well-maintained parks and open spaces can play a role in physical and mental wellbeing. Aside from these direct benefits, research has shown that greening efforts like planting street trees and expanding parks provide important long-term public health benefits enjoyed by all residents, like improving local air quality and providing shade to reduce extreme heat. Engaging with local communities to create and enhance parks where many people live and work, without displacing residents, is particularly important to equity goals. Additionally, improving access to the Bay Area's open spaces on the periphery of urban areas is key to ensuring equitable access to our region's natural riches. Plan Bay Area 2050's transportation strategies help more people access these spaces by supporting community-led transportation enhancements, eliminating barriers to multi-operator transit trips, and improving the region's roads and highways.

In addition to recreation and health benefits, undeveloped open spaces outside the region's urban footprint play a role in limiting sprawl and supporting climate goals. Restricting future development so that these open spaces remain in their natural state focuses development within more sustainable places — those that are near major employment centers and close to, if not already connected to, services and utilities. Such focused development patterns reduce the number of cars on the road and associated emissions from transportation and other sources. Developed lands on average produce an order of magnitude more greenhouse gas emissions than agricultural or natural lands,<sup>1</sup> but emissions vary by type of developed land: walkable, transit-friendly neighborhoods have a lower climate footprint than poorly connected, low-density neighborhoods where driving is the primary form of transportation. Creating and improving parks, while also implementing more sustainable land management practices, will improve resilience to wildfires and other hazards, enhance the ability of lands to sequester and store carbon, support urban greening, and provide employment opportunities.



1 US EPA. (2021). *Sources of Greenhouse Gas Emissions*. <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>



Plan Bay Area 2050 includes strategic investments to **modernize and expand parks, trails and recreation facilities** that will help ensure that the Bay Area’s growing population has access to open space, regardless of where they live. With a forecasted 35% increase in the Bay Area’s population by 2050, additional investments in parks and recreation facilities are essential to prevent overcrowding and degradation of these vital community resources. Keeping these spaces in a state of good repair, and furthermore, upgrading them to improve accessibility for people with disabilities or better provide community-tailored programming, can elevate the role of these spaces in building strong, equitable communities. Collaborative action to locate new park facilities in neighborhoods that currently lack open space, including Equity Priority Communities and other historically disinvested areas, would work toward equity goals. Such steps could build toward a future where all people have an open space in their community where they can relax, connect and play.

The Bay Area is sustained by its natural lands, ranging from the farms and fields that support our local food systems to buffer zones that stand between wildfire-risk areas and cities or towns. The protection and management of these natural lands has numerous benefits, ranging from carbon sequestration, which slows climate change, to water purification, groundwater storage and flood mitigation. These highly valuable ecological benefits are costly to provide artificially; in many cases, they are impossible to replace once they are lost. Plan Bay Area 2050 outlines further actions to **protect high-value conservation lands** that can ensure today’s natural lands continue to thrive well into the future. Regional funds that augment local investments to conserve and manage critical lands would support a regional goal of protecting and maintaining over 2 million acres of open space by 2050.

In order to curb urban sprawl, Plan Bay Area 2050 **maintains urban growth boundaries** already established by local jurisdictions and counties as of 2020. There are currently a variety of locally adopted land use policies that limit where greenfield development may occur. Maintaining boundaries for urban growth will direct new growth within an existing urban footprint, rather than allowing for further sprawl, while simultaneously preserving invaluable open spaces. Strategies described in detail in the housing chapter, such as strategies to allow more housing in Transit-Rich Areas or High-Resource Areas, are projected to spur enough new housing construction to accommodate all projected household growth. The housing needs of a growing region can be balanced in a way that fosters more inclusive communities, supports sustainable transportation choices, and works toward environmental health.



Photo: Ben Botkin





## NEW DEVELOPMENT AND TRANSPORTATION IMPACTS SENATE BILL 743 AS EMERGING POLICY

Senate Bill 743 (S. Steinberg, Statutes of 2013), implemented across the state in 2020, represents a rethinking of the transportation impacts of development. Historically, California environmental review has evaluated the transportation impacts of new developments based on their forecasted change in traffic congestion as measured by level of service, a method to qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, maneuverability, delay and safety. Infill development in existing neighborhoods, when measured by level of service, could appear to be more environmentally harmful than development on

greenfield sites in uncongested exurbs due to existing congestion within the already urbanized area. SB 743 updates the environmental review process to focus instead on the amount of new driving — as measured by vehicle miles traveled — that development incentivizes. As a result, developers may shift their anti-congestion priorities from roadway widening to support for shared or active travel or transportation demand management. While it is still too soon to quantify the impacts of SB 743, this reframing of environmental review is a significant new approach that will influence regional climate and housing production goals.





## STRATEGIES Reduce Climate Emissions

The importance of addressing climate change in the face of ever-worsening events like fires, drought, extreme heat and flooding — and the inequitable burdens they all impose — calls for a swift and sustained reduction in greenhouse gas (GHG) emissions across multiple sectors. Senate Bill 375 (A. DeSaulnier, Statutes of 2008), a state mandate to reduce GHG emissions from transportation, calls on regions across the state to combat climate change by coordinating land use and transportation planning across cities and counties.

The following environmental strategies work in concert with other strategies described in the housing, transportation and economy chapters of Plan Bay Area 2050 to reduce climate emissions. When implemented together as one package of policies and investments, the 35 plan strategies reduce GHG emissions by: focusing housing and commercial construction in walkable, transit-accessible places; investing in transit and active transportation modes; and shifting the location of jobs to encourage shorter commutes.

Strategies in this chapter recognize that action is needed at a variety of scales and on different timelines. Employers contribute by encouraging their employees to commute sustainably through incentives and disincentives. For individuals, the plan offers policies that support more sustainable transportation choices and promote access to zero-emissions vehicles. Outside the realm of transportation, buildings are retrofitted to be more efficient and emit less pollution. Together, these strategies could make a dramatic dent in the Bay Area's climate emissions, meeting state-mandated targets while simultaneously advancing equitable outcomes.

Nearly one in four trips taken on a typical day in the Bay Area is a commute trip. Plan Bay Area 2050 encourages sustainable commuting habits by **expanding commute trip reduction programs at major employers**. This strategy would require larger firms to provide alternatives to their workers to reduce their rates of driving alone to the workplace. Plan Bay Area 2050 includes significant investments in transit service enhancements, bike lanes and trails, and high-speed internet infrastructure, enabling a future with greener commutes. Employer policies that allow employees to work from home or commute without their cars leverage these investments.



Photo: Peter Beeler

This strategy relies on both increased work-from-home options and a package of incentives and disincentives to encourage more commutes by shared modes (like transit or carpooling) or active modes (like walking or biking), rather than driving alone. The benefits of these options go far beyond climate emissions. Even amid the obvious employment stresses they brought on, stay-at-home orders associated with the COVID-19 pandemic also demonstrated to many workers and employers the quality-of-life benefits that periodic working from home can bring. Increased telecommuting could also relieve pressure on crowded trains, buses and roadways at peak hours.

By the year 2035, large employers would have to ensure that no more than 40% of their workforce commutes by car on an average workday under the Plan Bay Area 2050 vision. To minimize impacts on small businesses and rural jobs, businesses with fewer than 50 employees would be exempt from this policy, as would agricultural employers. Each employer would have the flexibility to choose the right set of tools for their employees to meet or exceed this target.

Employers may provide free or subsidized transit passes to encourage transit use over car commuting, for example, or direct cash subsidies for employees who choose to walk, bike or telecommute. Parking lots could be reduced in size or eliminated, with the land reused for housing. Compressed work schedules could be yet another tool for employers to help reduce the number of workers commuting by car on any given weekday.

Next, **expanding transportation demand management initiatives** can support and augment employers' commute programs, providing a path to emissions reductions at the individual level. There are many different approaches that make it easier for individuals to shift behavior away from driving alone. Collectively, these approaches are known as transportation demand management (TDM). By reducing Bay Area residents' need to drive alone and making sustainable choices more attractive, government and employers can encourage behavioral shifts that result in fewer cars on the road. Traffic, GHG emissions, and road fatalities and injuries will all decline as a result. Transportation demand management is an area ripe for partnership between regional government, local jurisdictions and the private sector, as well as an opportunity to partner with the state Legislature and the Bay Area Air Quality Management District.

Today, a number of transportation demand management programs are already in place to promote more sustainable travel, including bike share and car share programs and locally imposed trip caps that limit the number of vehicle trips to and from specific employment areas. The Bay Area Commuter Benefits Program, codified into law in 2016, mandates that all employers in the Bay Area with 50 or more full-time employees offer their employees benefits that encourage alternatives to solo car commuting. MTC also coordinates several other transportation demand management initiatives, such as vanpools, education programs, and mobility hubs that concentrate transit and other shared commute options at community spaces. These programs and others like them would receive funding and additional support at the regional level to compound their impacts and reach more Bay Area residents.





Every auto trip begins and ends at a parking spot, making parking another transportation demand management tool with great potential to shift individual behavior. There are a number of approaches at policymakers' and employers' fingertips related to parking that can encourage people to use alternatives to driving alone to work. For example, commuter benefits programs can financially incentivize employees to take transit, and eliminating free parking at workplaces may discourage them from driving. An oversupply of parking encourages driving and impacts everyone, whether they drive or not. In addition to the harmful environmental effects of increased driving, the costs of constructing and managing parking in a building are typically passed on to property owners and renters. Land currently used for personal vehicle storage also prevents other potentially valuable uses of the space, such as housing or parks.

However, there are enduring policies in many cities and counties that mandate building a minimum number of parking spaces at new housing and office developments, regardless of demand. Removing parking mandates can allow for parking to better match market demand while aligning with transportation demand management strategies that reduce driving and traffic. Implementing this strategy benefits housing affordability as well, by allowing developers to forgo the expense of adding unnecessary parking and pass those savings on to renters or homebuyers.

While Plan Bay Area 2050 seeks to reduce the overall need for vehicle trips, it also recognizes that every trip is different and that cars will continue to be a transportation option into the future. In addition to the above strategies that reduce car trips, the plan also explores strategies that can make those remaining auto trips as sustainable as possible by **expanding clean vehicle initiatives**. The long lifespan of most vehicles presents an opportunity for Bay Area residents to retire their older, more polluting vehicles in exchange for rebates to buy zero-emission vehicles.

Aside from support for vehicle purchasing, a suite of supportive programs within MTC's Climate Initiatives Program would further facilitate the adoption of clean vehicles. These programs include a regional electric vehicle charger network and incentives to trade in fossil fuel-powered vehicles for electric vehicles. To advance equity through clean vehicle initiatives, Plan Bay Area 2050 places a specific emphasis on providing charging infrastructure in Equity Priority Communities and supporting households with low incomes to choose electric when replacing vehicles.



Photo: Noah Berger





Photo: Karl Nielsen

## CLEAN AIR PLAN

### THE AIR DISTRICT'S STRATEGY FOR POLLUTION REDUCTION

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The Bay Area Air Quality Management District (Air District) is the Bay Area's air pollution control agency. In 2017, the Air District adopted *Spare the Air, Cool the Climate*, its current Clean Air Plan, which provides a regional framework to meet state and federal air quality standards and work toward eliminating health risk disparities from exposure to air pollution. The Clean Air Plan further defines a vision and a regional climate protection strategy for transitioning to a post-carbon economy and achieving ambitious state greenhouse gas reduction targets for 2030 and 2050. While Plan Bay Area 2050's strategies work to reduce per-capita CO<sub>2</sub> emissions from vehicles and buildings, the Air District's plan addresses a much wider range of pollutants from a much larger number of sources. To that end, Plan Bay Area 2050 is one piece of the air quality puzzle, but additional policies and investments are needed to meet the Air District's more ambitious targets.

Several Plan Bay Area 2050 strategies align with Clean Air Plan strategies, including road pricing, advancing electric vehicle adoption, and retrofitting buildings to be more

energy-efficient and carbon-neutral. In addition, the Air District advocates for limiting fossil fuel combustion at industrial facilities, stopping methane leaks, reducing exposure to toxic air contaminants, promoting clean fuels, and supporting community choice energy programs throughout the Bay Area as part of its plan.

Since 2017, the Air District's Community Health Protection Program has also been working with Bay Area communities to plan and implement Assembly Bill 617 (C. Garcia, Statutes of 2017), a mandate to improve community health and promote equity by reducing exposure to air pollutants in neighborhoods most impacted by air pollution. Air District staff work closely with state, local and regional governments, including MTC and ABAG, as well as community groups and other stakeholders, to identify and reduce harmful air pollutants. Strategies included in Plan Bay Area 2050 advance equity by aligning with the goals and objectives of the Community Health Protection Program to target investments where they are most needed.





Photo: Noah Berger

## STATE ACTION ON VEHICLES

The Bay Area is not acting alone to promote a more sustainable future. Several mandates and pieces of legislation have been enacted in recent years at the state level to address GHG emissions, including California Executive Order N-79-20 (2020), which requires all new vehicles sales to be zero-emission vehicles by 2035. Plan Bay Area 2050's clean vehicle strategy accelerates the Bay Area's transition in advance of the state mandate by subsidizing charging infrastructure required to support an all-electric future and by promoting incentives to encourage vehicle owners to trade in their older, high-polluting cars for zero-emission vehicles. The state

mandate will require significant support to achieve, particularly to reach lower-income buyers, and Plan Bay Area 2050's investment in a buyback incentive will help the region step up to meet the state's goals.

Additionally, Senate Bill 1014 (N. Skinner, Statutes of 2018) establishes new requirements for transportation network companies (such as Uber and Lyft) to curb GHG emissions. The California Public Utilities Commission and the California Air Resources Board are in the process of finalizing the regulatory framework; the companies will be required to develop a GHG emissions reduction plan and begin meeting their GHG reduction targets by 2023.





## STRATEGIES Reduce Risks From Hazards

The most high-profile, and more visibly destructive, environmental events come from hazards like extreme weather, wildfires, earthquakes and sea level rise. Plan Bay Area 2050's third suite of environmental strategies falls under the theme of reducing risks from these hazards.

Even today, the impacts of extreme weather are evident. Wildfires that threaten thousands of homes are now an annual occurrence, and autumn days with extreme, fire-prone weather have more than doubled in California since the 1980s.<sup>2</sup> Traffic is already routinely rerouted on several low-lying roads during king tide events — annual periods of very high tides that are becoming more frequent as sea levels rise, offering a preview of how flooding may alter the landscape in coming decades. The threat of a major earthquake has also always loomed large over the region, with recent notable earthquakes occurring in the Bay Area in 1989 with the Loma Prieta and in southern Napa County in 2014. Scientific forecasts estimate a roughly 75% chance that the region will experience a major earthquake over the next 30 years.<sup>3</sup>

Events like fires, floods and earthquakes will continue to shape the Bay Area over the next 30 years and beyond. Plan Bay Area 2050 takes these risks into account, discouraging growth in high-risk wildfire areas; planning to protect homes, businesses and transportation infrastructure from sea level rise; and considering avenues to minimize damage from a major earthquake. One major question for the region is how much sea level rise is expected to occur over the next 30 years. The plan assumes 2 feet of sea level rise by 2050<sup>4</sup> and addresses those near-term inundation impacts, preparing to prevent temporary shoreline flooding events (from either sea level rise or storms) from becoming permanent. Given the uncertainty of exactly how and when these hazards will manifest in the region, strategies in Plan Bay Area 2050 seek to advance common-sense solutions to better prepare residents for any scenario.

A major earthquake could happen at any time, and wildfires already rage across the Bay Area. While newly constructed houses and apartment buildings are now subject to much stricter requirements on seismic integrity, fire resistance and utility efficiency, much of the region's existing home stock is comprised of buildings that are decades or centuries old. Many older buildings are not built to withstand major shaking, with structural deficiencies that make them vulnerable to damage during earthquakes, and they often lack the protections needed to reduce risk of burning during wildfires. Older buildings also tend to be less water- and energy-efficient, adding to climate emissions that in turn make wildfire, sea level rise, and other climate-influenced hazards more severe.

To ensure that cost is not a barrier to living in a safe, hazard-resistant home, Plan Bay Area 2050 aims to **provide means-based financial support to retrofit existing residential buildings**. These investments would ensure higher wildfire and seismic standards to protect residents, especially those with low incomes, from fire and earthquakes. This strategy would also fund water and energy upgrades to lower utility bills and reduce waste.

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2 Goss, M. et al. (2020). Climate change is increasing the risk of extreme autumn wildfire conditions across California. *Environmental Research Letters* 15(9). <https://doi.org/10.1088/1748-9326/ab83a7>

3 USGS. (2016). *Earthquake Outlook for the San Francisco Bay Region 2014–2043*. <https://pubs.usgs.gov/fs/2016/3020/fs20163020.pdf>

4 See the *State of California Sea-Level Rise Guidance* 2018 Update, which projects a 1 in 200 chance of exceeding 1.9 feet by the year 2050, characterizing this projection as a medium-high risk adverse choice: [https://www.opc.ca.gov/webmaster/ftp/pdf/agenda\\_items/20180314/Item3\\_Exhibit-A\\_OPC\\_SLR\\_Guidance-rd3.pdf](https://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf)



For residents living in wildfire-prone parts of the Bay Area, fire-resistant roofing and fire-wise landscaping are key areas of safety-focused home improvement. Older homes throughout the Bay Area are also in need of safety upgrades to bring them up to modern standards. Targeted investments for homes would address structural weaknesses that lead to seismic damage, such as buildings with unbraced crawl spaces or multi-story buildings with large openings on the ground floor, known as soft-story buildings.

Other home modification assistance, beyond safety upgrades, could include energy efficiency upgrades, water efficiency upgrades, and electrification to replace natural gas for heating and cooking. These improvements would save families money on their energy bills and help to reduce GHG emissions, further strengthening all the plan's strategies that work together to reduce climate emissions.

Plan Bay Area 2050 primarily directs financial assistance for building renovations toward households with low incomes and families living in Equity Priority Communities that may not have the resources for home improvements. Families living in buildings built before current safety codes were adopted and owners of apartment buildings would also receive financial support for renovations.

In addition to residential buildings, improvements targeting public and commercial buildings help meet Plan Bay Area 2050's climate goals and ensure that critical services remain functional in the event of a disruptive environmental hazard. A regional plan to **fund energy upgrades to enable carbon neutrality in all existing commercial and public buildings** would amplify the combined impact of climate emissions reduction strategies. Local governments across California are aggressively adopting all-electric new construction standards (i.e., to use electricity rather than rely on fossil fuels such as natural gas or propane to power furnaces, boilers or water heaters), though more leadership and action are still needed to retrofit existing public and commercial buildings in the region to make them carbon-neutral. Plan Bay Area 2050 supports fully decarbonizing existing publicly owned and commercial buildings by eliminating natural gas components and installing energy-efficient electrical systems.





Additionally, the plan supports the development of solar storage and microgrids to facilitate on-site clean energy generation, empowering communities to be more resilient to power loss during interruptions. These investments make essential buildings like hospitals, schools and food markets safer in the event of an earthquake or fire and reduce their contribution to climate change — a force that accelerates the severity and frequency of environmental hazards.

By 2050, flooding from rising sea levels threatens to destroy tens of thousands of homes and workplaces, and close several major highways. Coordinated action at the regional level is needed to **adapt to sea level rise** and protect homes, businesses and transportation corridors. Without intervention, flooding could have devastating impacts regionwide, including constricting an already limited housing supply even further. Plan Bay Area 2050 imagines a future of regional sea level rise adaptation, where vulnerable communities can employ a mix of human-engineered “grey” infrastructure and natural “green” infrastructure to protect the majority of these at-risk areas, as well as road and rail assets at risk of inundation.

While there is still important research to be done to understand the appropriateness and efficacy of various adaptation measures, Plan Bay Area 2050 emphasizes nature-based interventions, such as restoring degraded marshes or implementing ecotone levees — physical structures that protect communities and provide surface area where shoreline vegetation and habitats can slowly migrate up slope over time. These natural interventions have ecological benefits beyond stemming the impacts of sea level rise, as marshlands provide animal habitats, restore ecosystems and purify water. Plants growing in marshes or on ecotone levees also pull carbon dioxide from the air, contributing to lower climate emissions, not to mention their scenic and recreational value. Plan Bay Area 2050 adds its efforts to an existing regional goal of restoring 100,000 acres of marsh.<sup>5</sup>

<sup>5</sup> The goal was established in the 1999 *Baylands Ecosystem Habitat Goals* and remains a regional goal as of its latest update, in 2015: [https://baylandsgoals.sfei.org/wp-content/uploads/2015/10/Baylands\\_Complete\\_Report.pdf](https://baylandsgoals.sfei.org/wp-content/uploads/2015/10/Baylands_Complete_Report.pdf).



Photo: Noah Berger

In cases where natural methods are not feasible due to space or development, built infrastructure like sea walls, traditional levees (embankments typically constructed with fill), or infrastructure elevation provide other options. Sea walls and levees are already employed throughout the Bay Area and currently protect San Francisco’s Embarcadero and port facilities, the city of Belvedere in Marin County, and Foster City in San Mateo County. San Francisco International Airport is also planning to surround itself with a sea wall in the coming decade.<sup>6</sup> Elevating infrastructure, of interest particularly for transportation corridors, allows low-lying connections to remain in operation, albeit at a substantial financial cost. Through elevation and other interventions, Plan Bay Area 2050 protects road and rail corridors that are vulnerable to flooding, including State Route 37, a critical east-west connection for the North Bay; segments of U.S. Highway 101 in the Peninsula and Marin County; and vital freight and commuter rail lines traversing marshlands in Solano and Santa Clara counties.

Plan Bay Area 2050 focuses resources on protecting Equity Priority Communities with limited financial resources from flooding and related displacement. Under the plan’s strategies, 98% of homes regionwide are protected from sea level rise, including all homes in Equity Priority Communities as well as most workplaces in the region.

6 San Francisco International Airport. (2019, March). *Airport Shoreline Protection Program: Fiscal Feasibility Study*. <https://sfgov.legistar.com/View.ashx?M=F&ID=7513892&GUID=EC2CED9E-FB3A-4A25-930E-D481824BE6AD>





Photo: Noah Berger

## BAY ADAPT REGIONAL STRATEGY FOR A RISING BAY

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Bay Adapt is a regional initiative that aims to answer the question: What are the top actions necessary to adapt the Bay Area faster, better, and more equitably to rising sea levels? Threatening our wetlands, frontline communities, infrastructure, and the places we live and work, adapting to a rising bay requires collective will, local and regionwide implementation, and broad leadership. No one agency, jurisdiction or community can or should do it alone. Facilitated by the San Francisco Bay Conservation and Development Commission (BCDC), a state agency dedicated to the Bay's coastal management, and in partnership with community, local, regional, state and federal leaders, Bay Adapt will develop a platform of priority actions to be released in 2021.

This strategic initiative builds upon the work of BCDC's Adapting to Rising Tides program. In 2020, BCDC, the Bay Area Regional Collaborative, MTC, ABAG and Caltrans released *Adapting To Rising Tides Bay Area*, a groundbreaking regional vulnerability and adaptation study. The study assessed the potential impacts of sea level rise across a number of areas, ranging from transportation networks to socially vulnerable communities, natural resources and areas primed for future housing construction. The report also included a number of local case studies throughout the Bay Area, providing critical implementation direction for cities and towns. The study highlighted the urgency with which regional and local actors must come together to address this looming crisis.





## SEA LEVEL RISE ADAPTATION APPROACHES

There are a number of adaptation options for rising sea levels, each with its own suitability along the San Francisco Bay's diverse shoreline. While the right measure for each vulnerable community in the Bay Area will be determined through local planning and engagement, Plan Bay Area 2050 imagines the following set of example adaptation techniques that could be deployed in response to rising seas. In reality, there are many more possible sea level rise adaptation measures, including a number of nature-based solutions like submerged aquatic vegetation, nearshore reefs and beach nourishment, that could be prioritized where suitable.



Photo: Kingmond Young

**Marsh restoration:** rehabilitating or re-establishing a marsh area to return its natural functions and restore wetland habitat; 100,000 acres of marsh restoration is a goal for the region.



Photo: San Francisco Estuary Partnership

**Ecotone levees:** creating a gently sloped levee, which can attenuate waves, ecotone levees provide a wetland-upland transition zone habitat and allow marshland to migrate upslope.



Photo: Karl Nielsen

**Elevation:** reconstructing roadway or rail infrastructure so that it is higher than the projected inundation level while maintaining or creating connections between ecosystems.



Photo: Karl Nielsen

**Managed retreat:** acquiring residential properties where other adaptation efforts are cost-prohibitive or unlikely to be successful in the long-term.



Photo: Mike Gifford, Flickr


**Sea walls and traditional levees:** constructing physical barriers, either of human-engineered materials in the case of sea walls, or natural materials in the case of levees, to deter erosion and inundation.



MAP 5.1


# Impacts of Sea Level Rise and Resilience Investments

## ADAPTATION INVESTMENTS

 Elevated Roads/Rail, Ecotone and Traditional Levees, Seawalls and Tidal Gates

 Marsh Restoration

## AREAS OF PROTECTION


 Areas Protected


 Areas Not Protected

## CRITICAL INFRASTRUCTURE

 Major Seaport

 Major Airport

 Rail

 Highway and Interstate

 Major Road

## SCALE

**OAKLAND** > 350,000

Novato 50,000 – 350,000

0 8 16 Miles

0 12 24 Kilometers

Source: TomTom North America, 2019  
Map Author: PB, 5/21

Plan Bay Area 2050 considers an assumed 2 feet of sea level rise by the year 2050. Adaptation measures and areas protected or not protected are shown as modeling assumptions only. Potential areas for managed retreat and additional marsh restoration not shown. Specific adaptation interventions will be planned and implemented at the local level by the appropriate authorities in accordance with state and federal environmental review guidelines, and may include additional adaptation solutions. Areas of protection will vary based on the adaptation measure used and future site conditions.



## PREPARING FOR CLIMATE UNCERTAINTY: WILDFIRE MITIGATION AND ADAPTATION

Realizing that frequent fires do occur naturally in the area, Native American tribes in what is now Northern California held controlled burns for thousands of years as a land management strategy, before they were prohibited from doing so by the California state government nearly a century ago.<sup>7</sup> Since the 1980s, the fires that sweep across the state have increased in size and ferocity: five of the six largest fires in California history occurred in 2020 alone.<sup>8</sup> Scientists agree that the influence of climate change is evident in the increased fire risk of the 21st century, as hotter air means drier plants that burn more readily in fire seasons with longer and longer durations.<sup>9</sup>

The potential destruction of a wildfire cannot be understated. In 2017, wildfires in the North Bay resulted in the destruction of nearly 10,000 homes. Damage to homes, infrastructure and ecosystems are immediate impacts of intensified wildfires, with air- and water-quality impacts extending far beyond the fire's footprint. Plan Bay Area 2050 addresses wildfire with strategies that rely on the three core adaptation principles of **land use**, **land management** and **structural hardening**:

1. **Land use** strategies ensure that future development does not occur in the most at-risk places. Plan Bay Area 2050 **maintains urban growth boundaries** by restricting growth outside them and does not allow

for new priority growth areas to overlap with the highest fire hazard severity zones. This restriction on growth is made feasible by the identification of other safer, more easily mitigated areas of the region to accommodate future growth.

2. **Land management**, of both open and working lands, aims to reduce the intensity of future fires by addressing vegetation and other land characteristics that contribute to wildfires. Wildfire management techniques include reducing combustible materials, called fuel loads, and retaining critical buffer zones that slow the spread of wildfire where forests and urbanized areas meet. The strategy to **protect and manage high-value conservation land** would ensure the stewardship of these lands for generations.

3. **Structural hardening** combats fire risk in communities that already exist in zones at risk of fire damage. The strategy to **modernize existing residential buildings** is designed to reduce risk in over 75,000 Bay Area homes. The strategy would incentivize proven structural hardening methods to support homeowners in high-risk zones like wildfire-resistant roofing and fire-wise landscaping.

Together, these strategies focus future growth away from the highest-fire-risk zones, support increased wildland management programs to reduce ignition risk and fire intensity, and support residential building upgrades that reduce the likelihood of damage when fires occur in the wildland-urban interface.

7 Sommer, L. (2020, August 24). To Manage Wildfire, California Looks To What Tribes Have Known All Along. *NPR*. <https://www.npr.org/2020/08/24/899422710>

8 State of California. (2021). *California's Wildfire and Forest Resilience Action Plan*. <https://fmtf.fire.ca.gov/media/cjwfpckz/californiawildfireandforestresilienceactionplan.pdf>

9 Goss, M. et al. (2020). Climate change is increasing the risk of extreme autumn wildfire conditions across California. *Environmental Research Letters*, 15(9). <https://doi.org/10.1088/1748-9326/ab83a7>



## ENVIRONMENT STRATEGIES Funding and Implementation

Plan Bay Area 2050’s environmental strategies chart the course for a Bay Area where development is focused within an existing urban footprint, ringed by natural lands that are well-maintained, and dotted with parks and trails that provide easy access to open space, regardless of where a person lives. Together, these nine environmental strategies shift the Bay Area toward a more equitable future by ensuring that residents with low incomes can live in safe homes, access nature and breathe fresh air. Through advocacy, legislation, initiatives, planning and research over the next 30 years, MTC and ABAG can work with partners to secure a \$102 billion investment into our region’s future health and safety, ensuring that our natural land, air and water belongs to everyone — especially those historically marginalized and currently underserved.



Photo: Ben Botkin



## Environmental Strategies — Cost : \$102 Billion

Reduce Risks from Hazards	<b>EN1. Adapt to sea level rise.</b> Protect shoreline communities affected by sea level rise, prioritizing low-cost, high-benefit solutions and providing additional support to vulnerable populations.	<b>\$19 BILLION</b>
	<b>EN2. Provide means-based financial support to retrofit existing residential buildings.</b> Adopt building ordinances and incentivize retrofits to existing buildings to meet higher seismic, wildfire, water and energy standards, providing means-based subsidies to offset associated costs.	<b>\$15 BILLION</b>
	<b>EN3. Fund energy upgrades to enable carbon neutrality in all existing commercial and public buildings.</b> Support electrification and resilient power system upgrades in all public and commercial buildings.	<b>\$18 BILLION</b>
Expand Access to Parks and Open Space	<b>EN4. Maintain urban growth boundaries.</b> Using urban growth boundaries and other existing environmental protections, focus new development within the existing urban footprint or areas otherwise suitable for growth, as established by local jurisdictions.	<b>N/A</b>
	<b>EN5. Protect and manage high-value conservation lands.</b> Provide strategic matching funds to help conserve and maintain high-priority natural and agricultural lands, including but not limited to Priority Conservation Areas and wildland-urban interface areas.	<b>\$15 BILLION</b>
	<b>EN6. Modernize and expand parks, trails and recreation facilities.</b> Invest in quality parks, trails and open spaces that provide inclusive recreation opportunities for people from all backgrounds, abilities and ages to enjoy.	<b>\$30 BILLION</b>
Reduce Climate Emissions	<b>EN7. Expand commute trip reduction programs at major employers.</b> Set a sustainable commute target for major employers as part of an expanded Bay Area Commuter Benefits Program, with employers responsible for funding incentives and disincentives to shift auto commuters to any combination of telecommuting, transit, walking and/or bicycling.	<b>N/A</b>
	<b>EN8. Expand clean vehicle initiatives.</b> Expand investments in clean vehicles, including more fuel-efficient vehicles and electric vehicle subsidies and chargers.	<b>\$4 BILLION</b>
	<b>EN9. Expand transportation demand management initiatives.</b> Expand investments in programs like vanpools, bikeshare, carshare and parking fees to discourage solo driving.	<b>\$1 BILLION</b>