



# Sustainable San Mateo County

Economy. Equity. Environment.

October 2018

## Key Indicator 2018- Climate Change Action

This report identifies the key drivers of local greenhouse gas (GHG) emissions, emergent practices that remove emissions from the air, plans to scale up and fund solutions, and preparations for changes in temperature and weather patterns. Measuring and evaluating the effectiveness of these solutions will guide further action to remove excess carbon from the atmosphere and balance emissions as we move forward.

### Across the world, people are acting on climate change.

Resiliency leaders envision a renewed connection between people and our habitat, transforming lifestyles and business practices to regenerate natural systems.

Aligning action with values that prioritize community health strengthens bonds and elevates those most vulnerable to climate impacts.

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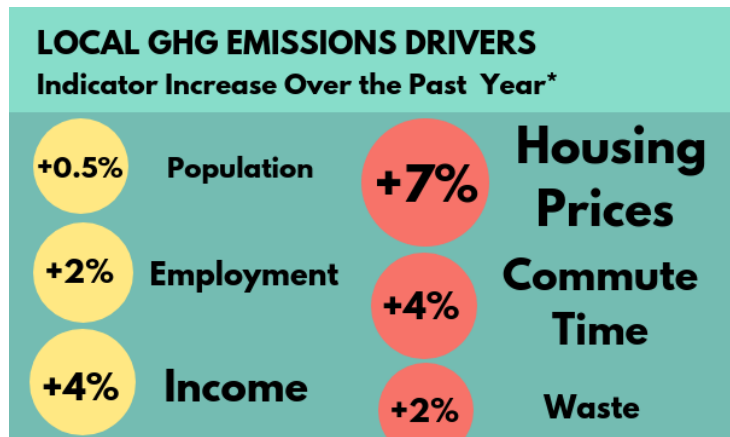
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## Explore Climate Change Data in the Indicators Report:

Our Indicators Report shows the complex interconnection between systems and behaviors that drive **GHG emissions**. The **high cost of living**, lack of **affordable housing**, and a culture of single-passenger transit drive **transportation** emissions. Growth in **business activity**, **population**, and **income**, increase consumption of goods, **energy**, and **water**, and the associated **waste**. Emissions increase **temperature**, which leads to weather changes, including **sea level rise**, **floods**, and storms.

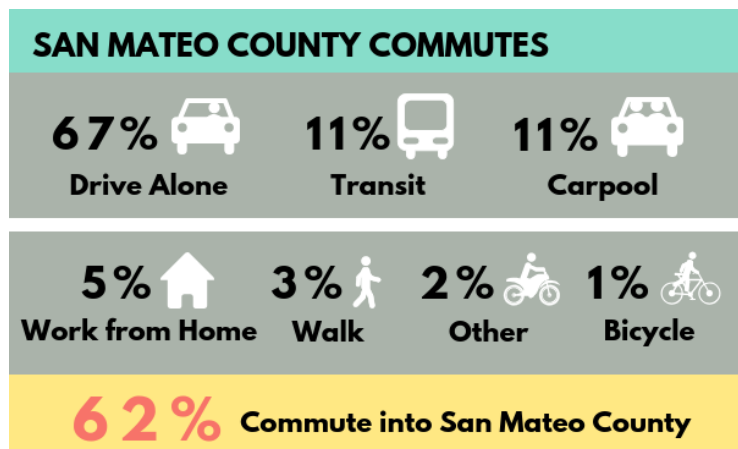
## Commute Management & Low Emission Transportation

Over the past 10 years, municipal GHG emission measures have shown a decrease in total emissions, however, the sector with the lowest rate of decrease is transportation. 60% of the county's GHG emissions arise from transportation practices. The largest contributor is solo driving, and the restrictive housing market compounds the problem by increasing commutes and traffic, which leads to idling engines.



Data Source: California Department of Finance, Employment Development Department, Census : American Community Survey, 10Year Estimates, MTC Vital Signs, CalRecycle \* All data compares 2017 to 2016, except Commute Time.

Displacement of residents is an increasing concern in San Mateo County and the Bay Area. A healthy, diverse community offers a balance between the availability of housing and the income levels of its residents, referred to as *Jobs-Housing Fit*. Emerging innovations in shared transit, economically balanced housing development, displacement prevention strategies, and planning for multimodal transportation are transforming cities and lowering emissions. Public transportation is increasingly powered by electricity, and widespread use of zero emission vehicles is vital to achieve total decarbonization of transportation. Airports, including the San Francisco International Airport, are making changes to their facilities and ground operations to reduce airside emissions.



Data Source: U.S. Census, American Community Survey 1 Year Estimates 2017, Commute Modes. U.S. Census, On the Map, 2015

## Redesign Cities for Efficient Housing and Mobility

- **Avoid Displacement:** In response to a campus expansion proposal by Facebook, [Youth United for Community Action \(YUCA\)](#) led a coalition of community based organizations including El Comit  de Vecinos, Community Legal Services of East Palo Alto and Faith In Action Bay Area, in partnership with the ACLU and Public Advocates to develop a [community pact](#). The pact established a community benefits partnership, where Facebook committed to invest in affordable housing, low-income tenant support services, job training, and hire a community jobs liaison. To see a map of displacement and gentrification in San Mateo County, visit the [Urban Displacement Project](#) website.
- **Affordable Homes:** San Mateo County workers increasingly reside outside the county and commute in for work driving single-passenger vehicles. A healthy, diverse community offers a balance between the availability of housing and the income levels of its residents, referred to as [Jobs-Housing Fit](#). The County’s Office of Sustainability hosts a web resource, [Home for All](#), which provides extensive resources for increasing housing stock in the county. [The Housing Leadership Council](#) mobilizes the community to advocate for affordable homes in San Mateo County.
- **Transit Oriented Development (TOD):** [Transit Oriented Development](#) is a technical term for new housing developments that are situated along transportation corridors enabling residents to use public transportation, walk, and cycle. A key element of TOD is increased density that creates homes for more people within a small space. When identifying sites for TOD, it is important to avoid displacing low-income residents, sometimes referred to as [climate gentrification](#). In 2018, an [affordable TOD](#) project was approved for the Bay Meadows development at Hillsdale Boulevard and El Camino in the City of San Mateo.
- **Development Design Strategy:** Smart growth design promotes walkability and compact building designs that emphasize vertical growth, open spaces, efficient land usage, and diverse transportation options. Similarly, [Complete Streets](#) design incorporates stormwater management best practices for natural filtration and groundwater recharge, such as, rain gardens or porous concrete in parking lots. It also includes parklets, bike lanes and a pedestrian-friendly environment.
- **Safe Routes to School:** [Safe Routes to School](#) aims to make walking or biking to school a safe option for students and convenient for parents. Driving kids to school accounts for 20-30% of morning rush hour traffic. To date, the program has served over 47,000 students in San Mateo County. The San Mateo County Office/Department of Education oversees the implementation of the program with funding from the Metropolitan Transportation Commission (MTC) and Measure M funding administered by City/County Association of Governments of San Mateo County (C/CAG).
- **Parking:** Several market-based approaches offer solutions for minimizing GHG emissions related to parking. Unbundling parking from residential or commercial units and reducing available spaces may encourage people to use alternative transportation and disincentivize auto ownership. Implementing parking congestion pricing forces drivers to recognize the cost of additional congestion and discourages driving and parking during peak hours. Requiring smart metered

parking<sup>2</sup> in garages reduces time spent looking for a parking space and in turn, reduces vehicle miles traveled (VMT). For examples of these practices in action, read how [Ireland is reducing parking and lowering the speed limit](#) to combat climate change and how [New York City's smart park program](#) reduces time spent on the road looking for a parking space.

- **Bicycles:** Planning for [bicycle safety and mobility](#) is an important step taken by municipalities such as San Mateo County which recently released a [biking and pedestrian plan for unincorporated areas](#). To become a local cycling advocate, connect with the [Silicon Valley Bicycle Coalition](#) whose website showcases bicycle routes, maps, and local bicycle clubs.

## Shared Transit

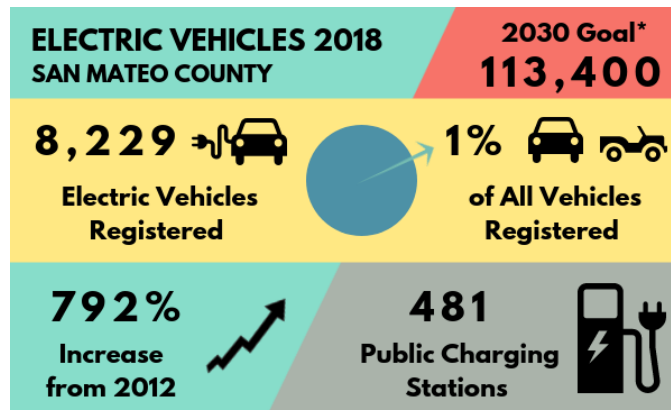
- **First and Last Mile to Transit:** For many, the distance from home or work to public transportation presents a time-consuming challenge. Services such as shuttles and shared electric bikes and scooters are getting transit riders where they need to go quickly. Many transit enthusiasts view [autonomous vehicles](#) as the future of first and last mile to transit.
- **Carpool:** San Mateo County has partnered with [Scoop](#), a carpool app that pairs drivers with passengers who pay for the ride. The county contributes \$2 per trip for riders and drivers.
- **Low Emission Shared Transportation:** Commute.org's [trip planner](#) lays out travel routes using various travel modes, noting the carbon footprint for each. Local public transportation providers Caltrain, BART, and SamTrans are transitioning to electric power. SamTrans recently purchased several electric buses from [a local bus company](#). Caltrain is [converting from diesel to electric-powered locomotion](#). Bay Area Rapid Transit (BART) currently runs on electricity generated in part, but not exclusively, from renewable sources. It will be fully powered by renewables by 2045.
- **Transportation Management Agencies:** Municipalities interested in reducing traffic are forming Transportation Demand Management Agencies that plan and implement methods to encourage shared transit. The [Palo Alto Transportation Management Association \(TMA\)](#) offers free transit passes to those who work in the city and earn less than \$70,000 annually. Their research found that 100% of technology workers surveyed were offered transit discounts through their employer and 26% commuted using a single-passenger vehicle. In contrast, none of the low-wage workers surveyed were offered transit discounts from their employers and 80% commuted using a single-passenger vehicle.

## Low and Zero Emission Vehicles

- **Low Emission Vehicles:** Through the EPA's [SmartWay](#) vehicle guide, consumers can see the 20% lowest-emitting vehicles for each year. For 2019 this includes diesel, regular fuel, and hybrid vehicles. Electric and hydrogen automobiles are not included in this list because they are zero emissions.
- **Electric Vehicle Charging Stations:** Most EVs go 100 miles on a single charge; however, California will need to massively expand its charging network in order for EVs to become the cars

of the future. EV owners can use the [San Mateo County-operated EV charging stations](#). [Electrify America](#) is planning networks of charging stations throughout California and the nation.

- **Vehicle Affordability:** In addition to numerous state rebates, the [Clean Vehicle Assistance Program](#) provides grants to low-income workers to purchase electric vehicles. Other strategies to make EVs more affordable include: [shared vehicles](#), free charging stations, and assured carpool lane access.
- **Fleet Funding:** The Bay Area Air Quality Management District (BAAQMD) is a public agency entrusted with regulating, measuring, and reducing sources of air pollution. The Air District’s [Clean Fleets Program](#) helps offset a portion of the cost of purchasing or leasing new light-duty zero-emissions vehicles (ZEV) for public and private fleets that operate within the Air District’s jurisdiction. For 2019, up to \$5 million has been allocated to this program, which reimburses up to 75% of the cost to purchase or lease a new ZEV after all other grants, rebates, and discounts are applied. Eligible applicants include businesses, nonprofits, and public agencies that own and operate light-duty vehicle fleets.



Data Source: San Mateo County Open Data Portal, California DMV  
\*California Air Resource Board Climate Change Scoping Plan 2017 statewide goal of 4.2 million electric vehicles by 2030

## Efficient Air Travel

- **San Francisco International Airport (SFO):** SFO commercial air travel adds an estimated 3.5% GHG emissions to the atmosphere annually. Airports also produce GHG emissions from associated ground service equipment, cars, buses, and from fuel and energy use at airport facilities. [SFO is taking steps to reduce these GHG emissions](#).
- **Carbon Standards:** The International Civil Aviation Organization has set CO<sub>2</sub> standards that must be met by the year 2028. The ICCT has determined that about 82% of current aviation demand will meet this standard already, and will not require significant manufacturing improvements. The current Airbus 380 will not meet the CO<sub>2</sub> standards by 2028, and may require a refresh to be compliant. In 2016 the UN created CORSIA, a [Carbon Offsetting and Reduction Scheme for International Aviation](#) that caps CO<sub>2</sub> emissions from 2020 through [carbon-neutral growth](#).

## Take Action!

- Support affordable housing projects!
- Smartphone apps make it easier to use public transportation, such as [Caltrain Savings Calculator](#) and [BART trip planner](#).
- Turn off your engine! Research shows that [vehicle idling](#) has a big impact on GHG emissions.
- Consider low/ZEV vehicles for your next car lease or purchase or use alternative transportation such as travel by train.
- Purchase Carbon Offsets to mitigate your travel emissions.
- For family trips, consider driving over air travel. Use the [CoolCalifornia.org](#) calculator to determine the total emissions for the trip by automobile, then use the [ICAO](#) air travel emissions calculator and multiply it by the number of travelers to compare emissions for both travel modes.
- Make room for cyclists and pedestrians while driving your car.
- If you have school-aged children, participate in the Safe Routes to School Program.

## Energy Efficiency & Renewables

With the goal of drastically cutting GHG emissions, researchers are on a quest to evaluate the fastest and most economically efficient methods to do so. According to a Natural Resources Defense Council (NRDC) report, energy saving strategies and the transition to a fossil fuel-free economy are key. The report considers the impact of cutting energy demand through energy efficiency, significantly expanding renewable energy sources (specifically wind and solar), employing clean power for electrification of vehicles and buildings, and decarbonizing remaining fuel use wherever possible. Energy efficiency, green building practices, and renewable energy systems have been developing for decades. As demand increases, these methods gain increasing momentum to transform our relationship with energy.

*In this section: Energy Efficiency, Renewable Energy, Take Action!*

### Energy Efficiency

- **Passive Solar Design:** The Nueva School, in San Mateo, CA, is a shining example of a LEED Gold building and winner of the [SMCC 2015 Green Building Award](#). With design input from the students, the building uses 65% less energy than a typical high school, including photovoltaic panels and passive solar design. The innovative design features a series of light and air chimneys that bring light to the school's center and enable ventilation, color sunshades which protect from solar heat gain and act as wind scoops to enhance central ventilation, and classrooms that open to the outside for natural sunlight. To top it off, the building has a living rooftop garden and a stormwater biofiltration garden that lead to the community-wide storm retention pond and a new habitat for indigenous species (a low-impact development design approach).
- **ENERGY STAR:** This joint program of the Environmental Protection Agency (EPA) and the Department of Energy (DOE) helps consumers and businesses save money and protect the environment through the implementation of energy-efficient products and practices. The [ENERGY STAR](#) label identifies top-performing, cost-effective products, homes, and buildings. Since 1992, ENERGY STAR associated GHG reductions have reached 3.1 billion metric tons.
- **Smart Glass:** This emerging technology relies on chromism, which refers to any process that causes material to change color. Utilizing smart glass for windows makes them responsive in real time to sunlight and weather, decreasing a building's energy load for lighting in addition to improving heating and cooling efficiency (Drawdown, n.d.). Currently limited by cost, smart glass is expected to become more common in the future as a sustainable and energy efficient alternative.
- **Zero Net Energy:** In 2007, the California Public Utilities Commission (CPUC) adopted new goals to have all residential construction in California be zero net energy by 2020, and all new commercial construction in California be zero net energy by 2030. A zero net energy (ZNE) building produces as much energy as it consumes over the course of a year. These buildings achieve ZNE first through high levels of energy efficiency and then through the addition of clean, on-site renewable power generation, typically solar.

## Renewable Energy

- **Community Choice Energy:** In April 2017, Peninsula Clean Energy (PCE) became the default electricity provider for San Mateo County and increased access to renewable energy. All customers are automatically enrolled in the ECOplus plan that provides 50% renewable and 80% carbon-free energy, at a price 5% lower than the rates offered outside of the program. Customers that “opt-up” to the ECO100 plan receive 100% renewable and carbon-free wind energy, at a cost of one cent more per kilowatt hour compared with ECOplus. In 2017, PCE enabled county residents, small businesses, and municipal accounts to avoid 515 million pounds of CO2 equivalent emissions. PCE enabled the county, as a whole, to exceed a 2020 GHG emission reduction target from the total 2015 countywide generation emissions inventory.
- **Solar Power and Storage:** Solar power is key for energy independence and resilience. Ideally, small solar installations can supply power during utility outages, providing a vital resource during emergencies. Since solar energy can only be generated during the day, energy storage devices are being developed to store the energy at night. Local residents and nonprofit organizations interested in solar can partner with SunWork Renewable Energy Projects, a nonprofit that installs solar systems on small-energy-footprint homes with the help of trained volunteers. Winner of the SMCC 2017 Sustainability Award, SunWork’s model provides installation at a third of the cost of conventional installers.
- **Fuel Cell Technology:** A fuel cell generates electricity from the abundant hydrogen and oxygen found in chemical compounds all around us. A hydrogen fuel cell’s exhaust is nothing but water. Although methods to extract hydrogen require energy, once extracted the hydrogen can generate electricity without any combustion a clean energy source. Fuel cells provide vital energy backup for many large facilities and primary energy for some remote locations. Fuel cells are even being used to power vehicles and homes.
- **California Energy Commission Solar Policy:** In a unanimous 2018 vote, the California Energy Commission approved a policy requiring most new houses and apartments in California to have rooftop solar by 2020 (Inside Climate News, 2018). The commission estimates the policy will lead to a decrease in GHG emissions equal to 493 million pounds of carbon per year, roughly equivalent to removing 50,000 cars from the road. The solar package is part of a broader set of building standards, all directed at reductions in GHG emissions and improving indoor air quality. The rules are projected to increase a typical monthly mortgage by \$30 but simultaneously reduce household energy costs by \$80 per month. The commission expects the rules to increase the state’s solar capacity by 200 to 400 megawatts per year.

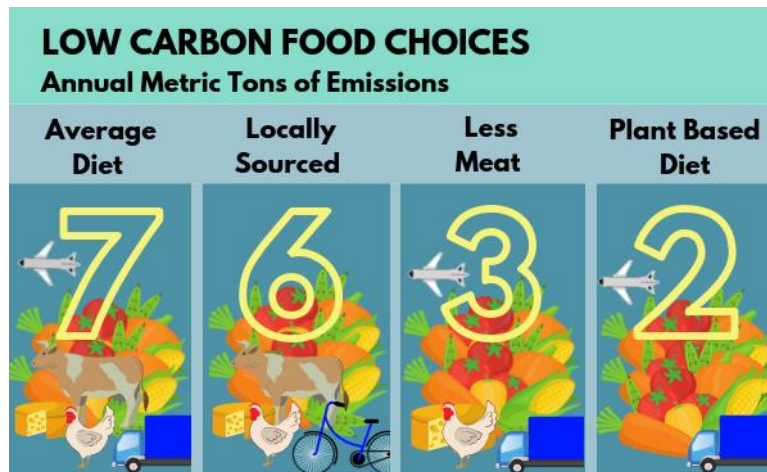
### Take Action!

- Conserve energy and water in your home and at work.
- Invest in energy efficiency! No-cost weatherization is available to low income residents through the [Energy Savings Assistance Program](#). Services include attic insulation, energy efficient refrigerators, energy efficient furnaces, weatherstripping, caulking, low-flow showerheads, water heater blankets, and door and building envelope repairs to reduce air infiltration.
- Switch to the ECO100 plan through Peninsula Clean Energy to receive 100% renewable energy (50% solar and 50% wind).



## Food & Agriculture

Food production and delivery have a massive impact on GHG emissions on a global scale. As consumers, we can reduce our carbon footprint on a daily basis by choosing food with the least harmful agricultural practices and smallest GHG footprint. See our research on [Agriculture and Climate](#) to learn how pollinators are affected by extreme weather and shifting seasons.



Data Source: CoolClimate Network Calculator, Food-miles and the Relative Climate Impacts of Food Choices in the United States.

*In this section: Low Carbon Food, Low Carbon Agriculture, Take Action!*

### Low Carbon Food

- **Plant-rich Diet:** Pursuing a [plant-rich diet](#) may be one of the most effective ways for an individual to lower their GHG footprint. Meat and cheese have the [highest carbon footprint](#) compared to other protein sources. According to a study by the Environmental Working Group, one kilo of lamb is the carbon equivalent of driving 90 miles because 50% of lamb in the US is imported.
- **Seaweed Farming:** Seaweed is a promising source of food, biofuel, and jobs. Its ability to absorb carbon dioxide, nitrogen, and phosphorus also make it efficient in cleaning up polluting chemicals in the ocean. Seaweed farming is zero-input, climate-friendly, and represents the potential for significant carbon sequestration. Blue Evolution is a local food manufacturer that grows crops along the west coast of Canada and Mexico. Numerous seaweed start-ups are surfacing around the Bay Area, including Ocean Source Farms and Salt Point Seaweed, which harvest in the North Bay. In California, new ocean farms must apply for an underwater lease, which requires an environmental review, and then a multi-agency permit application process ([GreenWave](#)). The long process may create barriers for widespread adoption of seaweed farming along the San Mateo County coast.
- **Carbon Footprint:** Studies indicate that increased efficiency in beef manufacturing is driving industry growth. On a global level, there is a connection between cattle ranching and [rainforest destruction](#). Rainforests are vital “carbon sinks” that absorb carbon dioxide. Several major

industries, including beef, soy, and palm oil, clear-cut ancient trees, eliminating the carbon storage built by the ecosystems over hundreds of years.

- **New Plant Protein:** Local food entrepreneur, [Impossible Foods](#), is making burgers from wheat protein, thus reducing the footprint of an American mainstay. Substituting an Impossible burger for a hamburger made with beef saves the equivalent of 75 square feet of land, a half bathtub of water, and 18 miles of auto emissions.
- **Water Footprint:** Recently, almonds have been identified as a water-intensive crop, contributing to GHG emissions ([water energy nexus](#)). Comparing the amount of protein in almond milk to that of dairy milk reveals a much higher use of water for the same amount of protein. Berkeley-based [Ripple Foods](#) makes milk from peas, which requires less water than both almond and dairy milk and produces almost 25% fewer emissions than dairy milk and 86% fewer emissions than almond milk.

## Low Carbon Agriculture

- **Organic Farming:** The acres of organic farmland in San Mateo County continue to grow. Studies show that organic farming can have a positive impact on GHG emissions compared to conventional farming. Organic farming practices such as avoiding tillage, planting cover crops, employing crop rotation, and using natural fertilizers like manure can lead to greater carbon storage in soil, reduced energy inputs, and increased yield. On a global scale, elimination of the use of mineral fertilizers would reduce agricultural greenhouse gas emissions by 20%.
- **Regenerative Organic Certification:** The certification, created by a coalition of farmers, ranchers, nonprofits, scientists, and brands, encompasses guidelines for soil health and land management, animal welfare, and farmer and worker fairness. Regenerative agriculture is farming in a way that emulates nature—no toxic chemicals, no-till farming, no soilless systems, and no CAFOs (confined animal feeding operations). Outcomes of a shift to regenerative organic agricultural practices could be profound. In 2014, research by Rodale Institute estimated that if current crop acreage and pastureland shifted to regenerative organic practices, 100% of annual global CO<sub>2</sub> emissions could be sequestered in the soil.
- **Regenerative Ranching:** Though beef production has a high level of GHG emissions, there is evidence that cows could be carbon-neutral if they are raised outside of industrial farming practices. For centuries, cows and other grass grazers played an essential role in fertilizing and pruning plants that kept carbon in the soil. Locally, TomKat Ranch devotes 1,800 acres of rangeland to ecological science in collaboration with Point Blue’s Rangeland Monitoring Network (RMN) in order to research the benefits of carbon farming and regenerative ranching practices. This research may shed light on the increasing incidence of desertification of grasslands and soil loss in the US.
- **Healthy Soil:** The California Department of Food and Agriculture’s (CDFA) [Healthy Soils Program](#) aims to build “soil carbon content and reduce GHG emissions by providing incentives to farmers and ranchers for the adoption of new management practices with climate benefits.” The Healthy Soils Program includes 21 projects in San Mateo County, including research on wood chip and nitrogen interaction, and reclamation of industrial sites for agriculture with cover crops.

- **Indoor Farming:** Several local companies are creating indoor or [vertical farming systems](#) that do not use soil at all. Instead, crops are grown in a minimal amount of water. Though the water footprint is low compared to conventional farming, reliance on [artificial lighting magnifies the GHG footprint](#) for this new form of agriculture. Traditional organic farmers are showing [resistance to labeling vertical farm products as “organic.”](#) proposing that soil is an essential part of organic farming.
- **Urban Farming:** There are over 25 community gardens in the county, and several municipalities have policies that encourage edible landscapes and allow beekeeping and chickens ([SSMC Food Systems Report, 2016](#)). In Santa Cruz, Plantronics collaborated with City blooms to install a [micro farm](#) at their headquarters providing fresh produce for their onsite cafe.

### Take Action!

- Grow your own food at a community garden or landscape with edible plants to reduce your food’s carbon footprint.
- Join a CSA – Community Supported Agriculture to have fresh local food delivered.
- Shop local at farmers’ markets where you can ask about farming practices.
- Bees! Support pollinators [in your garden](#).
- [Eat lower on the food chain](#). Meat, eggs, and dairy products require disproportionately more land, water, energy, and other resources to produce than they return in food value. Implement “Meatless Mondays” in your family’s weekly meal planning.

## Water

Scientists predict that climate change will have a significant impact on water systems in California. Precipitation patterns will shift away from winter snow in the Sierras (a natural water storage system) and toward prolonged periods of drought followed by years of wet weather. Increasing temperatures will lead to evaporation in reservoirs, heightened demand for drinking water and water for energy and industrial production, and increased waterborne infectious disease from flooding. Businesses, government agencies, nonprofits, and individuals residents are preparing to meet the challenge of safeguarding water supplies and managing the environmental repercussions of extreme weather.

Layers of interdependence bind energy and water production and delivery systems. This complex interrelationship is referred to as the [water-energy nexus](#), and it has large implications for GHG emissions. Water is a vital input for energy production and 12% of California's total energy use is related to water. Because of the water energy nexus, climate change impacts on natural water flow systems will have a ripple effect on drinking water and the water used for energy production. The water-energy nexus means that saving water is the same as saving energy and vice versa. See the energy section for more information on renewable energy sources that do not require water.

*In this section: [Water Reuse](#), [Water Conservation](#), [Water Planning](#), [Take Action!](#)*

### Water Reuse

- **Blackwater Systems:** Facebook is constructing a new [blackwater system](#) at its headquarters (Bayfront Campus) in Menlo Park, CA. This onsite reuse treatment system will service two new buildings and save up to 17 million gallons of water annually by transforming wastewater into purified, non-potable water, which will be used for irrigation and toilet flushing.
- **Recycled Water:** The Santa Clara Valley Water District (SCVWD) [Expedited Purified Water Program](#) seeks to respond to the current drought and expand the county's water supply. The program could potentially provide up to 45,000 acre-feet per year of purified water for indirect and/or direct potable reuse to supplement groundwater recharge from other existing sources.

### Water Conservation

- **Water Demand:** The [Bay Area Water Supply and Conservation Agency](#) (BAWSCA) spearheaded water conservation efforts during the last drought in California between 2014-2017, which resulted in drastic reductions in water consumption. Efforts included drought management education via public communication and outreach programs and assessment of regional water supply needs through the year 2040.
- **Drought Resistant Gardens:** [WaterLA](#) is a collaborative program that enables Los Angeles residents to help manage the region's stormwater and replace lawns with drought-resistant rain gardens. A variety of installations in 22 locations in the San Fernando Valley resulted in a total of 1.2 million gallons of stormwater captured in an average year along with a 25% reduction in residential water use.

- **Stormwater Capture:** The Piru Stormwater Capture for Groundwater Recharge Project in Ventura County will capture runoff from 123 acres in the unincorporated community of Piru. This runoff, estimated to be 38.5 acre-feet per year, will help recharge the area’s groundwater basin. Pre-treatment devices will remove pollutants while filtration via the soil profile will reduce bacteria concentration, providing dual benefits of water quality improvement and groundwater supply enhancement.

## Water Planning

- The New York City Department of Environmental Protection prepared a [water-energy nexus study](#) quantifying the impact of their watershed protection, green infrastructure, water demand management and conservation, and wetland restoration programs on DEP’s overall GHG portfolio. Examining these sustainability initiatives through the water-energy nexus helps to demonstrate which program can provide the greatest GHG and energy reductions. The results of the study can be visualized through the water-energy nexus Tool.
- The State of California hosts a website on climate change with resources for a variety of stakeholders, including a report on [opportunities to address climate change through the lens of the water-energy nexus](#).

## Take Action!

- Conserve water by installing a graywater or rain barrel system, using low-flow shower heads and faucets, replacing lawns with rain gardens, and fixing leaky pipes. The [Bay Area Water Supply & Conservation Agency’s website](#) provides a wealth of tips and resources.
- Implement sustainable landscaping with trees and plants that best absorb carbon dioxide (CO2).

## Business

To reverse climate change and address its current and future impacts, we need to change the way we do business. Forward-thinking companies are considering the triple bottom-line: people, planet, and profit.

*In this section: Innovative Business Models, Certification Programs, Accounting for Costs of Climate Change, Climate Conscious Investment, Sustainability Reporting Standards, Take Action!*

### Innovative Business Models

- **Circular Economy:** Traditional production processes based on the linear “take-make-waste” model are being transformed to a circular “borrow-use-return” model. A [circular economy](#) holds the potential to reduce GHG emissions, simplify supply chains, and stabilize price risk for materials. C&A has a vision for [circular fashion](#) that eliminates waste; the clothing manufacturer has developed a line of 100% cotton, biodegradable clothing that is [Cradle-to-Cradle Certified](#). H&M offers to take back any clothing or textiles through collection boxes in their retail stores. They partner with [I:CO](#) to resell clothing, and transform damaged textiles into other products, such as washcloths or insulation.
- **Benefit Corporations:** Businesses in California can elect to be a [Benefit Corporation](#), which is a legal structure that empowers a business to prioritize environmental or stakeholder benefits over profit without the fear of shareholder action. This corporate structure ensures that a company’s mission to provide social or environmental stewardship will remain intact regardless of changes in leadership. There are key [differences between Benefit Corporations and B Corps](#), a certification system described below.

### Certification Programs

- **B Corporation Certification:** B Lab is a nonprofit organization that offers the [B Corporation Certification](#) for businesses that strive to be a “force for good” and participate in an evaluation of their social and environmental performance. [EO Products](#), which began in the Bay Area, is a Benefit Corporation, a certified B Corp, and an organic manufacturer dedicated to using non-GMO ingredients. Learn more about the [difference between a Benefit Corporation and the B Corporation Certification](#).
- **Green Business Certification:** The San Mateo County [Green Business Program](#) certifies small and medium sized businesses that demonstrate positive environmental practices in their business operations. Across the state, certified green businesses have saved over 150 million gallons of water and 84,000 metric tons of CO<sub>2</sub>.

### Accounting for Costs of Climate Change

- **Price on Carbon:** As companies seek to account for the externalized environmental costs of business practices on their balance sheets, many are warming up to putting a price on carbon.

Whether this takes the form of a [fee](#), tax, [credit trading system](#), or [dividend](#), corporations are encouraging lawmakers to establish accountability systems. In 2018, Representative Curbelo from Florida introduced a [carbon fee bill](#) in an effort to reignite conversations among fellow Republicans about the impact of carbon emissions and the potential fiscal benefit of accounting for environmental costs. Regardless of the form, any program that puts a price on carbon must provide benefits for low-income citizens who will experience the greatest hardship from environmental harm. In California, the [cap and trade program provides vital funding](#) for programs that reduce emissions and improve health and environmental conditions in disadvantaged communities.

- **Executive Pay Linked to Environmental Performance:** It is common practice to link executive pay to performance on key business strategies. Since sustainability factors impact the bottom line for many companies, making executive pay contingent on sustainability performance makes sense.
- **Climate Change Insurance:** Property and casualty insurance is highly vulnerable to climate change. In response to the increase in natural disasters and projections of sea level rise, reinsurers have been building [ESG](#) (Environmental, Social, and Governance indicators) guidelines into their investment policies. Furthermore, litigation is increasingly used as a tool to hold businesses, such as oil companies, accountable for climate change impacts, which inflates risk for their insurers and reinsurers.
- **Rating Systems:** According to a report by MSCI, an independent provider of research-driven insights and tools for institutional investors, companies with a high ESG rating are better at managing their risks and opportunities in the form of low volatility and higher valuations. The report suggests that a company with a high ESG rating may become a key indicator for a company that is smartly managed.

## Climate Conscious Investment

- **Shareholder Action:** According to the [Harvard Business Review](#), shareholder proposals focused on environmental concerns are increasing. In 2017, there were 18 proposals for risk assessment based upon the 2 degrees Celsius increase delineated in the Paris Agreement, while there were eight in 2016 and only one in 2015.
- **Investment Strategy:** [Mercer's survey](#) of UK institutional investors has found that the number of investors that consider risks due to climate change increased from 5% in 2017 to 17% in 2018. This is largely driven by regulations from the EU Commission but is a promising trend toward evolving investment strategies that account for ESG. In the Bay Area, several private banks invest only in projects with positive impacts on GHG emissions. For example, [Beneficial State Bank](#) funds renewable energy and affordable housing projects that reduce commutes and associated emissions.

## Sustainability Reporting Standards

- The Sustainability Accounting Standards Board ([SASB](#)) sets standards across five sustainability dimensions for investors to assess the health of a publicly traded company: Environment, Social Capital, Human Capital, Business Model and Innovation, and Leadership and Governance. JetBlue is the first airline to incorporate SASB disclosures into its ESG report, highlighting actions that reduce their GHG emissions from operations.
- The [Financial Stability Board \(FSB\) Task Force on Climate-related Financial Disclosures \(TCFD\)](#) developed voluntary and consistent climate-related financial risk disclosures. Companies may use these standards to provide information to investors, lenders, insurers, and other stakeholders.

### Take Action!

- Purchase products that are reusable or designed for zero waste.
- Support certified [green businesses](#), [B Corporations](#), [certified B corps](#), and any business which has a formal sustainability management program like an [ISO certification](#) in place.
- Review your investment portfolio for ESG criteria and consider shareholder action.



## Carbon Storage

Carbon storage goes by many names and methods, all of which promise to reverse or capture carbon emissions. Natural carbon storage, also referred to as biological sequestration, takes place within the earth's carbon cycle. The process pulls carbon from the air and stores it in soil, trees, and other plants, including aquatic plant life. Biological carbon storage can be improved through sound land and water management. Carbon capture and storage (CCS) is the process of capturing airborne or point source carbon dioxide (CO<sub>2</sub>) pollution, typically from fossil fuel power plants, to prevent it from entering the atmosphere. With any form of technology or land management, these methods must be tested for effectiveness and identification of unintended consequences.

*In this section: [Biological Carbon Storage](#), [Carbon Capture and Storage \(CCS\)](#), [Take Action!](#)*

### Biological Carbon Storage

- **Forests:** [Bay Area Greenprint](#) measured the amount of “above ground live carbon storage” and “soil organic carbon storage” in the Bay Area. In San Mateo County, the marshlands in Belmont, San Carlos, Redwood City, Menlo Park, and East Palo Alto hold the highest concentration of “soil organic carbon storage.” However, much more carbon is stored above ground in trees and plants, over 12 million tons of CO<sub>2</sub> equivalent. The Santa Cruz Mountains Carbon Cooperative, supported by the [Sempervirens Fund](#), is exploring ways that funds generated on the carbon market may compensate landowners that protect and maintain forests.
- **Carbon Farming:** The San Mateo Resource Conservation District (SMRCD) works with local land owners, managers, and operators to create Conservation-Carbon Plans for natural and working lands (farms, vineyards, orchards, and ranches). Many agricultural practices, such as planting windbreaks or using cover crops, have a measurable impact on emissions in addition to multiple benefits for farms and ecosystems. [Carbon farming](#) is an emerging perspective to managing working lands that emphasizes agricultural and land stewardship practices that increase carbon storage in plants, roots, and soil. The result is improved soil health, increased water retention capacity, and enhanced crop and forage production and climate resilience.
- **Ocean Regeneration:** Our oceans (and other bodies of water) serve as natural carbon sinks; however, too much carbon absorption has led to ocean acidification. According to the [Scripps Institution of Oceanography](#), “26 percent of all the carbon released as CO<sub>2</sub> from fossil fuel burning, cement manufacture, and land-use changes over the decade 2002-2011 was absorbed by the oceans.” One plan to reabsorb this excess carbon using managed kelp forests is referred to as [marine permaculture](#). Similarly, the practice of [ocean farming](#) employs seaweed to pull carbon from ocean water in combination with oysters, which filter nitrogen, supporting the underwater ecosystem.

### Carbon Capture and Storage (CCS)

- Local entrepreneurs at [Blue Planet](#) have developed an air filter prototype that gathers carbon from the air and transforms it into a concrete-like solid suitable for building and roadway construction,

as well as for consumer products. [Air Miners](#) maintains an index of all the organizations that are mining carbon from the air.

- [The world's first carbon-capture plant](#), built in Switzerland by Climeworks, mimics the carbon storage of old growth forests. This “direct air capture (DAC) plant is capable of removing 900 tons of carbon dioxide (CO2) from ambient air annually.” Climeworks reports selling up to 900 tons of CO2 at market price for use as fertilizer. The product is also an input in the production of carbonated beverages and carbon-neutral fuel.
- According to the [Massachusetts Institute of Technology's Carbon Capture & Sequestration Projects database](#), as of September 2016, three large-scale coal-burning power plant CCS projects were in progress in the US: two in Texas and one in Mississippi. Internationally, CSS projects are already operating in China and Canada, and many more are planned across the United Kingdom, Korea, and the United Arab Emirates.

### **Take action!**

- Support the protection of trees, plants, and wetlands.
- Encourage continued state funding of carbon storage programs like the [Healthy Soils Program](#).

## Eliminate Waste

As the populations of California and the San Francisco Bay Area expand, it is vital to decrease waste by designing products for zero waste while also reducing consumption and the use of disposable packaging. According to CalRecycle, “labor, real estate markets, and residential construction continued to grow steadily” and “as the economy continues to grow, solid waste generation will continue to increase” (CalRecycle, 2016). Construction waste is a large part of the waste stream and is increasingly being recycled in innovative projects that reuse lumber, rocks, metal, and other materials. Composting and Waste-to-Energy (WTE) programs may be considered closed-loop systems where waste is turned into a new product; however, the downside of these practices is energy and material loss in the process. Regardless, these methods offer the opportunity to reduce greenhouse gas (GHG) emissions, including carbon dioxide and methane, and build toward broader sustainable business practices.

*In this section: Food Waste Reduction, Recycled Building Materials, Waste-to-Energy (WTE), Take Action!*

### Food Waste Reduction

- **Compost:** 40% of food waste happens at home; composting is one way to reduce the impact of this waste. Most communities offer curbside collection of compostable materials. In addition, San Mateo County’s website suggests three ways for individuals to compost. Backyard composting, worm composting, and grass recycling all present exciting ways to reduce food waste and create nutrient-rich soil sustainably. The County’s Sustainability Academy offers free, comprehensive composting classes.
- **Food Rescue:** [Peninsula Food Runners](#) is a non-profit organization focused on alleviating hunger and reducing food waste. Volunteers collect otherwise landfilled food waste from restaurants, caterers, bakeries, hospitals, event planners, corporate cafeterias, and hotels, and deliver it directly to neighborhood food programs. This effort reduces commercial food waste and provides direct-service neighborhood food programs with previously unavailable food resources. Organizations such as [Village Harvest](#) help residents distribute the excess produce grown in their gardens.

### Fix Products and Recycle Building Materials

- Fix-it clinics extend the life of products teaching people how to repair rather than throw away. The San Mateo County Office of Sustainability hosted its inaugural Fix-it Clinic in 2018, inviting residents to bring electronics, toys, and fabric items for evaluation by experts ready to guide them on how to extend the life of their belongings.
- The Gilead Sciences building at 309 Velocity Way, in Foster City, was a 2017 [Sustainable San Mateo County Green Building Award winner](#), due in part to recycling 80% of its associated construction waste. This was achieved by partnering with a local recycling provider with LEED certified staff who divert 100 million pounds of construction material from landfills annually.

## Waste-to-Energy (WTE)

- **Wastewater Treatment:** Treatment of wastewater is an overlooked but essential component of life on the Peninsula. The City of San Mateo Wastewater Treatment Plant (WWTP) and Silicon Valley Clean Water (SVCW) treat wastewater to create biosolids for landfill daily cover and agricultural reuse, as well as generate natural gas for fuel in fleets. During the process, both plants also use anaerobic digestion to generate fuel from the methane gas byproduct.
- **Landfill Waste-to-Energy (WTE):** In 2010, the Environmental Protection Agency's Methane Outreach Program selected Ox Mountain as one of eight award-winning sites for their landfill gas-to-energy project. Where methane gas was burnt arbitrarily before, Ameresco now converts the methane into electricity and sells it to the City of Palo Alto and the City of Alameda. The Cities pay the contracted price for the power and receive a low-risk, year-round, round-the-clock flow of electricity. WTE plants can turn waste into a steady stream of electricity and heat entire communities. While WTE plants address immediate needs, there is disagreement about whether the practice slows efforts toward Zero Waste Production Models (ZWPM) and perpetuates poor consumer and commercial habits by encouraging waste. ZWPMs aim to redesign resource life cycles by reusing all products so nothing is contributed to landfills or incinerators. While ZWPMs holistically address waste's environmental impact, combating food waste, encouraging reuse instead of recycling, and supporting WTE efforts are the first steps toward more sustainable production models.

### Take Action!

- Reduce, Reuse, Recycle, Rot – in that order!
- Avoid products with disposable packaging like plastic water bottles and single-use items.
- When ordering goods online, purchase multiple items in a bundle and have them shipped together when possible.
- Plan your meals to reduce waste by reusing ingredients or sharing portions.
- Participate in a fix-it clinic and learn how to repair items to save them from the trash!

## Resilience Planning

Preparation for extreme weather, heat, flooding, pests, service outages and supply shortages is vital at the individual and community level. Planning for disasters now will ensure that vulnerable communities like low-income working families, the elderly, and the disabled will not be left without vital resources when disaster strikes. Communities around the Bay Area are questioning whether federal homeland security funds should be directed to emergency preparation and how law enforcement can be trained to effectively aid all members of the community.

We have an amazing opportunity to positively impact future generations by maintaining the ideal temperature for our habitat. Over the long term, increased heat will cause water and food shortages and make some regions uninhabitable, causing mass migration and resulting in more competition for resources. This underlines the importance of efforts to stabilize and even reverse GHG emissions to lower global temperatures.

*In this section: Public Health, Infrastructure Improvements & Land Management, Reduce the Heat Island Effect, Take Action!*

### Public Health

- **Heat Exposure:** As temperatures rise, those who work outdoors, such as construction and farm workers, are at risk of heat exposure. In 2018, over 130 labor groups submitted a petition to the Occupational Safety and Health Administration (OSHA) demanding requirements for employers to [protect workers from heat](#). Measures include mandatory rest breaks and access to hydration and shade.
- **Energy Cost Assistance:** [LIHEAP](#) is a federal program that provides assistance to eligible low-income households to manage and meet their immediate home heating and/or cooling needs. Programs address crisis situations such as 24- to 48-hour disconnect notices and energy-related life-threatening emergencies. California utilities have a [medical baseline allowance](#) providing low rates for residents that rely on medical equipment, [Medical Baseline](#). Extra allowances of energy are billed at the lowest rate for customers who rely on medical-related equipment.
- **Pests:** Changes in temperature affect pest migration and extend breeding seasons. San Mateo County has a biologist available every weekday to help both businesses and individuals with pest identification (CSN, 2018). Pest identification resources are made available online through the University of California Integrated Pest Management Program based on home, agriculture, natural pests, and exotic and invasive species. Concerned citizens may also look up pests by location and type through [UC IPM](#).
- **Disease:** Increased temperatures and changes in weather patterns can lead to the spread of disease. Climate change is one important factor for the increased risk of exposure to West Nile virus. The virus is commonly spread to humans by infected mosquitos that are exposed to the virus by infected birds. Warmer temperatures boost mosquito populations and the migratory patterns of birds. As of July 2018, twelve human cases of West Nile virus were detected in California during 2018.

## Infrastructure Improvements & Land Management

- **Fire Prevention:** Research shows that the recent increases in temperature have contributed to fire risk in California. [Fire Safe San Mateo](#) provides guidance to member agencies and residents on how to reduce the risk of fire. Projects include shaded fuel breaks and fuel reduction at San Mateo County Parks.
- **Sea Level Rise and Flooding:** San Mateo County conducted an extensive evaluation of assets that are at risk due to sea level rise and flooding. Assets such as hospitals, roads and wastewater facilities are essential to the health and well-being of the community. See our indicators report for an overview of [the assessment](#) and details of the resilience projects organized by the San Francisquito Creek Joint Powers Authority ([SFCJPA](#)), designed to prevent flooding of East Palo Alto and Highway 101.
- **Storm Drain Master Plans:** Storm drain planning is one of the many issues identified by the [Adapting to Rising Tides](#) project, sponsored by the Metropolitan Transportation Commission. As sea levels rise, many of these drains will not function properly and may disrupt transportation when flooding occurs. To help address this concern, the City/County Association of Governments developed a countywide [Stormwater Resource Plan](#) and individual municipalities are developing Green Infrastructure Plans to support more sustainable stormwater management to protect residents and vital community assets.

## Reduce the Heat Island Effect

- **Cool Pavement:** Strategies are emerging to combat the heat island effect – temperature magnification from continuous pavement and development in urban areas. A pilot project in Los Angeles is painting streets white to reduce the heat absorbed by asphalt. [Cool Pavement](#) is most effective when combined with other strategies like increasing tree canopy to provide shade and lightening roofs.
- **Tree Canopy:** Local nonprofits, [Canopy](#) and [City Trees](#), enable communities to grow a protective layer of shade by mobilizing volunteers to plant trees in neighborhoods and along roadways.
- **White Roofs:** In New York, the [White Roof Project](#) educates and activates the public to undertake painting projects to cover heat absorbing tar roofs with a solar-reflective white coating. A roof covered with solar-reflective white paint reflects up to 90% of sunlight as opposed to the 20% reflected by a traditional black roof. This low-cost solution is a quick and easy way to cut carbon emissions, reduce the risk of ‘brown outs’ caused by stress on the power grid, save millions in energy costs, and even save lives.
- **Cool Roofs:** Designed to reflect more sunlight and absorb less heat than a standard roof, cool roofs are light in color and can be made of a highly reflective type of paint, a sheet covering, or highly reflective tiles or shingles. The results are lower indoor temperatures, reduced energy bills, a decreased heat island effect, and a lowered peak electricity demand that minimizes power outages.

- **Green Roofs:** Rooftops that host plants or vegetation provide insulation and minimize the need for heat during winter, and cool buildings in the summertime by participating in the dew and evaporation cycle. Though most buildings in the Bay Area do not have the load-bearing roofs needed to support the weight of a green roof, this design feature is possible for new buildings. Effective January 2017, San Francisco will require 15 – 30% of new buildings to have either Solar or Green Roofs or a combination of both.

Take Action:

- Make an [emergency plan](#) and learn community evacuation routes.
- Join the county's [Emergency Response Team](#) or become a [Disaster Health Care](#) volunteer!
- Plant trees! Nonprofit organizations such as [Canopy](#) or [City Trees](#) host tree planting events on the peninsula.
- Host annual block parties to strengthen ties to neighbors or organize a local [National Night Out](#) to promote neighborhood camaraderie and encourage police-community partnerships.

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