The City of Emeryville Climate Action Plan 2.0 2016

The time to act on reducing greenhouse gas emissions and our carbon footprint is now

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EXCEUTIVE SUMMARY

Climate change continues to be a serious and significant issue for the City of Emeryville to address. The City of Emeryville's Climate Action Plan (CAP) 2.0 was written to build on the progress made by the first CAP for the City of Emeryville in 2008 and to incorporate the new state mitigation targets and rapidly-evolving technology. In accordance to the State of California targets, the City of Emeryville aims to reduce greenhouse gas (GHG) emissions to 40% below baseline levels by 2030 and 80% below baseline levels by 2050.

The City of Emeryville CAP 2.0 meets the compliance for the Global Covenant of Mayors, a platform for standardizing climate action planning for local city governments and demonstrating local commitment to climate change mitigation and adaptation. As per the Covenant of Mayors' requirements, the CAP 2.0 contains a vision for the City's overall climate ambitions and objectives, updated community and municipal GHG inventories , a business-as-usual GHG emissions forecast, emissions reduction targets, a climate change vulnerability assessment, mitigation and adaptation implementation plans, and a monitoring plan.

With 17 mitigation goals, 5 adaptation goals, and over 100 combined initiatives for 2030, and 5 long-term strategies for 2050, this CAP 2.0 represents a strong step in reducing emissions and building climate resilience. Details about the initiatives, the GHG inventories, and the full climate vulnerability assessment can be found in the accompanying City of Emeryville Climate Action Plan 2.0 Implementation Plan.

Article I. BACKGROUND

Section 1.01 Vision for Emeryville

Sustainability is made up of three pillars: environment, economy, and equity.

Environment: People live within the limits of nature, protect and build natural assets, and maintain resources for future generations.
Economy: Economic activity should serve the common good, be self-renewing and build local assets.
Equity: All people should have access to an equitable distribution of goods, services and resources.

Sustainability and innovation, with respect for the past. The Emeryville community strives to live within means that do not compromise the ability of future generations to enjoy a livable, healthy, and vibrant city. Sustainability is encouraged through redevelopment of contaminated land as a healthy and cost-effective way of improving the local environment, ensuring access to essential services, use of "green" construction techniques, and promoting lifestyles with low ecological impacts upon energy consumption, climate, and the natural environment. The Emeryville community will coordinate and collaborate with regional and other outside efforts to improve local conditions and continue sustainable development. The City will interweave the future and the past, while respecting the scale, character, and use of historical neighborhoods and districts.

In 2008, Emeryville was among the first wave of US cities to adopt a climate action plan (CAP) to reduce its greenhouse gas (GHG) emissions 25% for 2020. Emeryville saw significant progress in the past eight years, including the installation of solar panels on several city facilities, street lighting upgrades, an adoption of an eco-foodware ordinance, and city-wide multi-stream recycling. The 2016 CAP Update builds upon that progress, setting a path for reaching Emeryville's 2030 and 2050 goals, creating a vision for a carbon-neutral city, and preparing Emeryville for the impacts of climate change.

Section 1.02 Introduction

Climate change is the greatest environmental challenge of the 21st century. It poses a serious threat not just to California's natural resources, but also to our jobs and our health. Climate change also presents huge opportunities for creating a healthier, safer, and more equitable zero-carbon world. Emeryville has an unparalleled opportunity to make changes in ways that create jobs and benefit all residents. Scientists expect that with the current trends in fossil fuel use, Californians may see more intense heat waves, droughts, rainstorms, floods, wildfires and landslides in the future. These impacts could drag down our economy, stress our natural resources and worsen inequities facing many Californians. Action is required at all levels, and local governments have a unique role to play in building low-carbon communities.

These impacts are caused by the accumulation of GHG such as carbon dioxide (CO_2) and methane (CH_4) in the atmosphere, primarily resulting from burning fossil fuels and land use

changes. Although the natural greenhouse effect is needed to keep the earth warm, a human enhanced greenhouse effect with the rapid accumulation of GHG in the atmosphere leads to too much heat and radiation being trapped (Fig 1). Carbon emissions from human activities have continued to rise in recent decades, reaching the highest rates in human history between 2000 and 2010.[1] About half of all carbon dioxide emissions between 1750 and 2010 occurred in the last 40 years. The energy, industry and transportation sectors have dominated these emissions increases. With the current trajectory of population growth, urbanization, and reliance on personal vehicles, global transportation emissions will double by 2050. Given the critical impacts of climate change on humanity, the time to act on reducing GHG and our carbon footprint is now.

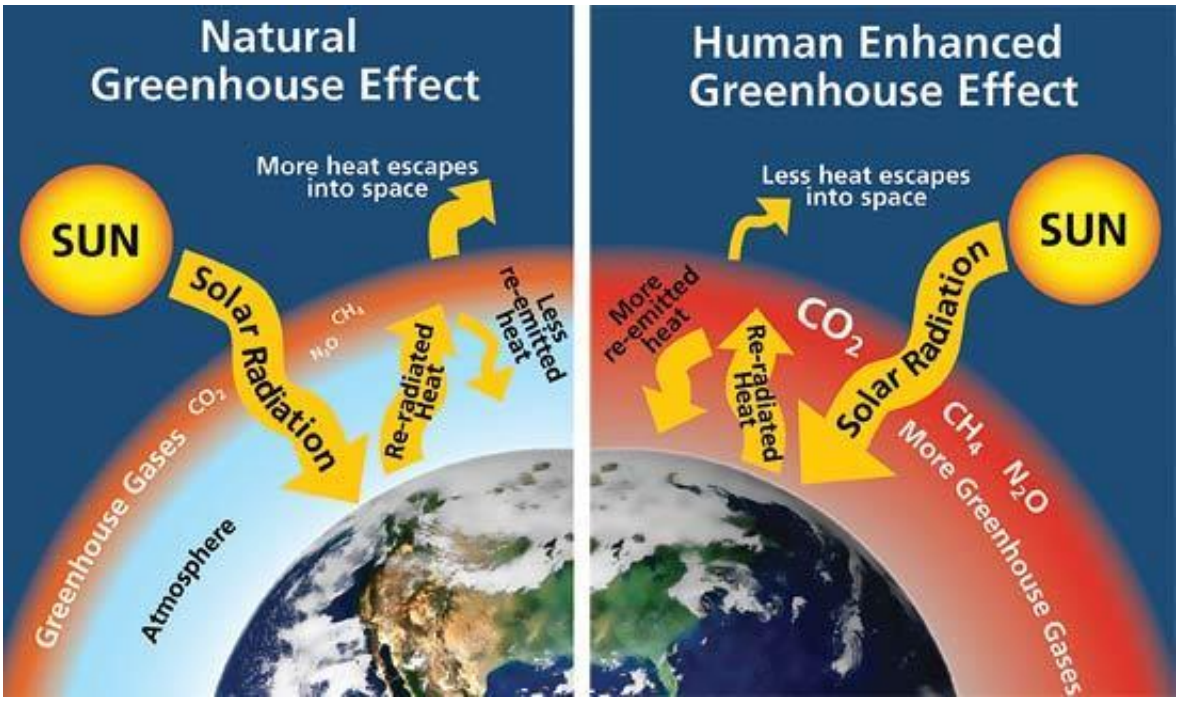

Figure 1: Greenhouse Effect. Left: Naturally occurring greenhouse gases — carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) — normally trap some of the sun's heat, keeping the planet from freezing. Right: Human activities, such as the burning of fossil fuels, are increasing greenhouse gas levels, leading to an enhanced greenhouse effect. The result is global warming and unprecedented rates of climate change. Source: Will Elder, National Park Service

With more than 80% of Americans living in urban areas, cities play a powerful role in addressing climate change. The design of cities—how we use our land, how we design our buildings, how we get around—greatly impacts the amount of energy we use and the volume of GHG emissions we produce. In the next 20 years, we expect another 1.5 billion residents in the world's cities, many of them in the developing world. Therefore, it is critical that cities like Emeryville demonstrate that it is possible to dramatically reduce GHG emissions while creating more vibrant and prosperous places to live and do business.

[1] Intergovernmental Panel on Climate Change. Climate Change 2014: Impacts, Adaptation, and Vulnerabilities: Summary for Policymakers, 2014.

Section 1.03 The Case for Climate Action

The evidence for man-made climate change has become overwhelming in the past decade.[2] Globally, the year 2015 was the warmest on record since 1880, even beating out 2014 by a wide margin, according to analyses by NASA and National Oceanic and Atmospheric Administration (NOAA).[3] Fifteen of the 16 warmest years on instrument record have occurred since 2000.[4] Furthermore, global annual average temperature has increased more than 1.5° Fahrenheit (F) since 1880 and minimum Arctic sea ice extent, which occurs in early to mid-September, has decreased by more than 40 percent since satellite records began in 1978.[5] Global average sea level was 1.5 inches above the 1993-2010 average in 2013. Sea level rise has accelerated to the rate of one-eighth of an inch per year.[6]

Climate models indicate that these trends will continue over the coming century, and the San Francisco Bay Area is no exception. The three major climate changes for this region include warming, precipitation, and sea level rise:

- An average increase of 2.7°F by 2050 in the Bay Area is likely to result just from the GHGs put into the atmosphere during the last century.[7] By 2100, temperature increases of 3.6 to 10.8°F are projected in the region.
- Projected annual precipitation patterns are expected to remain highly variable with snowmelt run offs earlier in the spring and more intense storm downpours.[8] Climate model outputs indicate that the greatest reduction in precipitation will likely be in the spring months.
- On the conservative end, sea level rise in the Bay Area is projected to be 10-17 inches at mid-century and 31-69 inches at the end of the century.[9] A more recent study from NOAA suggests sea level rise could be as much as 108 inches by 2050.[10]

(a) Potential Impacts to Emeryville and the Bay Area

[2] Intergovernmental Panel on Climate Change. Climate Change 2014: Impacts, Adaptation, and Vulnerabilities: Summary for Policymakers, 2014.
[3] Rebecca Lindsey, "No surprise, 2015 sets new global temperature record". https://www.climate.gov/news-features/featured-images/no-surprise-2015-sets-new-global-temperature-record Climate, Jan 2016.
[4] The Climate Reality Project, "2015 Crushed Global Heat Records: Three Things You Should Know" https://www.climaterealityproject.org/blog/2015-crushed-global-heat-records-three-things-you-should-know Jan 2016.
[5] U.S. Global Change Research Program, 2014 National Climate Assessment Report, http://nca2014.globalchange.gov/highlights/report-findings/our-changing-climate May 2014.
[6] Bulletin of the American Meteorological Society (BAMS), "Sea level variability and change," State of the Climate in 2013, http://www.climate.gov/news-features/understanding-climate/2013-state-climate-sea-level 2014.
[7] California Energy Commission, Climate Change Impacts, Vulnerabilities, and Adaptation in the San Francisco Bay Area: A Synthesis of PIER Program Reports and Other Relevant Research, July 2012.
[8] California Energy Commission, Climate Change Scenarios for the San Francisco Region, July 2012.
[9] San Francisco Bay Conservation Development Commission, "San Francisco Bay Plan". http://www.bcdc.ca.gov/plans/sfbay_plan.html, October 2011.
[10] Margaret Davidson and Michael Angelina, NOAA. "Environmental Intelligence: Quantifying the Risks of Climate Change". Session at RIMS Annual Conference, April 12 2016.

Climate change, with its increases in temperature, increased variability in precipitation, and rapid sea-level rise, poses significant risk to Emeryville. Not only is the natural environment affected, but the economy, critical infrastructure, and community services may all be impacted. Climate change can result in some of the following impacts:

- Sea level rise will increase the likelihood and intensity of flooding in Emeryville, including more frequent storm surges, flooding during high tides, and rapidly increasing shoreline erosion. Such extreme events may prevent road access, hamper emergency services, and risk lives.
- Regional wildfire risk will increase with the temperature increases and seasonal shifts. Drier conditions in the spring will also result in a longer fire season.
- Projected temperature trends may result in a significant increase in the frequency and intensity of days over 90 degrees Fahrenheit, with an increasing tendency for multiple heat wave days in succession. This may cause heat stress and increased risk of heat illness in residents.
- Risks to the water supply come from the changing pattern of snowfall and overall precipitation in the Sierra Nevada mountain range. Precipitation is changing as snowmelt runs off earlier in the spring and storms bring more intense downpours. Because Bay Area water suppliers draw their water both from the Sierra Nevada and local surface-water and groundwater, climate changes in both regions will impact future water availability.[11]
- Major components of the transportation network that serves Emeryville and the Bay Area are at risk from sea level rise and periodic inundation from storm surges or heavy rain by mid-century. These include local streets, freeways, bridge approaches, rail, and Bay Area Rapid Transit (BART) lines, the San Francisco Port, and the Oakland and San Francisco International Airports.[12] Disruptions to this network could have huge economic impact due to the number of commuters and goods passing through. Emergency services are also at risk.
- Residential energy demands are expected to increase as temperatures rise, particularly over summer months. At the same time, extreme heat events create less optimal conditions for power production and transmission, making it more challenging to meet energy demands and avoid brown-outs.[13]
- Increases in the occurrence of heat extremes, more days with bad air quality due to higher temperatures, and possible spread of diseases related to climate change will increase the threats to human health in the region. Some examples include asthma, West Nile virus from increased incidence of mosquitoes, and heat stroke. Some segments of the population, especially those with pre-existing health conditions, the elderly, infants and children, socially isolated individuals, those not speaking English, and the poor are more

[11] California Energy Commission. Climate Change Impacts, Vulnerabilities, and Adaptation in the San Francisco Bay Area: A Synthesis of PIER Program Reports and Other Relevant Research, July 2012.
[12] San Francisco Climate Action Strategy: 2013 Update, 2013.
[13] California Energy Commission. Climate Change Impacts, Vulnerabilities, and Adaptation in the San Francisco Bay Area: A Synthesis of PIER Program Reports and Other Relevant Research, July 2012.

sensitive than others, and/or may lack the ability to cope with or prepare for such impacts.[14]

(b) Opportunities for Climate Action

While the challenge of climate change is daunting, there is a huge capacity for city policies to influence GHG emissions, particularly considering that the majority of the world's population resides in urban areas. Four major areas of action include green buildings, renewable energy, transportation, and waste management. Simply recording building energy performance against national energy rating standards can result in average annual energy savings of 2.4%.[15] Cities can help negotiate renewable power purchasing agreements with local utilities as well as offer incentives for installing solar panels and wind turbines in the residential and commercial sectors. Similarly, cities' decisions to switch to electric public vehicles and buses, offer more electric charging stations, conduct smart transportation planning, and provide greater access to mass transit can alleviate GHG emissions from private driving in the transportation sector. Increasing waste diversion and reducing consumption also contribute significantly to emission reductions.

There are numerous benefits to taking action now on this. By implementing such climate action strategies, we not only help reduce global GHG emissions and slow climate changes, but on the local scale we also see:

- Better air quality and improved human health.
- New jobs and greater reinvestment in the local economy.
- Lower energy and water bills.
- Shorter commute times between home, work and school and more opportunities for people to walk, bike or take public transit.
- More resilient and connected neighborhoods and communities.
- Less damage to social and environmental systems due to drought, floods and fire, and fewer disruptions in services.
- Improved energy, water, and food security.

Section 1.04 GHG Emissions and Reduction Targets

(a) State Legislation

Recent state legislation on climate change sets our aim high. In 2015, California Governor Jerry Brown issued Executive Order B-30-15, which built upon Governor Arnold Schwarzenegger's Executive Order S-3-05, to set a statewide target of reducing GHG emissions to 40% below 1990 levels by 2030 and 80% below 1990 levels by 2050. This was later followed up by Senate Bill 350, which aims to increase retail sale of renewable electricity to 50% and double energy efficiency savings in electricity and natural gas end uses by 2030. These are ambitious goals, but California is committed to being an environmental leader. Climate strategies are now required as

[14] California Energy Commission. Climate Change Impacts, Vulnerabilities, and Adaptation in the San Francisco Bay Area: A Synthesis of PIER Program Reports and Other Relevant Research, July 2012.
[15] Zachary Hart. "The Benefits of Benchmarking Building Performance". Institute of Market Transformation, December 2015.

part of local government general plans, and the new Integrated Climate Adaptation and Resilience Program will help coordinate regional and local climate actions. The current state strategy continues to prioritize policies, programs, and investments to accelerate the transition to clean energy. This CAP is integrated closely with state policies and programs.

(b) International Agreements

Emeryville signed on to the international Compact of Mayors in November 2015. The Compact of Mayors was launched by United Nations Secretary-General Ban Ki-moon and his Special Envoy for Cities and Climate Change with support from ICLEI – Local Governments for Sustainability, C40 Cities Climate Leadership Group, and the United Cities and Local Governments (UCLG). President Obama pushed for 100 US cities to sign on to the Compact of Mayors prior to the Paris climate talks in December 2015 and Emeryville was one of the cities that answered the call. This Compact establishes a common platform for local cities' collective actions on climate change and provides standardization for measuring emissions and climate risk as well as for reporting mitigation and adaptation efforts. In July 2016, the United Nations' Compact of Mayors joined with the European Union's Covenant of Mayors to form the Global Covenant of Mayors.

To be compliant with the Global Covenant of Mayors, cities must register commitment on either the carbon*n* Climate Registry or the CDP platform to take steps on both climate change mitigation and adaptation. Then cities must complete a community-wide GHG inventory, identify climate hazards, conduct a climate change vulnerability assessment, and establish reduction targets. Finally, an action plan must be created to address climate mitigation and adaptation. Progress must be reported annually to maintain compliance.

Section 1.05 Challenges and Opportunities for Emeryville

Emeryville has been an active environmental player in the last decade. The City has led the way in encouraging more biking and walking, waste diversion, and green certified businesses. Since the CAP was passed in 2008, Emeryville has implemented a number of programs and achieved the following:

- Averted a total of 10,067 metric tons of CO_2 equivalent (CO_{2e}), proportional to taking 1,681 cars off the road for a year from participation in PG&E energy efficiency programs since 2006.
- Contracted with California Youth Energy Services to provide home energy-efficiency retrofits and train youth.
- Increased requirement to LEED Gold for new City Projects in 2011. Twenty three buildings have achieved LEED certification from the Green Building Council.
- Developed an award-winning Brownfields remediation program.
- Increased bike participation in Bike to Work Day from 272 in 2006 to 1,209 in 2014. The past three events have been completely car-free.
- Helped launched the regional BikeShare program with three bike stations in 2016 and seven more coming in 2017.

- Certified as a Bicycle-Friendly Community in 2012 and upgraded from Bronze to Silver in 2016.
- Reduced community solid waste disposal by 35% from 2004-2014.
- Adopted strict requirements for new street tree planting and compost requirement for all new landscapes.
- Upgraded streetlights to LED; retrofitted lighting in the Senior Center, City Hall, the Fire Station 35, and the Police Station; installed new boiler in Senior Center; and installed solar panels on City Hall and Police Station roofs.
- Adopted Green Chamber of Commerce and Healthy City Initiative. Twenty eight businesses are currently green certified.
- Adopted an ordinance requiring compostable or recyclable food service-ware for restaurants and caterers. Kitchen green pails are available for all Emeryville residents for free, with more than 1,100 distributed in the past two years.
- Adopted a vegetated stormwater management ordinance.
- Increased street trees by 18.5% since 2004.
- Adopted a stricter water-efficient landscaping ordinance.
- Required City projects to exceed the Bay Friendly landscaping minimum score.
- Reduced building permit fees for single family home solar installations.
- Completed Safe Routes to School and Safe Routes to Transit projects, encouraging active transportation.
- Signed on to the US Compact of Mayors in November 2015.
- Recognized by the Institute for Local Governments with the Beacon Award – Silver in 2016 for overall sustainability best practices and GHG reductions at the community and government agency level.

Despite these actions however, Emeryville still has a long way to go to meet its aggressive GHG reduction targets and adaptation goals. Emeryville's unique position as a small city at the junction of several major state highways in the Bay Area presents several challenges for mitigation and adaptation efforts.

- The high percentage of industrial/commercial businesses in comparison with the residential sector means improvements made by residents are overwhelmed by the magnitude of emissions in the commercial sector.
- The intersection of several major freeways in Emeryville results in a high proportion of pass-through traffic, which is tied to regional success in the transportation sector.
- Despite the availability of energy efficiency and other environmental programs, the level of community engagement is still very low in comparison to where the city needs to be.
- Certain components, such as PG&E's energy mix and methane capture at local landfills, are outside of Emeryville's municipal regulations.
- Since the city is already relatively built out, adaptive changes to existing infrastructure may be prohibitively expensive for property owners, despite the potential climate risks and costs of not making the changes.
- Many of the business owners in Emeryville rent their buildings and have little or no control over the building efficiencies or other property issues. Outreach is difficult in these situations if the property owner is not on site.

- Many of the anticipated climate impacts, such as sea level rise, require a larger scale regional approach than what is possible at the local individual city level.

In moving forward, strategies in approaching these challenges can come from metrics as well as policy implementation. By breaking down data by total population and per capita population, the city can better track progress and barriers to different mitigation policies. Collaborating with neighboring local governments to work on regional issues such as transportation and sea level rise will be essential. Another key strategy will be collaborating with commercial partners and businesses on best practices and working closely with Pacific Gas & Electric (PG&E) and the East Bay Municipal Utility District (EBMUD) to ensure promotion of water and energy program incentives.

Section 1.06 Emeryville Community GHG Inventory

(a) Baseline Production-Based Community GHG Emissions in 2004

In order to measure Emeryville's progress on climate goals, a baseline of GHG emissions had to be established. There are two components of GHG inventorying for cities – a community-wide inventory, defined by Emeryville's geographic boundaries and encompassing all residential, commercial, industrial, and municipal emissions; and a local government operations inventory, the subset of the community inventory focusing on emissions from municipal government operations. The baseline community GHG emissions inventory was completed in 2004 in conjunction with ICLEI and was recently updated with improved transportation data from the Metropolitan Transportation Commission (MTC). The baseline inventory and subsequent inventories done in 2010 and 2014 were completed using traditional production-based methodology, which includes emissions originating within geographic boundaries. The community of Emeryville emitted approximately 158,062 metric tons of CO_{2e} in the year 2004, with the bulk of the emissions coming from the commercial energy (48.11%) and transportation (43.43%) sectors, as shown in Table 1. This total GHG count includes state highway emissions. Results from the consumption-based inventory, the alternative methodology which encompasses emissions embedded in products or services consumed in the geographic boundary, are described in a later section.

Emeryville is unique in the San Francisco Bay Area region in that for its small land area, it has a large proportion of state highways, such as Interstate-80. Although Emeryville can take steps to mitigate traffic on local roads, it is more difficult to regulate what happens on state highways. The total GHG emissions data with state highways included can hide the results of local traffic mitigation efforts. Therefore, it is useful to look at an alternative GHG emission total with local traffic only, for the purpose of analyzing the effectiveness of local mitigation strategies. This does not discount the larger context of the emissions from the state highways and the importance of putting pressure on regional and state agencies to regulate those roads, but is merely another way to approach the inventory.

Given this context, a separate baseline for total GHG emissions with local traffic only was also calculated. Data on public roads collected by the State of California's Department of

Transportation in 2005[16] indicates that state highways make up 62.6% of daily vehicle miles traveled in Alameda County. Using this as a proxy for state highway usage in Emeryville per the guidance of MTC, this brings CO_2 emissions from the transportation sector from a total of 68,644 metric tons to 40,194 metric tons and a grand total for Emeryville's emissions to 129,612 metric tons of CO_2 (Table 1).

Table 1: Community GHG Emissions by Sector in 2004

All Traffic						
	Residential	**Commercial**	**Transportation**	**Waste**	**Water**	**TOTAL**
CO_2e (metric tons)	10,021	76,038	68,644	2,646	713	**158,062**
Percent of Total CO_2e	6.34%	48.11%	43.43%	1.67%	0.45%	**100.0%**
Local Traffic Only						
	Residential	**Commercial**	**Transportation**	**Waste**	**Water**	**TOTAL**
CO_2e (metric tons)	10,021	76,038	40,194	2,646	713	**129,612**
Percent of Total CO_2e	7.73%	58.67%	31.01%	2.04%	0.55%	**100.0%**

(b) Production-Based Community GHG Emissions in 2014

Emeryville's GHG inventory was updated again in 2010 and 2014 for community GHG emissions. In 2014, the total GHG emissions including state highway traffic were found to be 172,182 metric tons CO_2. Table 2 shows the breakdown of the emissions into residential, commercial, transportation, waste, and water sectors. The total GHG emissions with only local traffic were similarly calculated with the county-wide breakdown of daily vehicle miles traveled (58% state highways and 42% local traffic)[17]. In the local traffic scenario, the transportation sector contributed 44,282 metric tons CO_2, giving a community-wide grand total of 120,194 metric tons CO_2.

Table 2: Community GHG Emissions by Sector in 2014

All Traffic						
	Residential	**Commercial**	**Transportation**	**Waste**	**Water**	**TOTAL**
CO_2e (metric tons)	9,357	62,772	96,270	3,165	617	**172,182**
Percent of Total CO_2e	5.43%	36.46%	55.91%	1.83%	0.36%	**100.0%**
Local Traffic Only						
	Residential	**Commercial**	**Transportation**	**Waste**	**Water**	**TOTAL**
CO_2e (metric tons)	9,357	62,772	44,282	3,165	617	**120,194**
Percent of Total CO_2e	7.78%	52.22%	36.84%	2.63%	0.51%	**100.0%**

Overall, Emeryville has reduced its total GHG emissions since 2004 in the local traffic scenario, but emissions have increased in the all-traffic scenario. In the local traffic scenario, there was an overall reduction of 10,224 metric tons CO_2 or 7.84% in the total GHG emissions in 2014 compared to the local-traffic-only GHG total in 2004. By sector, local transportation emissions increased in 2014, but there were reductions seen in the residential, commercial, and water sector. In contrast, the GHG total in the all-traffic scenario increased by 13,314 metric tons CO_2 or 8.38%.

[16] State of California, Department of Transportation. 2005 California Public Road Data Statistical Information derived from the Highway Performance Monitoring System, September 2006.
[17] State of California, Department of Transportation. 2013 California Public Road Data Statistical Information derived from the Highway Performance Monitoring System, November 2014.

Emeryville is a fast growing city, with a population of 7,947 in 2004 and 10,967 in 2015, representing a 38% increase in the past decade. Thus, the per-capita GHG measure reflects more positively (Table 3). Both the per-capita metric for the all-traffic and local traffic scenarios decreased from 2004 to 2014, by 18.51% and 30.71% respectively.

Table 3: Community Per-Capita GHG Emissions

Year	All Traffic (metric ton CO_2/person)	Local Traffic Only (metric ton CO_2/person)
2004	19.99	16.41
2014	16.29	11.37
Reduction	18.51%	30.71%

(c) Consumption-Based Community GHG Inventory 2015

Emeryville's community GHG inventory follows standard emissions inventory protocols, which assign emissions to jurisdictions based primarily on the location of emissions-generating activities. In cases such as natural gas combustion by stationary appliances like building heating, the activity and the related emissions both occur within the jurisdiction. Other activities such as electricity use and solid waste generation occur within the jurisdiction, but the emissions may occur at power plants and landfills outside of the jurisdictional boundaries. They are included, however, because the local community has a high level of control over the activity that causes the emissions. The traditional production-based inventory methodology thus reflects a range of local activities that result in emissions both within and beyond the jurisdictional boundaries.

The logic to include emissions resulting from local activities can be applied more comprehensively to include the emissions resulting from consumption of goods and food. A consumption-based inventory includes the emissions resulting from all consumption activities of a local community of residents. It attributes all emissions to the end consumer, including all emissions released along the supply chain. This is in contrast to the traditional production-based inventory, which attributes all emissions to the location where the emissions occur (for example on agricultural lands or at manufacturing facilities). Both inventory methodologies are valid and most effectively inform GHG reduction policies when considered together; the consumer has the opportunity to consume more sustainably and the producer has the opportunity to produce more efficiently. In regions such as the Bay Area where consumption outweighs production, local communities benefit from knowing the upstream emissions impact of their consumption to better understand how they can help reduce those emissions.

Strategies to reduce consumption-based emissions also have the potential to benefit the local economy. Whereas traditional inventories can appear to benefit from a GHG reduction when production is outsourced, a consumption-based lens supports strategies for localizing and cleaning production, which creates local jobs and stimulates economic activity. Other strategies, such as encouraging consumer spending on local services and entertainment instead of goods (purchased online for example) clearly benefit the local economy and reduce consumption-based emissions but have no measurable local impact on the traditional emissions inventory.

The primary obstacle to including a consumption-based perspective is the difficulty of modeling consumption and obtaining data with enough detail to evaluate different consumption choices. Fortunately, the Bay Area Air Quality Management District (BAAQMD) commissioned UC Berkeley to develop a consumption-based inventory for every jurisdiction in the Bay Area based on GHG emissions expressed in CO_2e. UC Berkeley modeled the average household carbon footprint of every census block group and extrapolated those averages to create emissions profiles by jurisdictions. The findings are based on economic models. Local data were used whenever possible; however, some data sources reflect regional or national averages. The findings are useful to inform potential strategies or measures to reduce GHG emissions, but may not be able to track local impacts of those strategies over time.

The household footprints include all direct and indirect greenhouse gas emissions resulting from the life cycle of energy, transportation, water, waste, food, goods and services consumed by households in a calendar year, in this case 2013. The results for Emeryville are shown below in Figure 2.

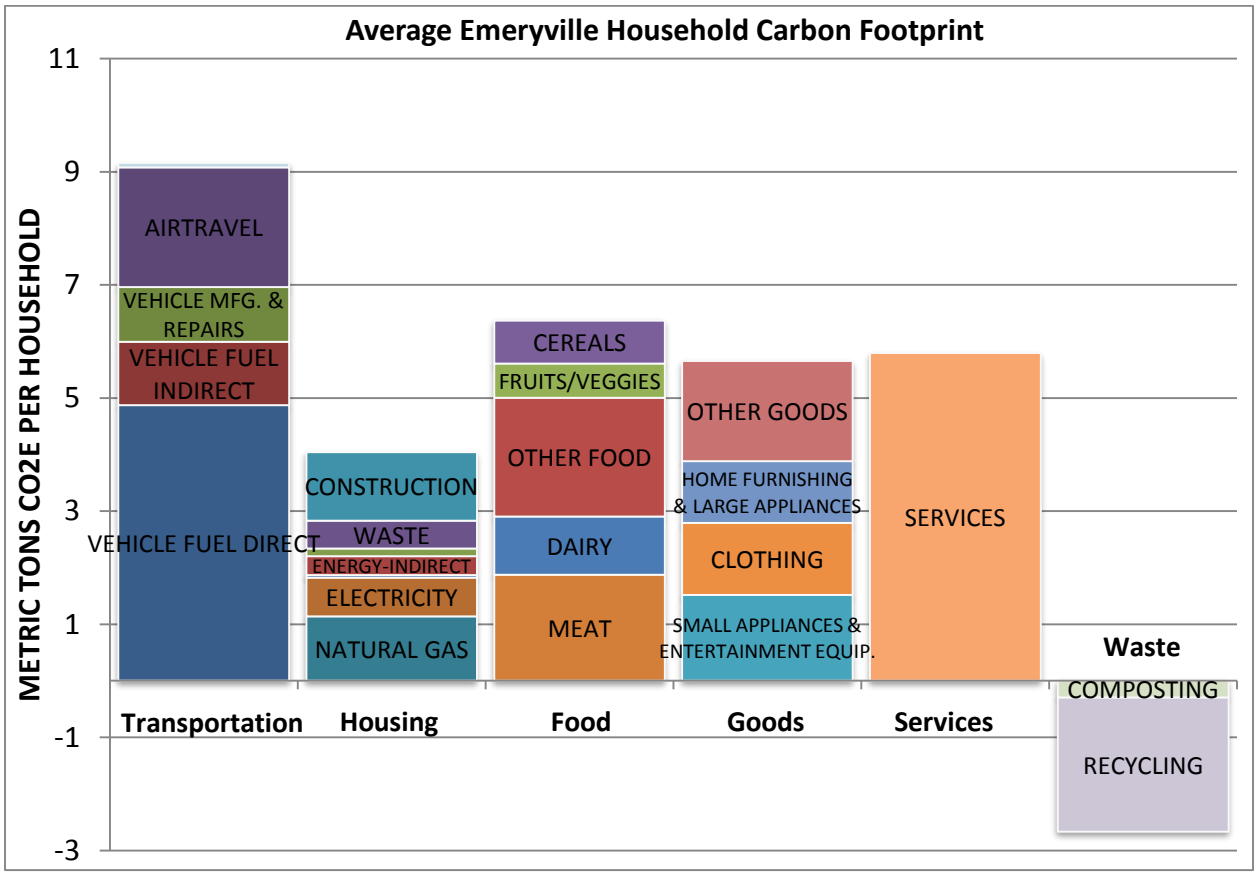

Figure 2: Average Emeryville Household Carbon Footprint. Results came from UC Berkeley and BAAQMD's 2015 consumption-based GHG inventory study.

The graph illustrates the significance of upstream emissions related to food and goods, which are not captured in the traditional inventory. Other additions include air travel within transportation and construction impacts within housing. Transportation and housing contribute a comparably smaller portion of the emissions than in the traditional inventory, but transportation is still the

dominant source, indicating that transportation remains the primary factor to focus on in achieving emissions reductions. Emeryville acknowledges the role that local consumption patterns play in these emissions.

One key finding from this analysis is that GHG emissions from electricity consumption are much lower in the Bay Area than the national average. This is due to the higher proportion of renewable energy sources that produce the electricity consumed in the Bay Area, in combination with our moderate climate. The low carbon intensity of electricity provides an opportunity to reduce GHG emissions from the transportation sector and the housing sector by promoting electric vehicles as well as electric space and water heating in homes and buildings.

Overall, it was found that Emeryville had the lowest average carbon footprint per household across the different cities in the Bay Area study, 30.41 metric tons of CO_2e per year. The carbon footprint of the average San Francisco Bay Area household was found to be 44.3 metric tons CO_2e. While Emeryville is doing better in comparison to other cities, this trend of low carbon intensity consumption should be continued and improved upon in the coming years.

(d) Business As Usual (BAU) Community Forecasts

In order to understand what is needed, we need to establish an estimate of where Emeryville is headed. ICLEI has developed a model called ClearPath for GHG inventorying and projecting emissions under climate change scenarios. This model allows us to forecast the current trends in fossil fuel use and GHG emissions. This business as usual (BAU) scenario assumes no further efforts to reduce our carbon footprint. There are 4 scenarios to consider: BAU without state mandates (all traffic), BAU with state mandates (all traffic), BAU without state mandates (local traffic only), and BAU with state mandates (local traffic only).

The State of California has several climate policies and regulations in place to help reach the 2030 and 2050 targets, such as the renewable portfolio standard (RPS) instituted in the 2002 Senate Bill 1078. The RPS program requires investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 33% of the total energy mix by 2020. Recently, this requirement was updated to 50% by 2030 under Senate Bill 350. In addition to this state mandate, supplementary mitigations are possible through vehicle efficiency improvements. These state mandates are important contributions to the mitigation effort, and it is necessary to investigate worst-case scenarios where BAU continues without enforcement of the mandates in order to see the magnitude of mitigation effort needed.

If the trends continue with BAU and none of the state mandates around renewable energy are enforced, the forecast for GHG emissions becomes very grim. Figure 3 shows the total forecasted GHG emissions for Emeryville, including state highway emissions, growing from 172,080 metric tons CO_2 in year 2014 to 273,815 metric tons CO_2 in year 2050 (red line). Even in a BAU scenario with state regulations, the forecast for 2050 is 182,189 metric tons CO_2 (green line), far above the target of 31,710 metric tons CO_2 (blue line).

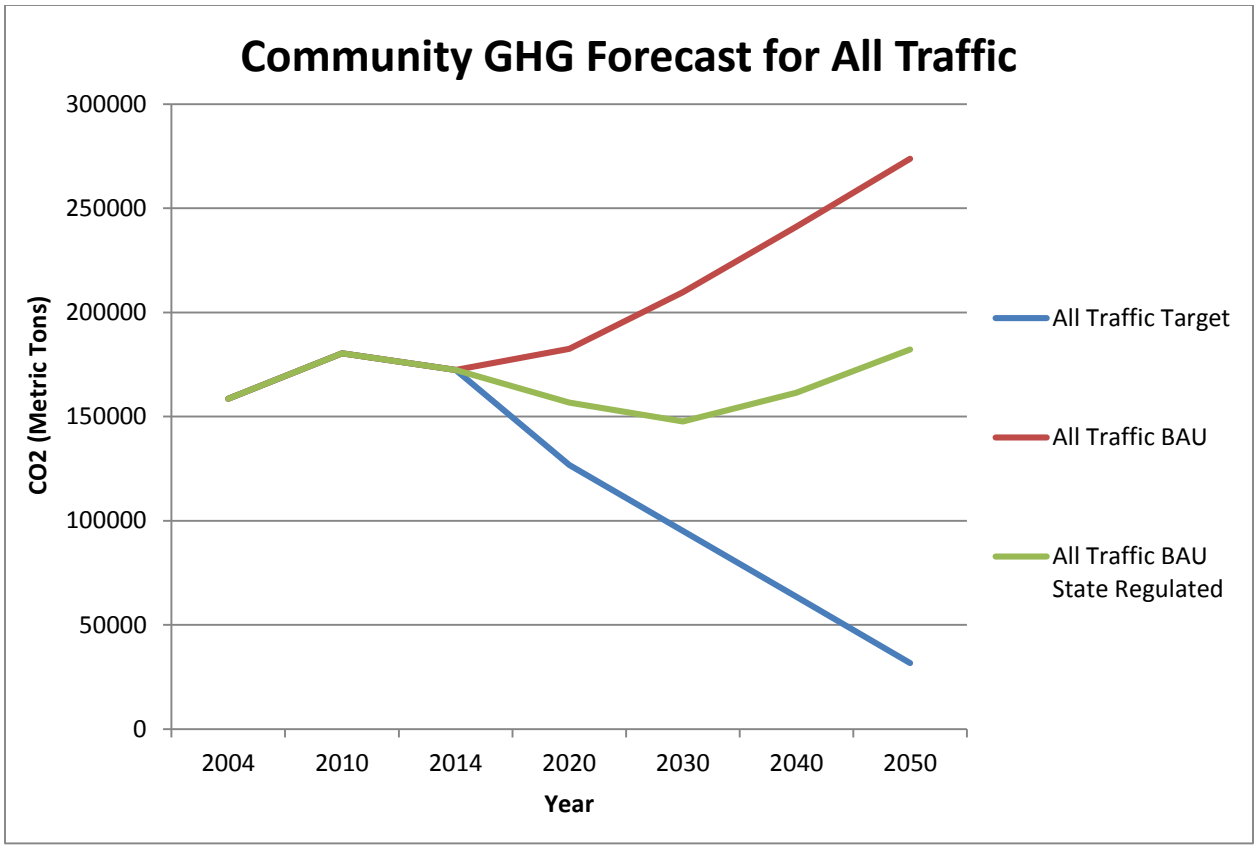

Figure 3: Forecast for Emeryville for All-Traffic Scenario. This forecast from ClearPath shows GHG emissions out to 2050, including state highway emissions within transportation.

Similarly, the BAU forecasts for the local traffic only scenario are far above where they need to be, as shown in Figure 4. Without state regulations enforced, total emissions increase to 192,170 metric tons CO_2 by 2050 (red line). With state regulations, the status quo is approximately maintained at 132,997 metric tons CO_2 (green line), and even dips below the 2020 target before starting an upward trend after 2030. The 2050 target is 34,467 metric tons CO_2 (blue line).

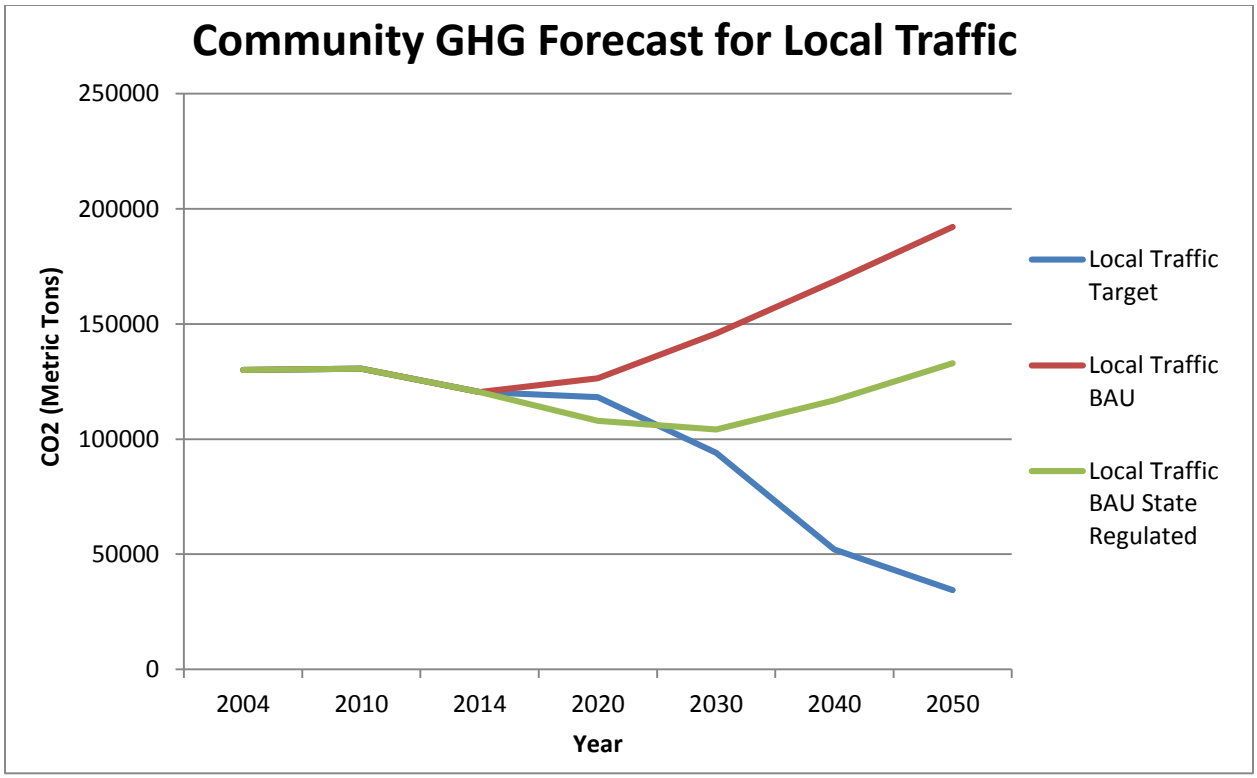

Figure 4: Forecast for Emeryville for Local Traffic Scenario. This forecast from ClearPath shows GHG emissions out to 2050, including local traffic only emissions within transportation.

The conclusion from these GHG forecasts is simple: even with the aid of state mandates, Emeryville will be far from its target for emissions reduction if current trends continue. Although local traffic conditions are slightly more favorable than the all-traffic scenario, both indicate a strong need for a paradigm shift in behaviors, policies, technologies, and regulations around climate and emissions.

Section 1.07 Emeryville Government Operations GHG Inventory

(a) Baseline Government Operations GHG Emissions in 2004

The baseline GHG municipal emissions for Emeryville's local government operations were inventoried the same year that the community GHG emissions were measured. These municipal emissions are a subset of the community emissions, but are useful for tracking the carbon intensity of government operations and informing internal policies. This baseline inventory included building and facility energy, street and traffic lights, vehicle fleet, solid waste, and water/wastewater, and gave a total of 1355 metric tons of CO_2 (Table 4).

Table 4: Comparison of Government Operations GHG Emissions from 2004-2014. All emissions are measured in metric tons of CO_2e. The vehicle fleet sector emissions in 2004 and 2010 include the Emeryville fire department while emissions in 2014 do not. No data is available for transit fleet, employee commute, and fugitive emissions from refrigerants and generators in 2004.

Year	Building Energy	Street & Traffic Lights	Vehicle Fleet	Solid Waste	Water & Wastewater	Transit Fleet	Employee Commute	Fugitive Emissions	Total
2004	427	313	414	160	14	-	-	-	1,328
2010	498	284	489	175	1	11	282	27	1,767
2014	402	234	410	131	1	7	431	27	1,643

(b) Government Operations GHG Emissions in 2014

The government operations GHG emissions inventory was updated in 2010 and 2014 in conjunction with the community inventory. In these inventory updates, additional sectors were included for analysis: transit fleet, employee commute, and fugitive and process emissions. Since it is difficult to track employee commutes and fugitive emissions that far back, it is not possible to update the baseline 2004 emissions inventory with the additional sectors. Therefore, comparative analysis on the whole inventory for 2014 is best conducted with the 2010 inventory instead. Some comparisons can be made for sector-specific emissions, such as building energy, if the 2004 inventory includes the baseline.

In 2014, the total government operations GHG emissions came to a total of 1,643 metric tons of CO_2. This represents a 123 metric tons CO_2 drop from 2010, or a 7.00% decrease. Between 2010 and 2014, Emeryville shifted away from an internal fire department to utilizing the Alameda County Fire Department and their vehicle fleet. Thus, part of the reduction in emissions must be attributed to this administrative shift rather than climate policy enforcement. When the fire department fleet loss is accounted for, the difference between 2010 and 2014 becomes 70 metric tons CO_2, or 4.10%. Although emissions from building energy, street and traffic lights, and solid waste decreased from 2010 to 2014, employee commute emissions increased significantly and are the largest single sector contributor to government operations emissions in 2014.

Business as usual forecasts are not applicable in this context because the infrastructure and built environment with its associated energy usage unlikely to increase drastically, so therefore the only major sector to grow will be employee commute.

Article II. MITIGATION ACTION PLAN FOR 2030

This document details 17 different objectives to achieve the goal of a 40% reduction in emissions by 2030. The actions associated with the objectives are outlined in the Mitigation Action Plan in the Implementation Plan and will be updated as more effective programs, technologies, and opportunities are developed. The objectives for 2030 are grouped into the following categories:

- Transportation
- Buildings
- Energy
- Consumption and Solid Waste
- Water Use
- Urban Space
- Local City Government

Section 2.01 Transportation

Transportation is the single largest contributor to Emeryville's community GHG emissions, particularly considering the state highways running through the city. Reducing transportation-related reductions will not only involve improving low-carbon transportation infrastructure, such as bicycles and buses, but also coordinating land use policies to promote a denser, more walkable community with jobs and housing located close to other necessities.

1. Create vibrant neighborhoods where residents can easily walk to their basic daily needs.
2. Reduce the total vehicle miles traveled on local roads by 30%.
3. Reduce the carbon intensity of vehicles through cleaner fuels and electrification by 30%.

Section 2.02 Buildings

Buildings are a major component of GHG emissions, especially from the commercial and industrial sector. Reducing the total energy use of buildings can potentially occur through improved energy efficiency, reduced energy demand, energy performance tracking, and green building design.

4. Reduce the total energy use of buildings built before 2016 by 15%.
5. Achieve zero net carbon emissions for 50% of new construction.

Section 2.03 Energy

Although California's electricity energy mix is cleaner than the rest of the nation, there is still a large component of non-renewable energy sources. Switching to renewable energy will be a major strategy to reducing emissions. Local renewable energy will go hand-in-hand with green jobs training to help build out a strong and resilient green economy and community in Emeryville.

6. Increase local renewable energy capacity in Emeryville by 30%.
7. Develop or support a green jobs training program to increase local renewable energy capacity and energy efficiency.

Section 2.04 Consumption and Solid Waste

As highlighted in the consumption-based GHG inventory, there are significant amounts of GHG emissions built into the production of food, clothing, and other goods. To achieve carbon reduction goals, Emeryville not only needs to continue recycling and composting, but also make a shift towards sustainable production and purchasing.

8. Reduce food scraps sent to landfills.
9. Achieve zero waste to landfills.
10. Reduce consumption-related emissions by encouraging sustainable consumption and minimization of the carbon intensity of business supply chains.

Section 2.05 Water Use

Water is a limited resource that requires careful management across different sectors. Reducing water use in the urban sector will free up water sources for environmental or regional use and reduce energy use embedded in water extraction, treatment, and distribution.

11. Reduce water use in the community by 30%

Section 2.06 Urban Space

There are many opportunities within the urban space for low-carbon infrastructure and sustainable living with multiple benefits. Eating more fresh fruits, vegetables and less processed foods helps support healthy bodies while at the same time reducing carbon emissions associated with food production. More green spaces will actively increase GHG mitigation and improve air quality.

12. Expand the urban forest with a minimum canopy cover of 50% in the Triangle and Doyle medium density residential neighborhoods and 25% in other city areas.
13. Expand access to healthy and local food.

Section 2.07 Local Government Operations

Although a smaller proportion of the community GHG emissions, government operations provide an opportunity to lead the way in reducing emissions and pushing demonstration projects across energy, water, transportation, and waste.

14. Reduce energy use in city facilities by 30%.
15. Reduce water use in city facilities by 30%.
16. Reduce emissions in the city fleet and employee commute by 30%.
17. Achieve zero waste to landfill from city facilities.

Article III. ADAPTATION

What does it mean to prepare for climate change?

Preparing for the impacts of climate change is a complex challenge. Climate science is evolving and is complicated by the uncertainty of future global emissions levels. Therefore, the City's preparedness strategy needs to be an evolving one as well. The systems, plans, and infrastructure put in place to enhance resilience to climate impacts must be grounded in the best available science of the time and frequently re-evaluated as new information becomes available.

Proactive planning for impacts can be more cost-effective than a reactive approach of responding to damage after the fact. Proactive planning can help ensure city infrastructure and systems continue to function as climate conditions change. This type of planning may mean designing for projected future conditions now or anticipating the need for later modifications or operational changes. For example, designing bridge expansion joints for projected future temperature extremes may be a cost effective way to prepare now for future temperatures, because retrofitting a bridge is challenging and costly and failure of an expansion joint could result in traffic delays and damage.

In other situations, the lack of certainty about the timing and magnitude of future impacts may mean that it is more cost effective to design a project to allow for future modifications, once potential impacts are more certain. For example, a current roadway stormwater system can be designed to allow future modification to accommodate additional precipitation. To be most effective, climate change preparedness requires project and program-specific decisions that require a broad understanding of the impacts of climate change.

How can we enhance equity by preparing for the impacts of climate change?

Our most vulnerable populations, including lower income, recent immigrant, and older residents, are at greater risk from the impacts of climate change, and they often have the fewest resources to respond to changing conditions. Fostering resilience in these more vulnerable residents and supporting their recovery after extreme events is critical. To enhance equity, climate change preparedness strategies should:

1. Prioritize actions that help vulnerable populations to moderate potential impacts and to cope with the consequences of climate change.
2. Incorporate input and perspectives from members of the vulnerable populations.

Section 3.01 Climate Hazard Vulnerability Assessment

A consultant was hired through StopWaste's Energy Technical Advisory Group (TAG) Council to conduct a climate hazard vulnerability assessment for several Bay Area cities. Emeryville participated in this round for technical assistance and received a vulnerability assessment by 427 Climate Solutions. The following is a summary of the findings by Four Twenty Seven Climate

Solutions; the full-length vulnerability assessment is available in the CAP 2.0 Implementation Plan.

(a) Inland Flooding

Emeryville's assets are well protected from historical floodplains, but with more climate change-driven intense precipitation events, there may be more frequent inundation of vulnerable assets. In a 100-year flood, which has a one percent chance of flooding in a given year, city parks along the Bay may be inundated, including Point Emery Park, Shorebird Park and the perimeter of Marina Park. The peninsula may also be affected, but impacts are expected to be limited to the docks and boat slips. The 500-year flood, which has a 0.2 percent chance in a given year, does not have an increased impact on the shoreline.

(b) Sea Level Rise

Sea levels are rising as a result of higher atmospheric and oceanic temperatures across the globe. The rate of sea level rise is expected to accelerate throughout the century, threatening coastal resources, but projections are complicated by the potential for a substantial acceleration of glacial ice melt resulting in rapid sea level rise, which is not currently accounted for in many global scenarios. In Emeryville, the assets most at risk from sea level rise include those located on the marina and shoreline, along with those neighboring the railroad to the southwest.

The Natural Research Council (NRC) identified the likely sea level rise estimates for the United States west coast in 2012. In Alameda County, models are projecting six inches of sea level rise by 2030 (range: 2-12 in), 11 inches by 2050 (range: 5-24 in), and 36 inches by 2100 (range: 17-66 in) relative to the year 2000. These timelines for increases in water level may occur sooner on a temporary basis given the combination of permanent sea level rise and temporary extreme tides from storm surge.

The most critical asset to consider in the sea level rise scenarios is Powell Street, where flooding east of the police and fire stations would prevent critical access to emergency personnel and equipment throughout Emeryville. In the 24-48 inch sea level rise scenarios, some assets along the marina shoreline will be inundated and westbound access to the Bay Bridge will be prohibited, but the flooding and access to the peninsula would be manageable. Figure 5 shows the list of assets in Emeryville impacted at various sea level rise scenarios.

The critical transition between manageable and devastating flooding in Emeryville occurs between 48 and 72 inches of inundation. These conditions may likely occur from a combination of sea level rise and storm surge, with the worst case scenario resulting from glacial melting, King Tides, and storm surge. With these higher impact scenarios, Powell Street flooding would cut off Fire Station 34 and the police station and railway flooding would extend into southern Emeryville and impact a few blocks of the industrial area to the east of the railway, as well as sections of the Bay Street shopping center to the west. Outside of Emeryville, impact to freeway exchange south of the city and the EBMUD wastewater treatment plant in Oakland will be important to consider in all sea level rise scenarios for transportation, water quality, and sewer service throughout the region.

Asset Type	Area	Impact	12 in.	24 in.	36 in.	48 in.	72 in.
Freeway Interchange	Oakland	H			1	2	2
Railroad	Park Ave & Bay St.	H				1	1
Alameda County Fire Station No. 34	Peninsula	H					1
Fire Hydrant	Peninsula	M					6
Fire Hydrant	Park Ave & Bay St.	M					6
Wastewater Treatment Plant	Oakland	H					1
Irrigation Backflow Facility	Peninsula	H					5
Storm Sewer Gravity Main	Peninsula	H		1	2	4	18
Storm Sewer Gravity Main	Park Ave & Bay St.	H					17
Storm Sewer Lateral Line	Peninsula	M		1	2	2	8
Storm Sewer Lateral Line	Park Ave & Bay St.	M					27
Storm Sewer Manhole	Peninsula	M				2	12
Storm Sewer Manhole	Park Ave & Bay St.	M					13
Pipeline	Park Ave & Bay St.	M				2	2
Hazmat Facility	Peninsula	M					2
Hazmat Facility	Park Ave & Bay St.	M					4
Trash Receptable	Shoreline	L					2
Trash Receptacle	Peninsula	L				15	39
Trash Receptacle	Park Ave & Bay St.	L					2
Streetlight	Peninsula	M		1	2	4	35
Streetlight	Park Ave & Bay St.	M					29
Marina Dock	Peninsula	L		8	8	8	8
Public Facility Parcel	Peninsula	L		2	2	2	2
Park	Peninsula	L		2	2	2	2
Park	Park Ave & Bay St.	L					3
Park	Shoreline	L		2	3	3	3
Public Art	Peninsula	L					1
Significant Building	Park Ave & Bay St.	M					10
Buildings	Peninsula	L		3	3	5	8
Buildings	Park Ave & Bay St.	L					24

Figure 5: List of Assets Exposed to Sea Level Rise by Asset Type and Level of Impact. The "impact" ranking is based on a high, medium, low scale. High - Critical resources during a disaster or assets that could lead to immediate secondary hazards if damaged. Medium – Important assets or those that could lead to secondary hazards if damaged. Low – Assets that will not compound hazard effects or that are easily replaced. This distinction is based upon reasonable judgement and should be scrutinized by local officials for accuracy. Inland flooding is not included due to relatively low levels of exposure. Source of asset count: Emeryville Local Asset Data and AECOM [18] as represented on Vizonomy.

(c) Temperature and Precipitation Changes

As greenhouse gas emissions increase, temperatures are expected to increase globally, placing growing stress on human health, water resources, energy systems and other critical assets. Emeryville's climate is no exception and following scenarios from the Intergovernmental Panel

[18] AECOM and Brian Fulfrost & Associates. (2015). *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment Final Report*.

on Climate (IPCC), temperatures are projected to increase throughout the city with the number of days over 90 °F increasing from less than once a year between 1970-2000 to 6 days per year by the end of century.

Precipitation modeling by Four Twenty Seven indicated that there may be increased variability in the high emissions scenario, but there is no clear increase or decrease in cumulative precipitation by the end of the century. Similarly, the low and mid-range emissions scenario produced average rainfalls consistent with historical rainfall trends. While extreme rain events will be less frequent, they will generate greater volumes of rain in shorter periods of time.

Conversely, there is a clear trend towards warmer temperatures in the Bay Area. By mid-century, in a high-emissions scenario, daily average temperatures in Emeryville will increase between +2.5 °F to +3.7 °F, daily minimum temperatures by +2.3 °F to +3.7 °F, and daily maximum temperatures by +2.7 °F to +3.8 °F. Even under a low emissions scenario, temperature increases are evident and range between an average daily increase of +2.3 °F and +3.6 °F by mid-century. This means that Emeryville's average maximum temperature would be comparable to current levels in Vallejo, California. Additionally, Emeryville will experience greater number of extreme heat days. By century's end, the number of days per year above the 90 °F mark could be up to 4 days per year in a low emissions scenario, but as high as 32 days per year in a business-as-usual scenario.

(d) Rainfall Induced Landslides

Although high intensity rainfalls will increase risk of inland landslides, Emeryville's location and topography results in low risk for landslides.

(e) Fire Hazards

While extreme temperatures and increased variability in rainfall will likely cause drier conditions in California, Emeryville's location in the Bay Area away from wildlife areas means that there is little threat of fire hazards. No city assets are at risk from wildfire threat.

Section 3.02 Adaptation Objectives

To prepare for the impacts of climate change, Emeryville is working to reduce exposure to risk and strengthen the capacity of the community to respond. Preparing for climate change requires an adaptive management approach, which monitors effects and promotes flexible strategies that leave a range of future options available. The first step in this process is to understand how extreme weather and other aspects of climate change will impact people, particularly vulnerable populations such as the elderly, the young, low income and people of color communities. It will be necessary to prioritize climate change adaptation actions in marginalized neighborhoods.

The actions associated with the objectives are outlined in the Adaptation Action Plan in the Implementation Plan and will be updated as more effective programs and opportunities are developed. The objectives are grouped into the following categories:

- Extreme Weather
- Sea Level Rise
- Community Engagement
- Businesses
- City Coordination

Objectives

18. Reduce risk and impacts of heat and drought by preparing for hotter, drier summers with increased incidence of extreme heat days.
19. Reduce risk and impacts of flooding by preparing for more intense rain events.
20. Reduce risk and impacts from sea level rise.
21. Build community capacity for responding to climate change.
22. Engage businesses on climate resilience and behavior change.

Article IV. 2050 VISION

Section 4.01 Carbon Neutral City

The long term goal is to reduce Emeryville's GHG emissions to 80% below 2004 baseline levels by the year 2050 while creating a more vibrant, sustainable and equitable city. A carbon neutral and climate resilient city will need to be as fossil-fuel free as possible, with utilization of 100% renewable energy and a clean economy. Such a transition will require considerable shifts in how energy is utilized in the building sector and the transportation system as well as how energy is produced. It is important to position Emeryville now with long term strategies to meet the 2050 goal.

Deep carbon reduction will have a multitude of co-benefits for Emeryville. They include:

- Making the community an attractive place for businesses and people to locate;
- Keeping more energy dollars local;
- Stimulating local business/economic development/job creation opportunities;
- Creating cost savings for consumers/households and businesses
- Improving public health;
- Improving environmental quality;
- Addressing "energy security" and reducing exposure to energy price increases;
- Increasing the community's resilience;
- Improving livability/quality of life; and
- Other potential impacts important to local stakeholders.

Although city planning is a long-established practice, deep carbon reduction planning brings new aspects into urban planning: measurable targets supported by scientific analysis, a distant time horizon longer than most city-planning processes, an high level of uncertainty, system-changing strategies, and consideration of other regional cities' goals. Given the uncertainty in moving forward with the climate science, policy landscape, technological advances, and more, it is useful to fall back to guiding principles. The Carbon Neutral Cities Alliance (CNCA), a group of cities worldwide who have committed to 80% or more reduction targets, has developed a number of organizing principles for deep carbon reduction planning. A full version of this resource can be found in the CNCA Framework. A summary of the principles is as follows:

- Use the best available science.
- Embrace the unfamiliar.
- Lead by example.
- Make carbon reduction everyone's responsibility in government.
- Seek strategies that produce co-benefits.
- Get "all hands on deck" in the community.
- Base decisions on data – the essence of performance management and accountability.
- Don't hesitate: Set transformation into motion as soon as possible.
- Integrate climate targets into other city plans.
- Anticipate where your strategies will need to go.

- Embrace social equity in climate action.

As it stands, this document and strategies associated with the 2050 vision will be living documents to revisit on a frequent basis. This will not only ensure Emeryville is on track for the goal, but also to reflect any changes in climate science, new technologies or policies, and opportunities.

Section 4.02 Strategies for 50x80

(a) De-Carbonizing the Energy Supply

There are programs already in place that are moving towards cleaning up the Bay Area's regional energy production to transition to 100% renewable energy, such as the Community Choice Energy programs in San Francisco, Marin, and Alameda Counties; PG&E's California Solar Initiative; and the Self-Generation Incentive Program. This will be an important component of the GHG reduction plan. Since it is currently unlikely to transition to a fully de-carbonized grid with existing technology and energy demand projects, the push for more renewable energy needs to be coupled with greater energy efficiency and reduction of energy consumption.

The state of California recently passed a significant piece of legislation to increase the renewable portfolio standard and establish GHG targets for 2030. It is possible that more stringent legislation going out to 2050 will be on the table in the coming years.

Emeryville will also work towards local micro energy grids, which enable greater control over fuel sources and can incorporate local renewable energy. While there are currently some state regulatory barriers to this strategy, there is a lot of momentum in that direction. Emeryville looks to the Cities of Berkeley, Fremont, and San Leandro as they explore pilot micro grid projects with municipal buildings.

Strategies and explorations for 2050:

- Decarbonization of imported electricity
- Elimination of fossil-fuel heating sources, such as natural gas
- Expansion of local renewable energy production
- Local micro grids for solar and wind power
- Neighborhood-level cooling, particularly by ocean water
- Removal of legal and regulatory impediments to neighborhood energy and renewables
- Standardized rules and minimal fees for grid interconnection
- Regional carbon tax
- Zero-carbon standards for new developments
- Feed-in tariff guaranteeing full-cost compensation to cover the actual cost of a specific renewable energy investment and encourage rooftop solar/wind

(b) Low-Carbon Transportation

If a low-carbon electricity grid is achieved, then electric transportation options will then be low-carbon as well. Although strategies for reducing automobile travel will continue, it is likely that the car will remain a substantial part of the transportation system in 2050. Emeryville will work with regional and state partners to advance an electric and fossil fuel-free transportation system. Investing in public transit and aiding in the transition of AC Transit, Amtrak, and BART to hydrogen or electric power will be essential. This will require major infrastructure investments over the next few decades, particularly since the current system of roads, parking, and fueling stations has been designed for personal vehicles.

Strategies and explorations for 2050:

- Expanded private and public infrastructure for both passenger and medium/heavy duty electric vehicles
- Zero-carbon municipal vehicle fleet (i.e. electric vehicles powered by solar or wind)
- Expanded public transit lines that are affordable, accessible, and regionally connected
- Other zero-carbon vehicles (i.e. hydrogen-powered) and associated infrastructure
- Transition of AC Transit, Amtrak, and BART to net-zero carbon energy sources
- Regional tax-and-invest program in public transit

(c) Guiding Policies

Planning for 2050 can be challenging due to the high level of uncertainty for the political landscape, the speed of climate change, and new technologies. An interim planning goal between 2030 and 2050 can help Emeryville stay on track for the implementation of current projects and development of new projects. It can also act as a check-in on the existing sector targets and give an opportunity for realignment of strategies or targets if necessary.

Strategies and explorations for 2050:

- Creation of an interim carbon target between 2030 and 2050 to stay on track
- Utilization of production and consumption-based GHG inventory
- Active review mechanism for all climate related plans and GHG inventories

(d) On-Going Research and Innovation

There are many cities around the world that are planning for a low-carbon and resilient economy, some as part of the 100 Resilient Cities initiative, CNCA, the Urban Sustainability Directors Network (USDN), or similar programs. Emeryville is in a good position to learn from these cities, particularly San Francisco and Berkeley. Partnerships with institutions such as University of California, StopWaste, and ICLEI should be continued to learn about best practices and new technologies. It is especially important to learn about innovative business models and financing mechanisms.

Strategies and explorations for 2050:

- Build research partnerships to solve climate mitigation and adaptation challenges
- Support for innovative business models
- Support for the educational base, green-STEM job skills and pipelines, businesses, and economic structures

- Networking with and learning from leading green city leaders

(e) Community Education and Awareness

Community engagement is an important strategy for meeting both the short term and long term climate goals. Environmental awareness will be essential for driving participation in programs and supporting tough policy decisions. Continued efforts to focus on youth and environmental education will be critical as well. Educational programs should not just include content directly related to carbon emissions, but also that which connects people to their local environment, such as waste diversion, maintaining open space and access to nature, water conservation, and food access.

Strategies and explorations for 2050:

- Fully integrated sustainability curriculum in schools
- Community-scale waste-to-energy pilots
- Creation of self-sustaining and climate resilient eco-neighborhoods

Article V. MONITORING PLAN

Section 5.01 Purpose of Monitoring Plan

In accordance to the Global Covenant of Mayors, Emeryville must monitor and report its progress on the CAP 2.0 objectives and associated actions. Establishing a monitoring process enables Emeryville to track the impacts of the actions included in the plan and compare estimated impacts to what is actually achieved in terms of energy savings, renewable energy production, and GHG emissions reduction. Assessing the implementation status of the actions will allow determination of whether the action is performing well and to identify corrective measures. This process is also an opportunity to understand barriers to implementation and identify best practices or new opportunities in moving forward.

Section 5.02 Monitoring Plan Structure

Under the recommendation of the Global Covenant of Mayors, Emeryville will undergo reporting every two years. Table 5 describes the components of the monitoring reports. Action reports are occur every two years and will only include status updates on the overall strategy, the mitigation action plan, and the adaptation action plan. The full monitoring report will occur every four years and in addition to the components in the action report, will include an updated community and municipal GHG inventory. This will help Emeryville track its GHG emissions reduction progress. With the approval of this CAP 2.0 in 2016, the first monitoring action report will be due in 2018 and the first full monitoring report with the updated GHG inventories will be due in 2020. Ideally, the most recent GHG inventories should be no more than four years old.

Table 5: Monitoring Plan Overview. Action reports occur every two years while full reports occur every four years.

Monitoring Report Component	Action Reporting	Full Reporting
Overall Strategy: Reporting any changes to initial strategy as well as updated information on human and financial resources	Yes	Yes
GHG Emissions Inventories: Provide updated energy consumption and GHG emissions data for the reporting year	No	Yes
Mitigation and Adaptation Action Plans: Report the implementation status (completed, in progress, on hold) of key actions and update their impacts	Yes	Yes

Article VI. RESOURCES

These are resources compiled for Emeryville's sustainability website regarding climate change and sustainability. The links are for both residents and businesses.

Section 6.01 Climate Change

Get involved

- CoolCalifornia Household Actions Things you can do to reduce your GHG emissions at the household level
- Carbon footprint calculator Calculate your carbon footprint
- Rebates for Households Household rebates and incentives
- Rebates for businesses Business rebates and incentives
- CoolCalifornia Small Business Toolkit Small business climate toolkit
- National Tree Benefit and Carbon Calculator Calculate how much your street trees are saving you in money and carbon!
- Cool roofs Learn how to utilize cool roofs

Learn more

- Climate Action Plan Learn more about Emeryville's 2008 Climate Action Plan and the update in progress
- Climate Change Facts Learn the basics about climate change
- Cal-Adapt Explore interactive maps and charts on climate change research in CA
- State of California Sea Level Rise Guidance 2013 State report on sea level rise
- Climate Change CA The portal for CA's climate change strategy
- CoolCalifornia School Resources For teachers and schools on climate change
- US Toolkit for Climate Resilience A federal portal for climate resilience strategies and tools
- State Environmental Justice EnviroScreen and other environmental justice tools
- Regional Organizations Get involved in any number of these regional Bay Area organizations

Section 6.02 Water

Get involved

- StopWaste Drought Measures Household actions to save water during the drought
- BayFriendly Coalition Bay Friendly landscaping and gardening resources for a drought-hardy garden
- Greywater Action How to use greywater in the home
- Rain Barrels How to make a rain barrel
- EBMUD WaterSmart Center Water conservation and rebates for individuals, businesses, and commercial landscapes from EBMUD
- EBMUD WaterSmart Business Certification WaterSmart business certification

Learn more

- EBMUD General information on water and drought from EBMUD
- Water Efficient Landscape Ordiance (WELO) Information about the landscaping ordinance passed in CA on July 15, 2015
- EBMUD Recycled Water General information on recycled water use from EBMUD
- Regulations on Water Efficient Appliances CA state policy for water efficient appliances
- Stormwater Treatment Emeryville regulations on sormwater treatment
- Regional Organizations Get involved in any number of these regional Bay Area organizations

Section 6.03 Energy

Get involved

- Bay Area Energy Upgrade Energy Upgrade California rebate program for Bay Area homeowners interested in energy efficiency
- PG&E Rebates for Residents Rebates for residents making energy upgrades for their homes
- PG&E Rebates for Businesses Rebates for commercial businesses making energy upgrades
- CYES California Youth Energy Services is a program run by the Rising Sun Energy Center to hire young adults ages 15-22 to do energy assessments and residential efficiency installs for 7 weeks each summer
- Home Energy Analyzer Free and confidential online tool to analyze your home energy use and fix energy leaks
- Home Score CA Department of Energy scoring tool for homeowners & buyers to assess their home's energy efficiency.
- Energy Star Portfolio Manager Online tool to track your energy and water consumption for public and commercial buildings

Learn more

- Strategic Energy Plan Emeryville's plan for energy efficiency for city facilities and operations
- Energy Upgrade CA List of energy and water efficient products and appliances from Energy Upgrade CA
- Assembly Bill 802 California's AB 802 authorizes public gas/electric utilities to provide financial incentives, rebates, and technical assistance for efficiency retrofits in existing buildings. This comes into effect as of Sept. 1st, 2016.
- Benchmarking Fact sheet on benchmarking: saving money and energy
- Benchmarking Building Performance Report on the benefits of benchmarking building performance
- CA Solar Statistics Learn about solar energy capture and usage in CA
- CA Zero Net Energy Homes Learn about ZNE residential progress and goals in CA
- Institute of Market Transformation Resources on energy efficiency in buildings
- Regional Organizations Get involved in any number of these regional Bay Area organizations

Section 6.04 Waste and Recycling

Get involved

- Emeryville Waste Collection Services Find out more about waste collection in Emeryville
- Commercial Container Program Emeryville provides free or low-cost waste containers for commercial businesses. Find the form here.
- Kitchen Pail Program Emeryville provides free kitchen pails for residents to collect food scraps
- Construction Demolition Waste Information from Emeryville on disposal of construction and demolition waste
- Preventing Waste for Residents Check out all the resources and tips at StopWaste for individuals to reduce waste at home
- Preventing Waste for Businesses StopWaste also has an abundant list of resources for businesses
- Junk Mail How to stop junk mail
- Waste Reduction Model (WARM) WARM compares GHG and energy impacts of landfilling, recycling, incineration, composting, and source reduction.

Learn more

- Hazardous Waste Disposal Resources at StopWaste for hazardous waste disposal
- Recycling Business Waste Resources at StopWaste for recycling business waste
- Construction and Demolition Recycling Resources at StopWaste for handling construction and demolition debris
- Alameda County Recycling Program Read more about Alameda County's mandatory recycling program
- Emeryville's Ecofoodware Ordinance Emeryville's regulation on food containers
- Alameda County Waste Characterization Study 2008 Find out what kind waste Alameda County generates
- Regional Organizations Get involved in any number of these regional Bay Area organizations

Section 6.05 Green Buildings

Get involved

- Green Tenant Toolkit The Green Tenant Toolkit includes best practices for tenants and building management to engage in win-win environmental initiatives.
- Build It Green Local organization with database on green building materials and technologies, certified green architects and contractors, and continuing education and networking for building professionals and agencies
- Green Home Calculator Find out how green your home is compared to your neighbors' homes in CA
- Bay Area Energy Upgrade Energy Upgrade California rebate program for Bay Area homeowners interested in energy efficiency

- PG&E Rebates for Residents Rebates for residents making energy upgrades for their homes
- PG&E Rebates for Businesses Rebates for commercial businesses making energy upgrades
- Home Energy Analyzer Free and confidential online tool to analyze your home energy use and fix energy leaks
- Energy Star Portfolio Manager Online tool to track your energy and water consumption for public and commercial buildings
- Home Score CA Department of Energy scoring tool for homeowners & buyers to assess their home's energy efficiency.

Learn more

- USGBC: LEED Learn about LEED certification from the US Green Building Council
- Benchmarking Fact sheet on benchmarking: saving money and energy
- Benchmarking Building Performance Report on the benefits of benchmarking building performance
- CALGreen CA's green building standards code (2013)
- Institute of Market Transformation Resources on energy efficiency in buildings
- Zero Net Energy Goals in CA Energy Upgrade CA report on ZNE goals
- Zero Net Energy Explore resources from the New Buildings Institute on ZNE buildings
- Living Building Challenge Beyond ZNE, there is the Living Building Challenge, a comprehensive sustainability standard for water, energy, waste, and materials in buildings
- Green Roofs Learn about green roofs
- Regional Organizations Get involved in any number of these regional Bay Area organizations

Section 6.06 Food

Get involved

- Preventing Food Waste Recommendations from StopWaste on preventing food waste
- Food Scrap Recycling Find out best practices for recycling your food scraps from StopWaste
- Compost Start composting with your soil with StopWaste
- Permaculture Principles Utilize these permaculture principles in your backyard
- Emeryville Community Gardens Visit one of Emeryville's community gardens
- Planting Justice Volunteer with Planting Justice's food forest, 15 min from downtown Oakland
- City Slicker Farms Volunteer with City Slicker Farms at their community gardens in West Oakland
- Gill Tract Farm Check out the Gill Tract Farm at UC Berkeley

Learn more

- Planting Justice: Resources Useful links from Planting Justice on local food organizations and guides on food justice

- Food First: Resources Publications from Food First, a leading research organization in the Bay Area on food sovereignty and hunger
- Regional Organizations Get involved in any number of these regional Bay Area organizations

Section 6.07 Transportation

Get involved

- Bay Area Bike Share Check out the new roll out of the regional bike share program
- East Bay Parks Check out these bike trails from East Bay Parks
- Scoop Carpooling app
- AC Transit AC Transit offers discount employee EasyPass for organizations

Learn more

- Emeryville Public Transit Find out more about public transit options in Emeryville
- Vital Signs Visualizing transportation data from the MTC
- TransForm CA Movement to transform communities and transportation in CA
- CA Road Charge Pilot Project Road charge is an innovative funding mechanism that allows drivers to support road maintenance based on the distance they travel or the period of time they use the roads, rather than the amount of gasoline they consume. Sign up to be a participant in the pilot project!
- Regional Organizations Get involved in any number of these regional Bay Area organizations

Section 6.08 Businesses and Permits

Get involved

- Green Business Program Emeryville's certified green businesses list
- EBMUD WaterSmart Business Certification Read more about the WaterSmart business certification from EBMUD
- Green Business Certifications Find out more about the green business certification process from StopWaste
- Small Business Awards Program Find out more about the small business awards program from Cool California
- EBMUD WaterSmart Center Water conservation tips for commercial businesses
- Preventing Waste for Businesses Resources on waste reduction for businesses from StopWaste
- PG&E Rebates for Businesses Rebates for commercial businesses making energy upgrades
- CoolCalifornia: Rebates for Businesses Resources on business rebates and incentives
- CoolCalifornia Small Business Toolkit Small business climate toolkit
- Green Tenant Toolkit The Green Tenant Toolkit includes best practices for tenants and building management to engage in win-win environmental initiatives.

Learn more

- Resilient Businesses The resilient business initiative in the Sacramento region

Section 6.09 Money Saving Measures

- Bay Area Energy Upgrade Energy Upgrade California rebate program for Bay Area homeowners interested in energy efficiency
- PG&E Rebates for Residents Rebates for residents making energy upgrades for their homes
- PG&E Rebates for Businesses Rebates for commercial businesses making energy upgrades
- CoolCalifornia: Rebates for Businesses Resources on business rebates and incentives on climate resiliency
- CoolCalifornia: Rebates for Households Household rebates and incentives on climate resiliency
- EBMUD Rebates for Residents Rebates for individuals for water-efficient appliances
- EBMUD Rebates for Businesses Rebates for commercial businesses for water-efficient appliances

Article VII. CONTACT

For more information about any of the resources or programs, please contact Nancy Humphrey, Environmental Services Supervisor at the City of Emeryville at 510-596-3728 or nhumphrey@emeryville.org.