



Hayward Climate Action Plan

Draft



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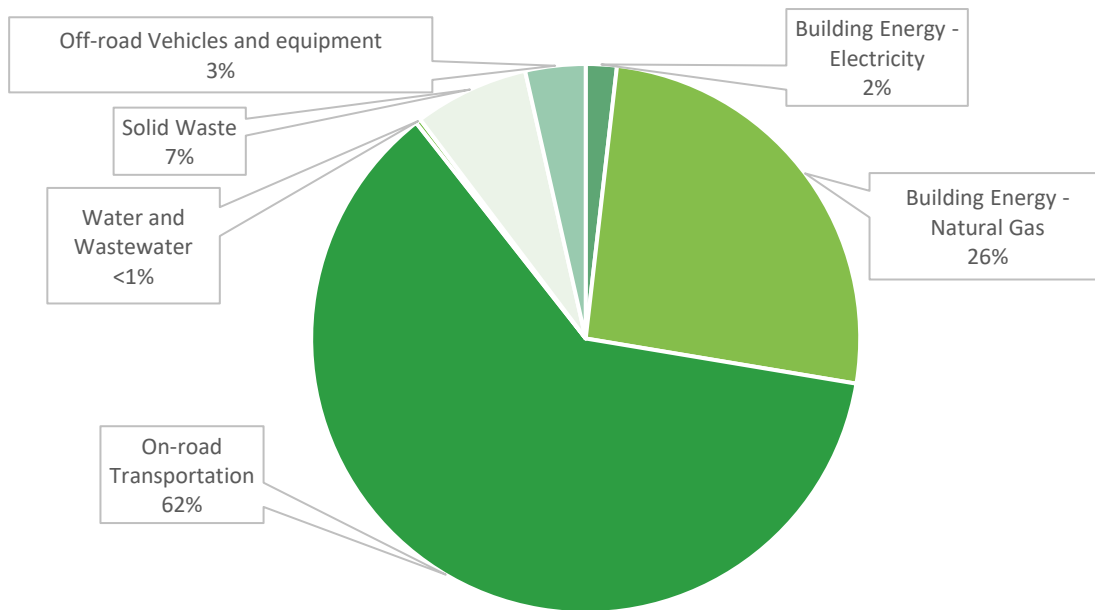
Hayward CAP Executive Summary

Hayward is taking action to reduce greenhouse gas (GHG) emissions and minimize the impacts of climate change. Through the development and implementation of this Climate Action Plan (CAP), Hayward will enhance the community's wellbeing and continue taking actions intended to limit the impacts of climate change. The following is a high-level executive summary of GHG emissions levels, projected GHG emissions levels, established emissions targets, and GHG reduction measures for Hayward to achieve the City's adopted targets.

Hayward Current GHG Emissions Inventory

The 2019 Community GHG Emissions Inventory for Hayward indicates that total community GHG emissions were 684,399 metric tons of carbon dioxide equivalents (MT CO₂e). Figure ES-1 shows the share of total emissions for each sector of the community.

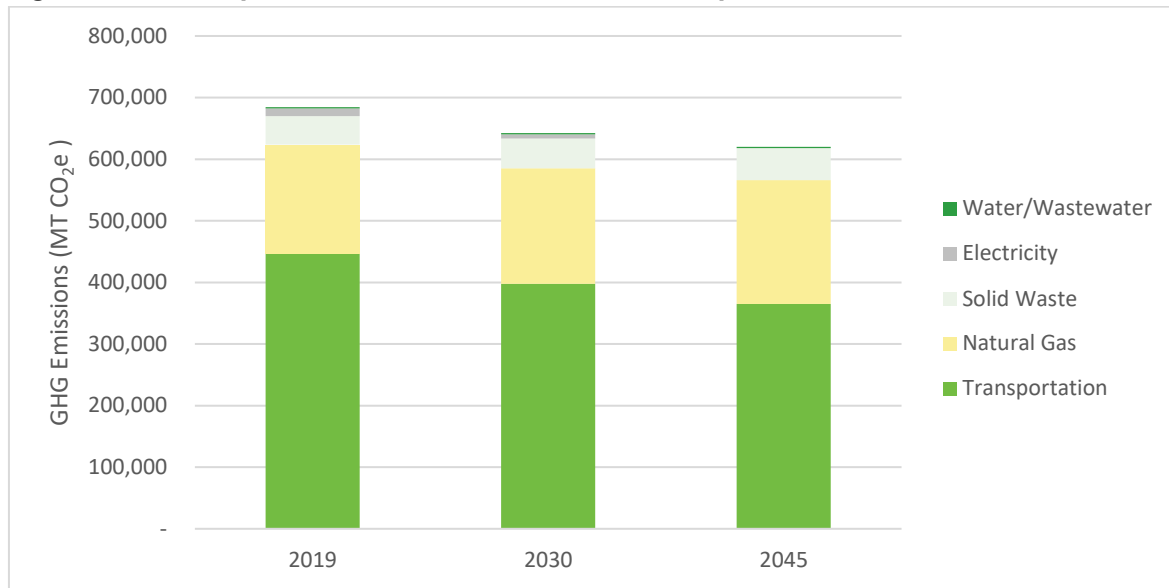
Figure ES-1 Hayward GHG Emissions by Sector for 2019



Hayward Projected GHG Emissions Forecasts

Future Hayward GHG emissions levels are projected based on the 2019 GHG emissions, job growth, and estimated population growth trends. Enacted State policies and legislation that will take effect in the future and will reduce the expected emissions and are incorporated into the projections. Hayward's future emissions are projected to be 642,486 MT CO₂e (or 3.84 MT CO₂e/person) in 2030 and 620,134 MT CO₂e (or 3.36 MT CO₂e/person) in 2045. Forecasted emissions by community sector for both the 2030 and 2045 target years are shown in Figure ES-2.

Figure ES-2 Hayward Forecasted GHG Emissions by Sector for 2019, 2030, and 2045



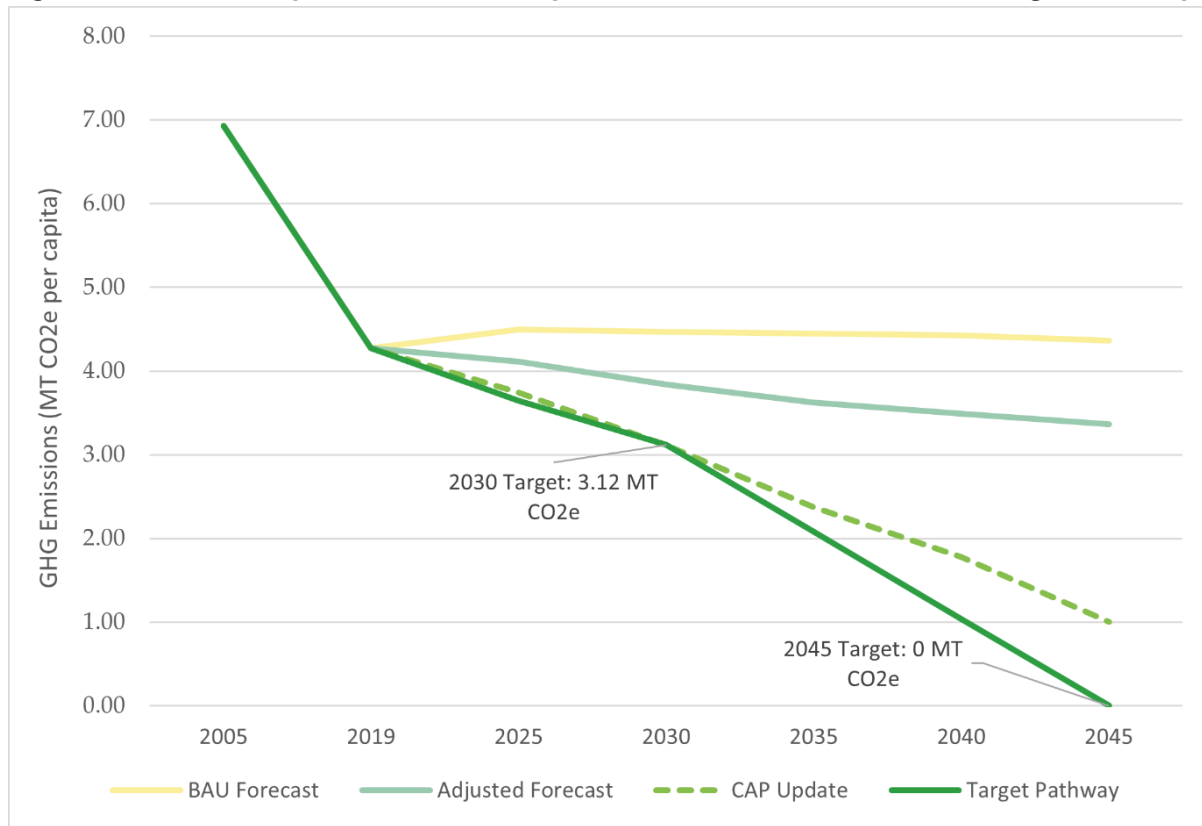
Hayward GHG Emissions Targets

As of 2019, Hayward has reduced GHG emissions beyond the City's 2020 GHG reduction target of 20 percent below their 2005 GHG emissions levels, thereby exceeding the State's goal established by AB 32. In support of State and international climate goals, Hayward has adopted the following targets using the 2005 GHG inventory as the baseline:

- Reduce GHG emissions by 20 percent below 2005 levels by 2020 (equivalent to 1990 GHG emissions)
- Reduce GHG emissions by 30 percent below 2005 levels by 2025
- Reduce GHG emissions by 55 percent below 2005 levels by 2030 (equivalent to 40 percent below 1990 GHG emissions)¹
- Work with the community to develop a plan that may result in the reduction of community-based GHG emissions to achieve carbon neutrality by 2045.

In alignment with State recommendations to use efficiency metrics (MT CO₂e per capita) for local targets to account for population growth, the following targets have also been developed for Hayward's future GHG emissions in this CAP: 3.12 MT CO₂e per person by 2030 and 0 MT CO₂e per person by 2045. The corresponding GHG emissions target pathway over the coming decades is illustrated in Figure ES-3. Together, the measures and actions in the CAP Update provide Hayward with the GHG reductions necessary to achieve Hayward's 2030 climate action target as shown in Table ES-1 and Figure ES-3. The 2045 GHG emissions reductions quantified for their longer-term measures are not yet enough to meet the City's 2045 climate action target of carbon neutrality. This CAP strives to institute equitable and resilient systems and make substantial progress towards eventual carbon neutrality. Further updates to the Hayward CAP beyond 2030 will also delineate new technologies, legislation, and additional measures and actions that Hayward will implement to close the remaining gap to achieve the carbon neutrality target.

¹ Hayward does not have a 1990 GHG inventory, and the targets developed by the City are instead compared to its 2005 GHG inventory baseline. In the 2006 AB 32 Scoping Plan, the recommended target for local governments to meet 1990 levels was 15 percent below "current" levels by 2020, where "current" levels were construed as baseline years between 2005-2008.

Figure ES-3 Per Capita Emissions Compared to Forecast Scenario and Target Pathway**Table ES-1 2030 and 2045 Emissions Levels Compared to Targets**

Target/Forecast	2030 GHG Emissions (MT CO ₂ e/person)	2045 GHG Emissions (MT CO ₂ e/person)
Business-as-usual Forecast	4.47	4.36
Adjusted Forecast	3.84	3.36
Reductions from Full Implementation of Measures	0.73	2.36
GHG Emissions after Measure Reductions	3.11	1.01
Climate Action Targets	3.12	0.00
Target Anticipated to be Met?	Yes	Substantial progress demonstrated

Hayward CAP Measures to be Implemented by 2030

Through full implementation of the suite of measures included in this CAP, Hayward will achieve its 2030 target of 3.12 MT CO₂e per person. In addition to new technologies and State legislation, new measures will likely be required as part of future CAP updates to attain the longer-term goal of carbon neutrality by 2045. Each measure is supported by a set of actions that will help to achieve the full benefits of that measure. The measures and actions are supported by substantial evidence and have been designed using principles called key pillars that support changes that are robust, effective, and inclusive. Key pillars include structural change, feasibility studies, funding, equity, education, and partnerships. The measures and actions have been reviewed and co-developed by the community throughout the CAP process (Table ES-2).

Table ES-2 CAP GHG Emissions Reduction Measures Overview

No.	Measure	MT CO ₂ e Reduction
BE-1	Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.	2030: 5,392 2045: 18,761
BE-2	Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.	2030: 13,872 2045: 68,020
BE-3	Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.	2030: 20,667 2045: 114,200
BE-4	Support Ava Community Energy in providing 100% carbon-free electricity by 2030.	2030: 4,802 2045: 0
BE-5	Continue to promote energy efficiency improvement, in alignment with the 2014 Climate Action Plan.	Supportive
BE-6	Generate carbon-neutral electricity on City facilities meeting 80% of the municipal operational electricity needs by 2030.	Supportive
T-1	Increase active transportation mode share to 15% by 2030 and to 20% by 2045.	2030: 6,485 2045: 8,755
T-2	Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.	2030: 7,585 2045: 25,092
T-3	Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-1 and T-2.	Supportive
T-4	Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045.	2030: 16,014 2045: 88,718
T-5	Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.	2030: 3,161 2045: 37,461
T-6	Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045.	2030: 4,312 2045: 22,542
T-7	Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.	Supportive
SW-1	Implement and enforce SB 1383 requirements to reduce community-wide landfilled organics by 75% by 2025 and 90% by 2045.	2030: 35,925 2045: 47,101
SW-2	Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.	Supportive
WW-1	Reduce water consumption by 15% by 2030 and maintain it through 2045.	2030: 35 2045: 0
CS-1	Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.	2030: 212 2045: 743
CS-2	Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030 and 2045.	2030: 3,081 2045: 3,392
Total GHG Emissions Reduction		2030: 121,543 2045: 434,784
Total GHG Emissions Reductions – per capita (MT CO₂e/person)		2030: 0.73 2045: 2.36
Percent Reductions from 1990 Baseline Levels – Per Capita		2030: 46% 2045: 81%

* Measures and actions marked as “supportive” may also be quantifiable and have substantial evidence to support their overall contribution to GHG reduction, but they are not quantified for one of several factors. Refer to Section 6 for more information.

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1 Public Review and Adoption

This Hayward Draft CAP was published for public review and comment on October 5, 2023. It will be available for public review for a 40-day period until November 14, 2023.

The Final CAP, in conjunction with the CEQA review document for the CAP, is anticipated to be adopted during the Hayward City Council Meeting on January 9, 2024.

2 Vision and Purpose

2.1 Hayward CAP Update Vision Statement

Vision

The City of Hayward is focused on creating a more sustainable, equitable and healthy community while maintaining a strong economy, building resilient homes and businesses, and reducing greenhouse gas (GHG) emissions to mitigate climate change. Climate change poses a challenge to that vision and the effects of climate change are already impacting Hayward and other California communities.

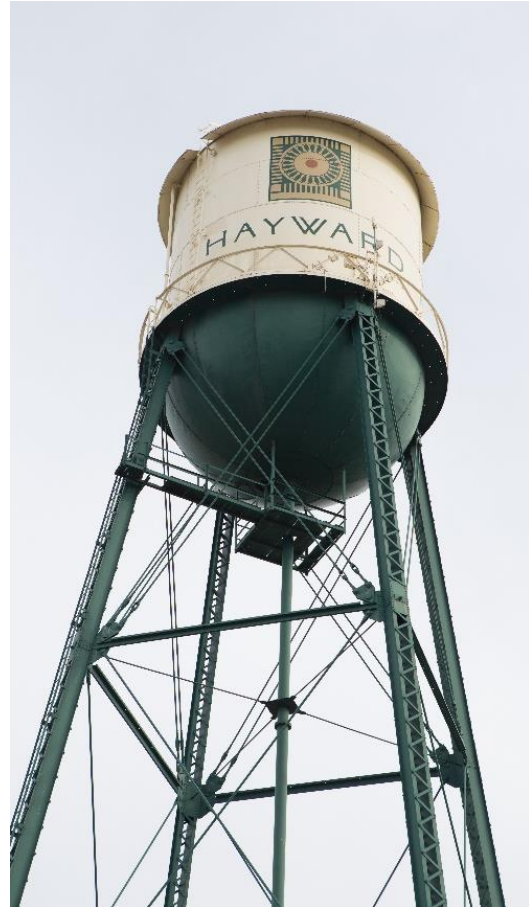
Climate change impacts are projected to worsen through the century if there is not a concerted global effort to address the root cause of climate change through reducing the release of GHG emissions. Hayward understands the need for ambitious climate action through GHG emissions reduction. On January 15, 2019, the city passed Resolution No. 19-007, declaring a climate emergency. This resolution calls for an emergency mobilization effort to stop the burning of fossil fuels and release of GHG emissions as soon as possible while educating and engaging residents and businesses about climate change. This Climate Action Plan (CAP) supports that resolution and builds on the progress achieved in Hayward's 2014 CAP by providing an updated blueprint for reducing GHG emissions, increasing equitable community resilience, and supporting state and global climate goals through achieving the City's 2030 and 2045 climate action targets.

By achieving carbon neutrality, Hayward will contribute its fair share to address the climate crisis and support international climate goals, limiting global temperature rise. This target is consistent with the United Nations International Panel on Climate Change (IPCC) analysis on what is necessary to reduce the likelihood of catastrophic global climate change.

Purpose

Climate Action

This CAP is intended to set forth new measures and actions to build upon the GHG emissions reductions that have been achieved in recent years. The CAP will guide Hayward towards reducing GHG emissions 55 percent below 2005 per capita levels by 2030, which is consistent with the California 2030 target of 40 percent below 1990 per capita levels, established by California Senate



Bill (SB) 32. This CAP will also put the City on a trajectory to meet the State goal of achieving carbon neutrality by 2045, established by California Assembly Bill (AB) 1279. See Appendix A for a written description and a timeline of relevant climate action planning regulations.

CEQA GHG Emissions Analysis Streamlining

This CAP fulfills the requirements of California Environmental Quality Act (CEQA) Guidelines Section 15183.5(b) to be considered a “qualified” GHG reduction plan.² In compliance with CEQA and State CEQA Guidelines, local agencies must evaluate the environmental impacts of new development projects or plans, including impacts related to GHG emissions associated with the construction and operation of projects or plans. This process can be cumbersome for local agencies and developers alike and can result in project delays. The CEQA Guidelines provide an option for new projects to streamline the CEQA analysis of GHG emissions by tiering from a qualified GHG reduction plan.

This CAP and its associated CEQA environmental assessment documentation are consistent with the criteria set forth in CEQA Guidelines Section 15183.5(b) as summarized in Table 1. As such, this CAP is considered a qualified GHG reduction plan.

Table 1 CEQA Guidelines Section 15183.5(b) Criteria Addressed in CAP

CEQA Criteria	CAP Chapter Addressing Criteria
1. Quantify existing and projected GHG emissions within the plan area	Chapter 4
2. Establish a reduction target consistent with State targets	Chapter 4
3. Identify and analyze sector specific GHG emissions from specific actions or categories of actions anticipated within the geographic area	Chapter 4 Appendix B
4. Specify measures and actions that substantial evidence demonstrates would collectively achieve the specified reduction target	Chapters 7, 8,9,10,11
5. Establish a mechanism to monitor progress and amend the plan if it is not achieving specified emissions levels	Chapter 12
6. Adopt in a public process following environmental review	See associated CEQA environmental assessment documentation

If future projects are consistent with this CAP, future CEQA GHG emissions impact analyses can be streamlined according to the City’s direction.

² Governor’s Office of Planning and Research (OPR), “General Plan Guidelines - Chapter 8: Climate Change,” Available: https://opr.ca.gov/docs/OPR_C8_final.pdf.

2.2 Hayward Climate Emergency Declaration

Acknowledging the pressing and life-threatening nature of climate change, the City of Hayward officially proclaimed a climate crisis through the adoption of Resolution No. 19-007 on January 15th, 2019. Alongside calling for an emergency mobilization effort to cease GHG emissions at the local level, the resolution appeals to the State of California, the United States, and all global governments to launch urgent mobilization campaigns aimed at mitigating climate change, halting the rise of GHG emissions, and safely reducing atmospheric carbon levels.

As part of the resolution the City of Hayward committed to keeping equity central to the climate mobilization planning process by encouraging inclusive community engagement and diverse participation. The development process for this CAP and the measures are aligned with this mission. Please refer to Section 5 for more detail about the planning process and how public input was incorporated into this CAP.

3 Scientific Context and Impacts

3.1 Climate Change Science

The Greenhouse Gas Effect and Climate Change

Earth's climate is largely driven by energy that comes from the sun. When solar radiation reaches the Earth's atmosphere, some of it is reflected into space and a portion is absorbed by the Earth's surface. As the Earth absorbs solar radiation, its surface heats up and re-radiates heat back out into the atmosphere.³ While some of the heat escapes past the atmosphere into space, gases in the atmosphere prevent the loss of some of the heat. The gases trapping the heat are known as greenhouse gases (GHG).⁴ Without some GHGs in the atmosphere, the Earth would not be warm enough to sustain life as we know it. This heat trapping quality of gases in Earth's atmosphere is known as the greenhouse effect. Increased levels of specific GHGs in the atmosphere means that less heat escapes to space. More heat trapped in the atmosphere leads to much hotter than average temperatures also known as global warming, which in turn contributes to more intense storms, drought, extreme heat events, and sea level rise.⁵ These effects are considered climate change.

Human-caused climate change is well understood and widely accepted by the scientific community, with over 97 percent of climate scientists agreeing that the planet is warming and human activities are the root cause.⁶ Human activities have raised the levels of GHGs in the atmosphere from 280 parts per million to over 410 parts per million in the last 150 years.⁷ Although many changes to climate are governed by natural processes, human activities have added GHGs to the atmosphere at a rate that is unprecedented in Earth's history, leading to CO₂ levels that are now higher than they have been any time in the past 800,000 years.⁸

Globally, climate change is already impacting both human and natural systems. Scientists have measured shrinking ice sheets, warming, and acidifying oceans, increasing global temperatures, less snow cover, sea level rise, and species extinction. The potential consequences of these climate change related impacts include the flooding of low-lying areas, reduction of fresh-water supply, adverse changes to biological resources and public health, as well as many other adverse environmental consequences.⁹

³ NASA. "The Causes of Climate Change," Climate Change: Vital Signs of the Planet. Available: <https://climate.nasa.gov/causes>.

⁴ UCAR. "The Greenhouse Effect | Center for Science Education," Available: <https://scied.ucar.edu/learning-zone/how-climate-works/greenhouse-effect>.

⁵ IPCC. "Summary for Policymakers — Global Warming of 1.5 °C. Available: <https://www.ipcc.ch/sr15/chapter/spm/>.

⁶ NASA. "Scientific Consensus: Earth's Climate Is Warming," Climate Change: Vital Signs of the Planet. Available: <https://climate.nasa.gov/scientific-consensus>.

⁷ J. Blunden and T. Boyer, "State of the Climate in 2020," *Bulletin of the American Meteorological Society* 102, no. 8. 2021. Available: <https://doi.org/10.1175/2021BAMSSStateoftheClimate.1>.

⁸ Ibid.

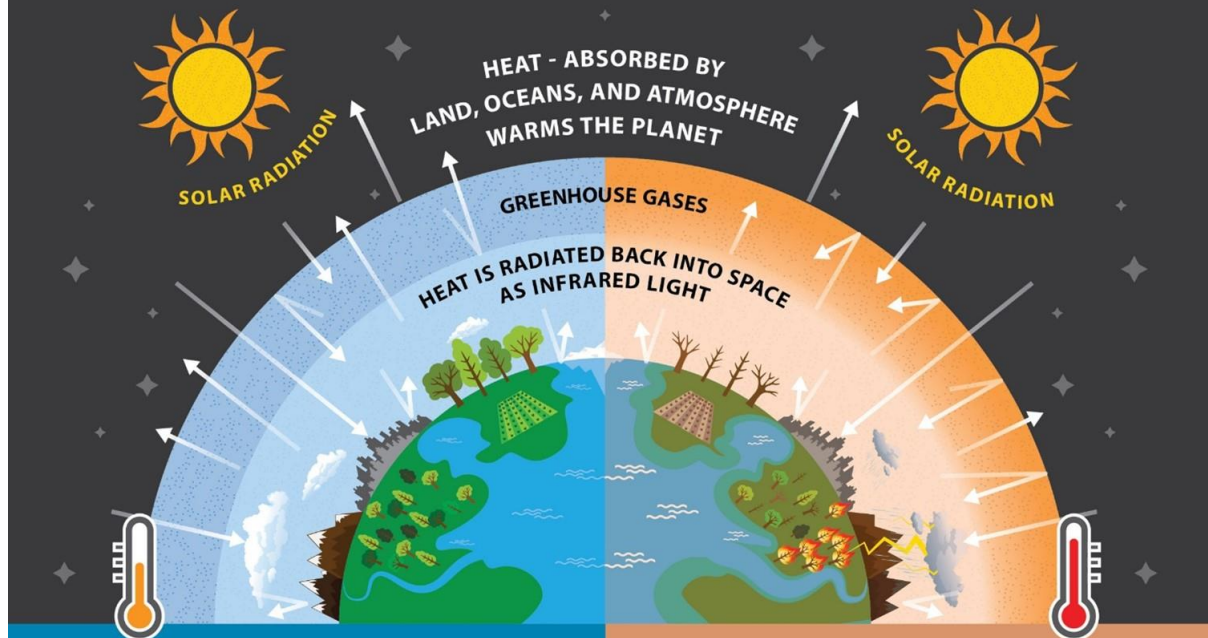
⁹ IPCC. "Impacts of 1.5°C of Global Warming on Natural and Human Systems," *Assessment Report 5*. 2018. Available: <https://www.ipcc.ch/sr15/chapter/chapter-3/>

GREENHOUSE GAS EFFECT

Since the advent of the industrial revolution human activities such as burning fossil fuels and deforestation have caused a substantial increase in the concentration of greenhouse gases in the atmosphere.

THE RESULT: EXTRA TRAPPED HEAT AND HIGHER GLOBAL TEMPERATURES.

WITH NORMAL GREENHOUSE GASES



Some heat continues into space while the rest, trapped by greenhouse gases, help maintain the planet's relatively comfortable temperatures.

LESS GHG = LESS HEAT TRAPPED IN THE ATMOSPHERE

Retain more reliable:

- Weather
- Temperature
- Rainfall
- Sea Level

Increased greenhouse gases means less heat escapes to space. Between preindustrial times and now, the earth's average temperature has risen by 1.8°F (1.0°C).

MORE GHG = MORE HEAT TRAPPED IN THE ATMOSPHERE

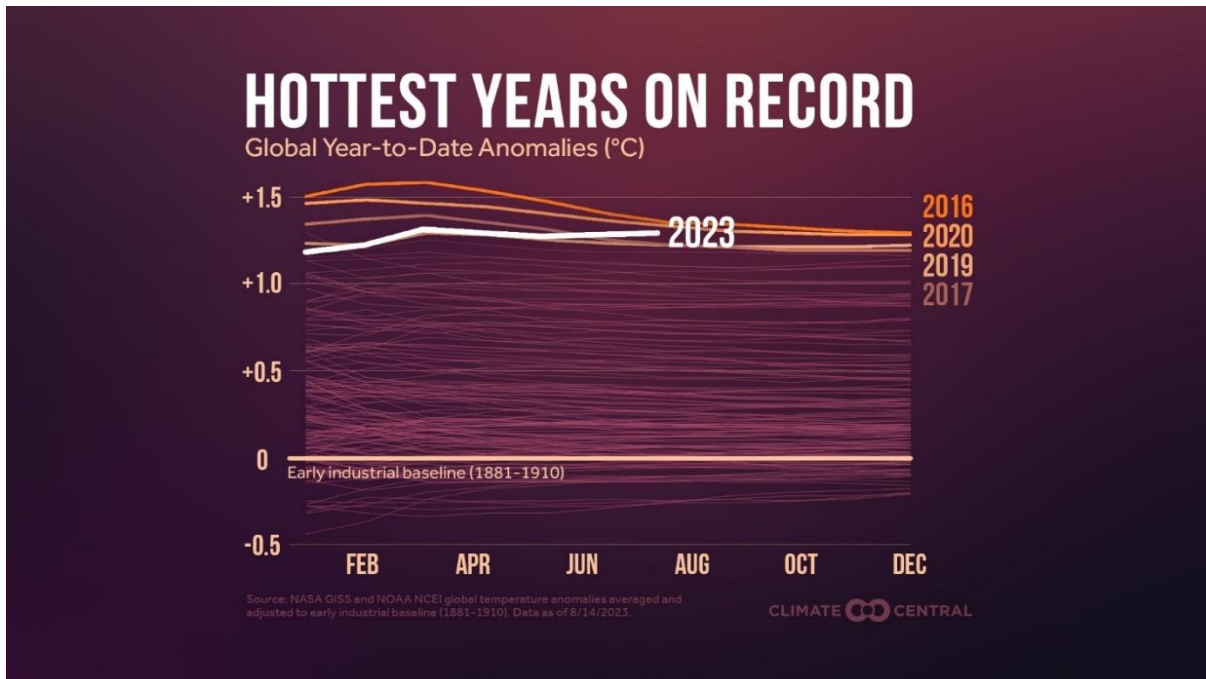
Results in more intense:

- Storms
- Heat
- Drought
- Sea Level Rise

Source: National Resources Defense Council, <https://www.nrdc.org/stories/greenhouse-effect-101>

Globally, a warming trend is abundantly clear, with nineteen of the hottest years on record occurring since 2000.¹⁰ The year 2020 tied with 2016 for the hottest year on record since record-keeping began in 1880, and these trends are consistent across numerous monitoring agencies and data sets.¹¹ NASA recorded July 2023 as the hottest month on record since 1880.¹²

Though climate change is a global phenomenon it has the potential to impact facets of society on the local level including health outcomes, natural resource access, infrastructure, emergency response, tourism, and frequency of disasters. The United Nations Intergovernmental Panel on Climate Change (IPCC) projections show that a reduction in GHG emission to carbon neutrality by mid-century is required to limit warming trends to 1.5 degrees Celsius and avoid the worst impacts of climate change.¹³ In order to do this, action must be taken at all levels of society to reduce emissions of GHGs.



Source: Climate Central, <https://www.climatecentral.org/graphic/summer-heat-pushes-2023-temperatures-near-record?graphicSet=2023+Global+Temperatures+Near+Hottest+on+Record>

¹⁰ NASA-GISS. "Land-Ocean Temperature Index (C): Global Mean Estimates Based on Land and Ocean Data". Available: https://data.giss.nasa.gov/gistemp/graphs/graph_data/Global_Mean_Estimates_based_on_Land_and_Ocean_Data/graph.txt.

¹¹ NASA. "Global Surface Temperature | NASA Global Climate Change," Climate Change: Vital Signs of the Planet. Available: <https://climate.nasa.gov/vital-signs/global-temperature>. Climatic Research Unit (CRU). "Land Surface Air Temperature Variations Across the Globe Updated to 2019: The CRUTEM5 Data Set," *Journal of Geophysical Research: Atmospheres* 126, no. 2. 2021. <https://doi.org/10.1029/2019JD032352> Accessed:

¹² <https://www.nasa.gov/news-release/nasa-clocks-july-2023-as-hottest-month-on-record-ever-since-1880/>

¹³ IPCC. "Summary for Policymakers — Global Warming of 1.5 °C". Available: <https://www.ipcc.ch/sr15/chapter/spm/>.

Types of GHG Emissions

The IPCC lists the following GHGs: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), as well as chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, which are collectively called fluorinated gases.¹⁴ Almost all the GHGs emitted in the United States each year consist of CO₂, CH₄, and N₂O, while fluorinated gases make up the remaining emissions¹⁵. Because CO₂, CH₄, and N₂O comprise a large majority of GHG emissions at the community level, these are the gases considered in this analysis.

Each GHG has a different propensity for trapping heat in the atmosphere, known as its global warming potential (GWP). GHGs also last for different periods of time in the atmosphere, ranging from a decade to several thousand years. Because all the GHGs have different characteristics, a standard unit is needed to compare the potential impact of different GHGs and allow them to be added up in an analysis. This is achieved by converting all GHGs into the standard unit known as a carbon dioxide equivalent (CO₂e), based on the amount of heat one metric ton (MT) of CO₂ traps in the atmosphere. GWP for each GHG was drawn from the IPCC fifth Assessment Report¹⁶, which represents the best available scientific consensus and is consistent with the methodology outlined in the California Air Resources Board (CARB) Scoping Plan. Since CO₂ is used as the reference point for trapping heat, CO₂ has a GWP of 1. Methane has a GWP of 28, meaning that each metric ton (MT) of methane causes 28 times more warming than 1 MT of CO₂. Nitrous oxide has a GWP of 265, meaning 265 times the GWP of 1 MT of CO₂.¹⁷

Sources of GHG Emissions

The combustion of fossil fuels is the primary source of GHG emissions, decomposition of waste, and land use change are also major contributors. It can be helpful to understand how different sectors contribute to total emissions. The top sources of GHGs Statewide are transportation (37 percent), industrial processes (20 percent), and electric power (16 percent). The magnitude of total California GHG emissions is due in part to its large size and large population compared to other states. However, a factor that reduces California per capita fuel use and GHG emissions as compared to other states is its relatively mild climate.¹⁸

The main sources of GHG emissions in Hayward are from transportation, buildings, and waste. Transportation emissions are generated by fuels used to power cars, trucks, public transit, and off-road vehicles. Building emissions are associated with electricity and natural gas used by commercial, residential, and municipal buildings. Waste from residential, commercial, and municipal sources

¹⁴ Note: Fluorinated gases, which includes four main types: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆) and nitrogen trifluoride (NF₃), are man-made gases that can stay in the atmosphere for centuries and contribute to the GHG effect. Center for Climate and Energy Solutions. "Main Greenhouse Gases". 2021. Available: <https://www.c2es.org/content/main-greenhouse-gases/>. Accessed December 2021

¹⁵ Note: Ninety-seven percent of the annual GHG emissions consist of CO₂, CH₄, and N₂O and fluorinated gases make up the remaining three percent of GHG emissions. US EPA. "Inventory of U.S. Greenhouse Gas Emissions and Sinks". 2021. Available: <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>. Accessed: December 2021; World Resources Institute. "4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors". 2021. Available: <https://www.wri.org/insights/4-charts-explain-greenhouse-gas-emissions-countries-and-sectors>.

¹⁶ IPCC. *Climate Change 2014: Synthesis Report*. Available: https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf. Accessed December 2021; and California Air Resources Board (CARB). "California's 2022 Climate Change Scoping Plan". Available: <https://www2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents..>

¹⁷ IPCC. *Climate Change 2014: Synthesis Report*. Available: https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf.

¹⁸ U.S. EPA. 2023. Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2021. Available at: <https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf>

generates methane emissions as material (especially organics like food scraps and yard waste) decomposes in the landfill.

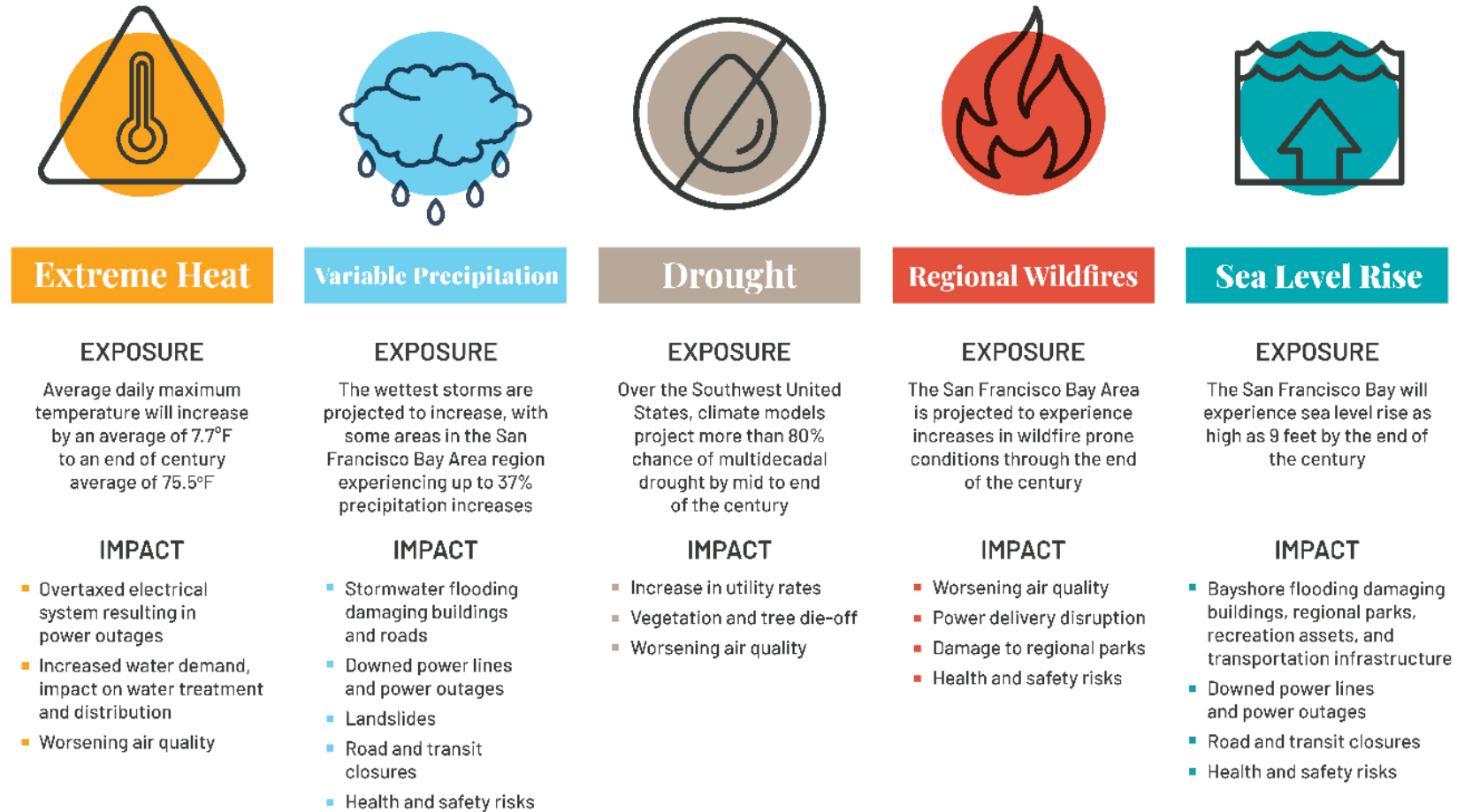
Opportunities to Reduce GHG Emissions

Cities play a crucial role in reducing GHG emissions in California. The policies and initiatives implemented by local governments have the capability to influence activities that can affect high-emissions behaviors, mitigate the consequences of climate change, and equip the community to better withstand its effects. Cities hold the potential to drive climate action and emission reduction through strategic land use planning, the revision of building codes and standards, and developing partnerships between public and private entities that promote shifts in behavior. They can enact various measures to decrease emissions, including enhancing building regulations to curtail energy consumption, offering incentives for alternative transportation methods to reduce fuel usage, broadening options for diverting waste and utilizing renewable energy sources, as well as educating residents about their roles as both citizens and consumers.

3.2 Climate Change Impacts

Climate change already has impacted and will continue to impact the Hayward community, including its residents, businesses, and visitors. In the past few years, Hayward has experienced severe droughts, poor air quality from regional wildfire smoke, local flooding from extreme precipitation events, extreme heat events, and rising sea levels. As the climate continues to change, many climate hazards may become more frequent and intense. In 2016, the California legislature adopted Senate Bill (SB) 1000 requiring local jurisdictions to review and update Safety Elements of the General Plan to address and update hazards related to flooding, fires and to include climate adaptation and resilience strategies. The Hayward General Plan includes a Hazards Element that addresses State requirements for a Safety Element. As such, in support of the update to the Hayward General Plan Hazards Element, the City prepared a climate change vulnerability assessment to evaluate the potential impacts of climate change on community assets and populations. The climate change vulnerability assessment describes the community's vulnerabilities to climate change and provides a foundation to develop strategies to increase community resilience. A summary of climate exposures and potential impacts within Hayward as identified in the Hayward Hazards Element is summarized in Figure 1.

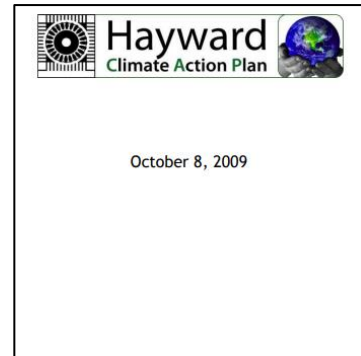
Figure 1 Hayward Climate Change Exposure and Impacts



4 Climate Action History

4.1 Progress to Date

The City of Hayward has conducted a GHG emissions inventory of communitywide GHG emissions for 2005, 2010, 2015, 2017, 2018, and 2019. In addition to these inventories, the City adopted its first CAP in 2009 and updated the CAP in 2014 and incorporated it in the City's General Plan. See Appendix B for more information about the data used and how GHG emissions were calculated for Hayward's 2019 GHG emissions inventory. Figure 2 shows some of the major milestones from recent history in Hayward's climate actions.



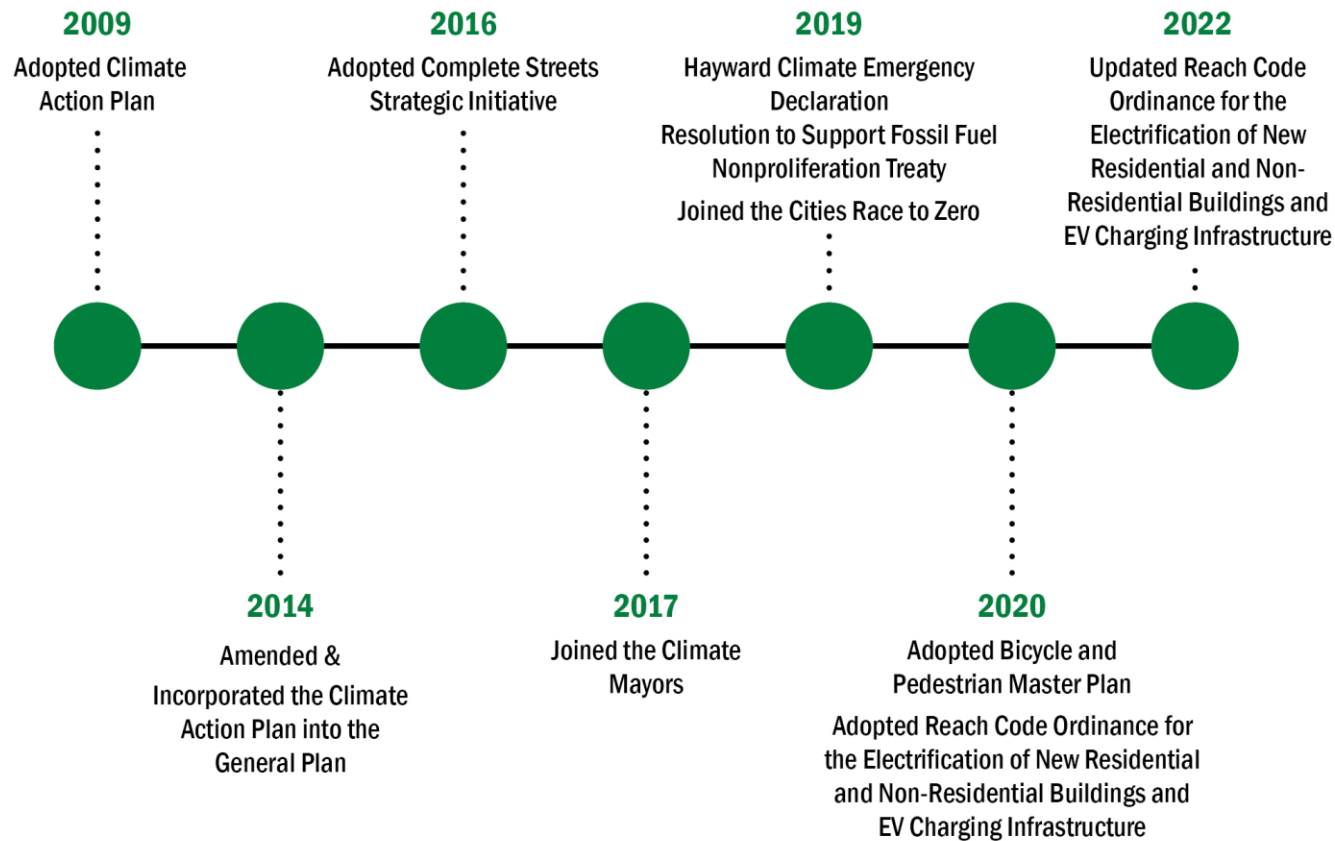
Trends from Hayward GHG Emissions Inventories

In the 2014 CAP, the City of Hayward set a target to reduce GHG emissions 20 percent below 2005 baseline levels by 2020. The City achieved this goal in large part to the community's enrollment in the Ava Community Energy's¹⁹ Brilliant 100 electricity product, which provided 100 percent carbon free electricity. Community emissions are driven by both residential and commercial activity occurring within Hayward. Thus, changes in population and jobs in the City can result in increases or decreases in community emissions. For example, Hayward has experienced an estimated 11 percent increase in population, 8 percent increase in jobs, and a 6 percent increase in housing units since 2010. During this growth the City's climate actions and other systemic changes resulted in an overall 30 percent decrease in emissions compared to 2005 and 22 percent decrease in emissions compared to 2010. However, there is an additional opportunity for continued progress.



¹⁹ Beginning in October 2023, East Bay Community Energy (EBCE) began transitioning to Ava Community Energy.

Figure 2 Milestones in Hayward's Climate Action History



Climate Action Leadership

The City of Hayward stands out as a notable leader in climate action in California and the nation. In 2022, the City was recognized as one of 122 local governments worldwide on the 2022 CDP Cities A List for its leadership in environmental action. This makes the fourth time in five years that Hayward has received this recognition.²⁰ Achievements have been made possible through the diligent efforts of the City's Environmental Services Division, Council Sustainability Committee, and other key City departments.

Environmental Services Division

The Environmental Services Division leads Hayward's sustainability, climate action, and climate adaptation efforts. The team implements the City's Climate Action Plan and provides staff support to the Council Sustainability Committee. The team also provides solid waste and recycling services and programs to minimize stormwater pollution. The team focuses on implementing various climate action programs around solar and energy efficiency, composting, electric vehicles, and building electrification.

City Council Sustainability Committee

The Hayward Council Sustainability Committee, as established by the City Council in 2007, provides expertise and guidance on policy areas related to the City's ongoing climate action planning efforts. The Council Sustainability Committee provides policy recommendations related to renewable energy, energy efficiency and conservation, green buildings, and other efforts to mitigate the impacts of climate change on the local level. The Council Sustainability Committee meets bi-monthly to discuss policy issues related to Hayward's sustainability goals and provide critical input during the CAP Update.

Future Progress

The measures and actions in this CAP provide Hayward with the GHG reductions necessary to achieve the City's 2030 climate action target. However, the City's climate action target of carbon neutrality by 2045 requires significant reductions in emissions that depend on critical changes to the technology, legislation, and systems currently in place.

As these measures and actions are put into effect, the City will acquire increased insights, novel technologies will be explored, and ongoing pilot projects and programs will grow to the size needed to reach carbon neutrality. Additionally, it is anticipated that state-level regulations will be revised, and added assistance will be extended in the future to aid in achieving carbon neutrality. The City has established a future CAP update schedule, as described in Section 13. Future CAP updates beyond 2030 will outline new measures and actions that Hayward will implement to close the remaining gap to achieve the target of carbon neutrality by 2045.

²⁰ City of Hayward. 2022. Hayward Earns Fourth Recognition for Environmental Leadership Among Cities Worldwide. <https://www.hayward-ca.gov/discover/news/nov22/hayward-earns-fourth-recognition-environmental-leadership-among-cities-worldwide>

5 Current and Projected GHG Emissions

5.1 Hayward GHG Emissions Inventory

Community GHG inventories measure the GHG emissions generated by residents and businesses operating in the community, as well as municipal operations. The process of creating a GHG inventory includes first identifying activities that are major sources of emissions and collecting summary data on those activities for a calendar year. Then, the City uses science-based GHG emissions factors to convert the collected activity data into GHG emissions produced. Inventories measure GHG emissions in units of metric tons of carbon dioxide equivalent, or MT CO₂e.

GHG Inventory Protocols

Emissions estimates were calculated using the International Council for Local Environmental Initiatives (ICLEI) methodologies, specifically, the United States Community Protocol for Accounting and Reporting Greenhouse Gas Emissions Version 1.2 (Community Protocol) is used for communitywide emission. The Community Protocol is an authoritative guide for best practices in calculating community-scale GHG inventories. The protocol separates a city's GHG-generating activities into categories known as emissions sectors. Large emissions sectors for cities include the transportation sector (such as combustion emissions from cars and other vehicles operating within the city), the building sector (including emissions from electricity and natural gas usage), and the waste sector (capturing emissions from sending solid waste to the landfill).

Not all activities within a city that generate GHGs are included in a GHG emissions inventory. Activities that cannot be controlled or influenced by city policies are generally excluded as they have little bearing on city planning. For example, emissions from cars traveling through a city, whose origins and destinations are both outside of city limits, are typically excluded because a local government cannot reasonably influence this pass-through travel activity.²¹

²¹ The Regional Targets Advisory Committee (RTAC) established under SB 375 recommends the following accounting of various trip types for VMT purposes²³: Include 100% of internal-internal (I-I) trips Exclude external-external (X-X) trips Count 50% of internal-external (I-X) and external-internal (X-I) trips. Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375. September 2009. <http://www.arb.ca.gov/cc/sb375/rtac/report/092909/finalreport.pdf>

Current Inventory

The CAP Update includes a 2019 inventory of GHG emissions from Hayward's communitywide activities. The inventory includes sources that are within some degree of the City of Hayward's jurisdictional control, in accordance with established GHG accounting protocols and State guidance. In 2019, Hayward's GHG emissions totaled 684,399 MT CO₂e. This represents a 22 percent decrease in emissions compared to 2010 emissions levels (882,196 MT CO₂e) and a 30 percent reduction in emissions relative to 2005 emissions levels (973,244 MT CO₂e).

As shown in Figure 3 and Table 2, in 2019 GHG emissions from transportation made up the largest sector (422,717 MT CO₂e, or 62 percent of total emissions). The second largest source was building energy use from electricity and natural gas consumption (189,116 MT CO₂e, or 28 percent of total emissions). 54 percent of building energy emissions were attributed to the residential sector while 46 percent were attributed to the commercial/industrial sector. The remaining community emissions were from solid waste (46,187 MT CO₂e, 7 percent of emissions), and water and wastewater (2,092 MT CO₂e, 0.3 percent of emissions).

Figure 3 Hayward Greenhouse Gas Emissions by Sector, 2019

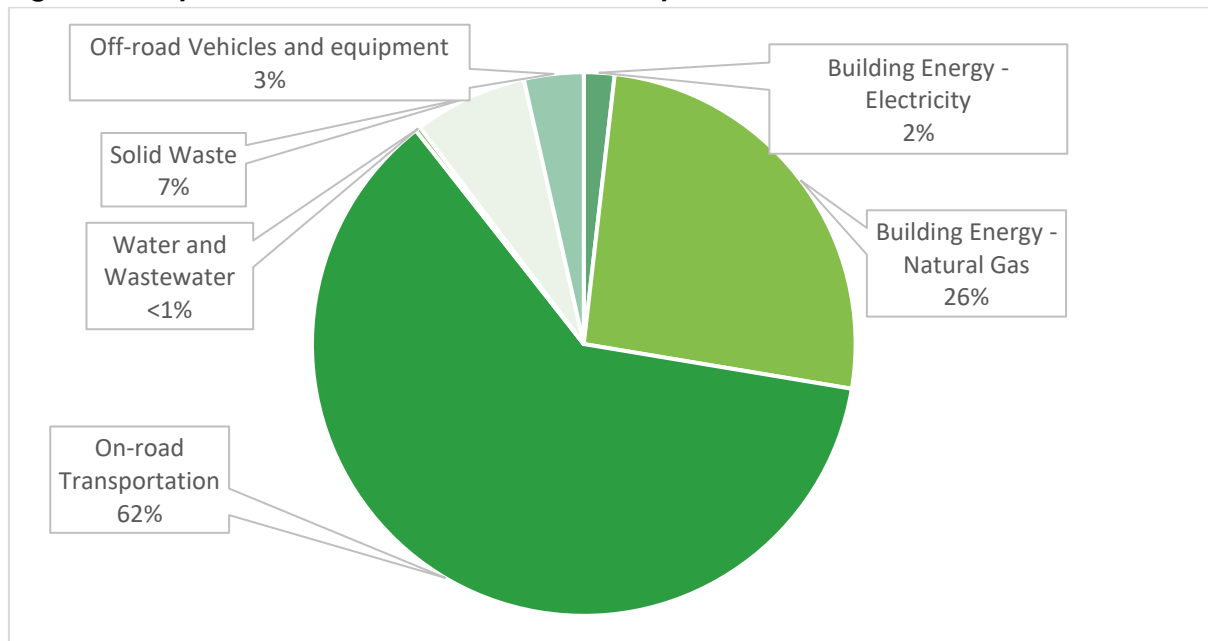


Table 2 Hayward 2019 GHG Emissions Inventory Summary

GHG Emissions Sector/Source	CO ₂ e (MT)	% of Total Emissions
Transportation		
Passenger On-Road Transportation	298,256	44%
Commercial On-Road Transportation	111,329	16%
Buses On-Road Transportation	8,277	1%
BART	547	0.1%
AC Transit	4,308	1%
Off Road - Diesel	14,661	2%
Off Road - Gasoline	4,940	1%
Off Road - Natural Gas (LPG)	4,687	1%
Electricity		
Residential Electricity – PG&E	1,144	0.2%
Residential Electricity – Ava Community Energy	5,182	1%
Commercial/Industrial Electricity – PG&E	3,032	0.4%
Commercial/Industrial Electricity - Ava Community Energy	3,108	0.5%
Natural Gas		
Residential Natural Gas	95,291	14%
Commercial/Industrial Natural Gas	81,358	12%
Water and Wastewater		
Wastewater - Direct	1,702	0.2%
Wastewater – Indirect	380	0.1%
Water - Indirect	10	0.001%
Solid Waste		
Solid Waste Generated/Disposal	46,187	7%
CO ₂ e = carbon dioxide equivalent; PG&E = Pacific Gas and Electric		

5.2 Hayward GHG Emissions Forecasts

GHG emissions forecasts provide an estimate of Hayward’s GHG emissions in the future. Forecasting helps to track trends and progress for Hayward and allows the City to see how much it needs to reduce communitywide emissions in order to meet its future GHG emissions reduction targets. GHG emissions forecasts for Hayward were developed using the 2019 inventory for 2025, 2030, 2035, 2040 and 2045.

The City developed two forecasts to contextualize how emissions will change and better understand the reduction actions that Hayward must take. The first forecast is a business-as-usual (BAU) forecast, which is developed using the 2019 inventory and projected changes in population and job growth in the City. The second is an adjusted forecast that accounts for State regulations that require the reduction of future GHG emissions within the State.

Business-as-Usual Forecast

The BAU forecast assumes that emission factors and activity remain constant over time. Under this assumption, population, and job growth are the main drivers for GHG generating activities. The BAU forecast provides a basis of comparison by assuming there are no changes to technology, behaviors, or legislation, and population and job growth trends continue as projected. Another forecast that accounts for the impacts from state regulations is discussed in the sections below.

To develop a GHG emissions forecast, growth metrics (e.g., population, housing, and employment projections) are multiplied by BAU growth indicators, which represent a baseline metric developed from the GHG emissions inventory (Table 3). Appendix C includes more details on the growth metrics, demographics, and methodologies used to develop the BAU forecast. This process allows the City to convert growth projections into GHG emissions estimates using specific GHG emissions factors, which are assumed to be the same in the future as in the 2019 GHG emissions inventory. This methodology is used for all GHG emissions sectors and sources included in the 2019 GHG emissions inventory, apart from the off-road emissions sector. To forecast off-road emissions, the OFFROAD2021 off-road emissions database was used to project fuel use since no significant GHG emission reduction legislation is included in the model. Table 4 summarizes the BAU forecast for each forecast year.

Table 3 Growth Metrics for Hayward BAU GHG Emissions Forecast

Growth Metric ^{1,2}	2019 ¹	2025	2030	2035	2040	2045 ³
Population	160,197	161,781	167,425	173,069	178,713	184,358
Employment	70,739	70,326	72,073	73,821	75,568	77,315
Service Population	230,936	232,107	239,498	246,890	254,281	261,673
Housing	47,987	51,788	53,108	54,427	55,747	57,066

Note: Service Population = Population + Employment

¹ Previous inventory demographic data was obtained from MTC, including years 2005, 2010, 2015, 2017, 2018, and 2019.

² Forecasted demographic data for Hayward is based on the Alameda CTC Zone from plan Bay Area 2040 and is consistent with the projections used for the Housing Element and traffic analysis conducted by Kittleson & Associates, Inc. Data was provided for year 2020 and 2040, therefore interim years were linearly interpolated.

³ To estimate demographic growth past 2040, the annual compound growth rate between 2020 and 2040 was applied to the demographic data to estimate demographic projections in 2045.

Table 4 BAU Emissions Forecast (MT CO₂e)

GHG Emissions Source	2025	2030	2035	2040	2045
Transportation					
Passenger On-Road Transportation	321,882	330,084	338,285	346,486	354,687
Commercial On-Road Transportation	120,212	124,041	127,869	131,697	135,525
Buses On-Road Transportation	8,319	8,584	8,849	9,114	9,379
BART	550	568	585	603	620
AC Transit	4,330	4,468	4,605	4,743	4,881
Off Road Transportation & Equipment	26,818	29,084	31,274	33,662	28,177
Electricity					
Residential Electricity	6,828	7,001	7,175	7,349	7,523
Commercial/Industrial Electricity	6,104	6,256	6,408	6,560	6,711
Natural Gas					
Residential Natural Gas	102,840	105,460	108,080	110,701	113,321
Commercial/Industrial Natural Gas	80,883	82,893	84,903	86,912	88,922
Water and Wastewater					
Wastewater - Direct	1,719	1,779	1,839	1,899	1,959
Wastewater – Indirect	384	397	410	424	437
Water - Indirect	6	6	7	7	7
Solid Waste					
Solid Waste Generated/Disposal	46,421	47,899	49,377	50,856	52,334
Total	727,297	748,520	769,667	791,012	804,484
Per Capita Total	4.50	4.47	4.45	4.43	4.36

Notes: Values in this table may not add up to totals due to rounding

All values are of the unit metric tons of carbon dioxide equivalent (MT CO₂e)

CO₂e = carbon dioxide equivalent; PG&E = Pacific Gas and Electric;

Adjusted Forecast

The adjusted forecast adjusts the BAU forecast to account for state-level legislation, policies, and programs (e.g., SB 100, Title 24 Energy Efficiency Standards, Advanced Clean Truck Rule) that are expected to reduce GHG emissions. As it takes into account the influence of enacted laws, the revised projection is deemed a more authentic representation of Hayward's future emissions scenario. Contrasting the BAU and adjusted forecast can show the magnitude of anticipated reductions in Hayward's GHG emissions, which are expected to stem from state-level policies and initiatives.

State-Level Policies Included in the Adjusted Forecast

Numerous regulations and policies at the State level have been put into effect and are anticipated to lower Hayward's future emissions. These pieces of legislation are incorporated into the adjusted forecast to provide a more accurate depiction of Hayward's future emissions. The pertinent policies and initiatives are outlined below:

- **Advanced Clean Cars Program.** A comprehensive car emissions control program which regulates smog, soot-causing pollutants, and GHG emissions into a single coordinated package of requirements.
- **Innovative Clean Transit.** A regulation focused on long-term goal of full transition of the heavy-duty transportation sector to zero-emission technologies. It requires all public transit agencies to gradually transition to a 100 percent zero-emission bus fleet and encourages them to provide innovative first and last-mile connectivity and improved mobility for transit riders.
- **Title 24 Building Energy Efficiency Standards.** Building standards that regulate new residential and commercial development in California by requiring increased efficiency related to space heating and cooling, lighting, and water heating.
- **California Renewable Portfolio Standard (RPS).** Requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from renewable energy resources. Adopted in 2018, SB 100 requires electricity providers to increase procurement from eligible renewable energy resources to 60 percent by 2030 and 100 percent by 2045. SB 1020 builds upon SB 100 by advancing the State trajectory to 100 percent clean energy procurement by 2045 by creating clean energy targets of 90 percent by 2035 and 95 percent by 2040.
- See Appendix A for more information on these and a suite of other programs and policies that are intended to reduce emissions, including SB 1383 and AB 341, that are not included in the adjusted forecast because they are emphasized in the measures.

Table 5 Adjusted Forecast (MT CO₂e)

GHG Emissions Source	2025	2030	2035	2040	2045
Transportation					
Passenger On-Road Transportation	281,963	264,018	256,013	254,427	256,924
Commercial On-Road Transportation	103,620	94,404	83,586	77,090	74,698
Buses On-Road Transportation	7,703	6,398	4,975	3,964	2,922
BART	550	568	585	603	620
AC Transit	4,010	3,324	2,581	2,056	1,519
Off Road Transportation & Equipment	26,818	29,084	31,274	33,662	28,177
Electricity					
Residential Electricity	4,771	3,586	2,401	1,210	0
Commercial/Industrial Electricity	4,670	3,548	2,370	1,190	0
Natural Gas					
Residential Natural Gas	102,311	104,748	107,185	109,622	112,059
Commercial/Industrial Natural Gas	80,883	82,893	84,903	86,912	88,922
Water and Wastewater					
Wastewater - Direct	1,719	1,779	1,839	1,899	1,959
Wastewater – Indirect	297	232	160	83	0
Water - Indirect	5	4	3	1	0
Solid Waste					
Solid Waste Generated/Disposal	46,421	47,899	49,377	50,856	52,334
Total	665,743	642,486	627,251	623,574	620,134
Per Capita Total	4.12	3.84	3.62	3.49	3.36

Notes: Values in this table may not add up to totals due to rounding

All values are of the unit metric tons of carbon dioxide equivalent (MT CO₂e)

CO₂e = carbon dioxide equivalent; PG&E = Pacific Gas and Electric;

Comparing Forecast Scenarios

The BAU forecast for Hayward projects an increase in GHG emissions above the 2019 GHG emissions inventory from all GHG emissions sources through 2045 based on projected job and population growth. Hayward’s BAU GHG emissions are projected to increase to 4.36 MT CO₂e per person or 804,484 MT CO₂e in 2045, see Table 4.

The adjusted forecast projects that state legislation will result in GHG emissions reduction from the BAU forecast in both the residential and commercial/industrial sectors. Title 24 is expected to reduce GHG emissions due to reduced electricity and natural gas consumption in new residential and non-residential construction. SB 100 and the California RPS are expected to reduce GHG emissions associated with electricity generation in both the residential and the commercial/industrial sector. State transportation regulations,



including Advanced Clean Trucks, Advanced Clean Cars, and Advanced Clean Fleet, are expected to significantly reduce transportation GHG emissions. Hayward's adjusted GHG emissions are projected to 3.36 MT CO₂e per person or 620,134 MT CO₂e in 2045, see Table 5.

Refer to Appendix C for a more detailed discussion related to methodology modeling, and supportive evidence for Hayward's GHG forecasts.

5.3 International and State Context and Timeline/ Emissions Targets

International Context

Local climate action is guided by science and policy targets at the international level. Bodies such as the United Nations Intergovernmental Panel on Climate Change (IPCC) conduct scientific evaluations and formulate policy recommendations. International treaties such as the Paris Agreement (2016) are legally binding treaties that cover nearly every nation on earth. The goal of carbon neutrality by 2045 is consistent with IPCC findings and research-based targets for avoiding the most serious climate change impacts. The central aim of the Paris Agreement is to limit global temperature rise to 1.5 degrees Celsius above pre-industrial levels. The IPCC has found that to achieve this and reduce the likelihood of catastrophic global climate change, the world must reach carbon neutrality by mid-century (~2050) and stabilize atmospheric concentrations at 350 parts per million (or less).

California also aligns Statewide targets with these international frameworks. According to the California Air Resources Board (CARB), reducing State emissions to carbon neutral by 2045 would be consistent with the IPCC analysis, as indicated in the AR6 Synthesis Report: Climate Change 2023,²² of the global emissions trajectory needed to achieve these goals.²³ The Paris Agreement sets a worldwide objective of improving adaptive capacity and mandates each participating entity to identify their country's contributions to the collective climate effort. Regular emissions reporting and updates on implementation progress are also required. Similar endeavors are reflected in Hayward's work to increase resilience, achieve carbon neutrality, regularly inventory emissions, report progress towards targets and ultimately to contribute a fair share towards limiting global temperature rise. Hayward's targets associated with this CAP are consistent with both State and IPCC science-based targets related to GHG emissions reduction.

State Context

In the past two decades, California has adopted extensive legislation, policies, and programs to reduce GHG emissions across the state, establishing itself as a global leader in climate change action. The primary legislation enumerating the State climate goals and driving climate action at the State level are AB 32, SB 32, and AB 1279. Together these regulations set Statewide GHG reduction targets for 2020, 2030, and 2045 and chart a path towards a carbon neutral California, as explained below. See Appendix A for a full list of relevant state-level legislation.

- **Assembly Bill 32:** This legislation codified the Statewide goal of reducing GHG emissions to 1990 levels by 2020 and required CARB to prepare a Scoping Plan that outlines the main strategies the State will employ to meet the 2020 target.
- **Senate Bill 32:** This successor legislation to AB 32 requires a Statewide reduction in GHG emissions of 40 percent below 1990 levels by 2030. A new Scoping Plan was adopted in 2017.
- **Assembly Bill 1279:** This legislation codified the Statewide carbon neutrality goal into a legally binding requirement for California to achieve carbon neutrality no later than 2045 and ensure 85 percent GHG emissions reduction under that goal. AB 1279 builds upon Executive Order (EO) B-55-18 that originally established California's 2045 goal of carbon neutrality. The latest Scoping Plan was adopted in 2022.

²² IPCC. 2023. AR6 Synthesis Report: Climate Change 2023. <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>

²³ CARB. 2022. 2022 Scoping Plan for Achieving Carbon Neutrality. <https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf>

5.4 Hayward Context and Timeline/Emissions Targets

Hayward GHG Emissions Targets

The 2022 California Climate Change Scoping Plan recommends that local agencies establish communitywide GHG reduction goals for local climate action plans that will help California achieve its 2030 target and longer-term goal. The Scoping Plan notes that it is appropriate to derive evidence-based targets or goals from local emissions sectors and population projections if this process is consistent with the framework used to develop the Statewide targets. CARB also notes that GHG goals and targets should show a downward trend consistent with Statewide objectives.²⁴

State climate legislation compares emissions reduction targets to a 1990 baseline. However, Hayward does not have a 1990 GHG inventory, and the targets developed by the City are instead compared to their 2005 baseline. In the 2006 AB 32 Scoping Plan, CARB indicates that the 1990 GHG emission levels were 15 percent below “baseline years established between 2005-2008. Hayward’s climate action targets are to:

- Reduce GHG emissions by 30 percent below 2005 levels by 2025.
- Reduce community GHG emissions by 55 percent below 2005 levels (equivalent to 40 percent below 1990 level) by 2030, equivalent to 3.12 MT CO₂e per person or 521,777 MT CO₂e by 2030.
- Work with the community to develop a plan that may result in the reduction of community based GHG emissions to achieve carbon neutrality by 2045.

The Hayward climate action targets are in line with the State-level goals to reduce GHG emissions 40 percent below 1990 levels by 2030 (in compliance with SB 32) and to carbon neutrality by 2045 (in compliance with AB 1279). This CAP includes per capita emission targets to align with guidance from the Scoping Plan. Making substantial progress toward California’s 2030 and longer-term 2045 goals is important, as these targets have been established at levels that achieve California’s fair share of international emissions reductions. California’s goals are in line with those of the IPCC and Paris Agreement.

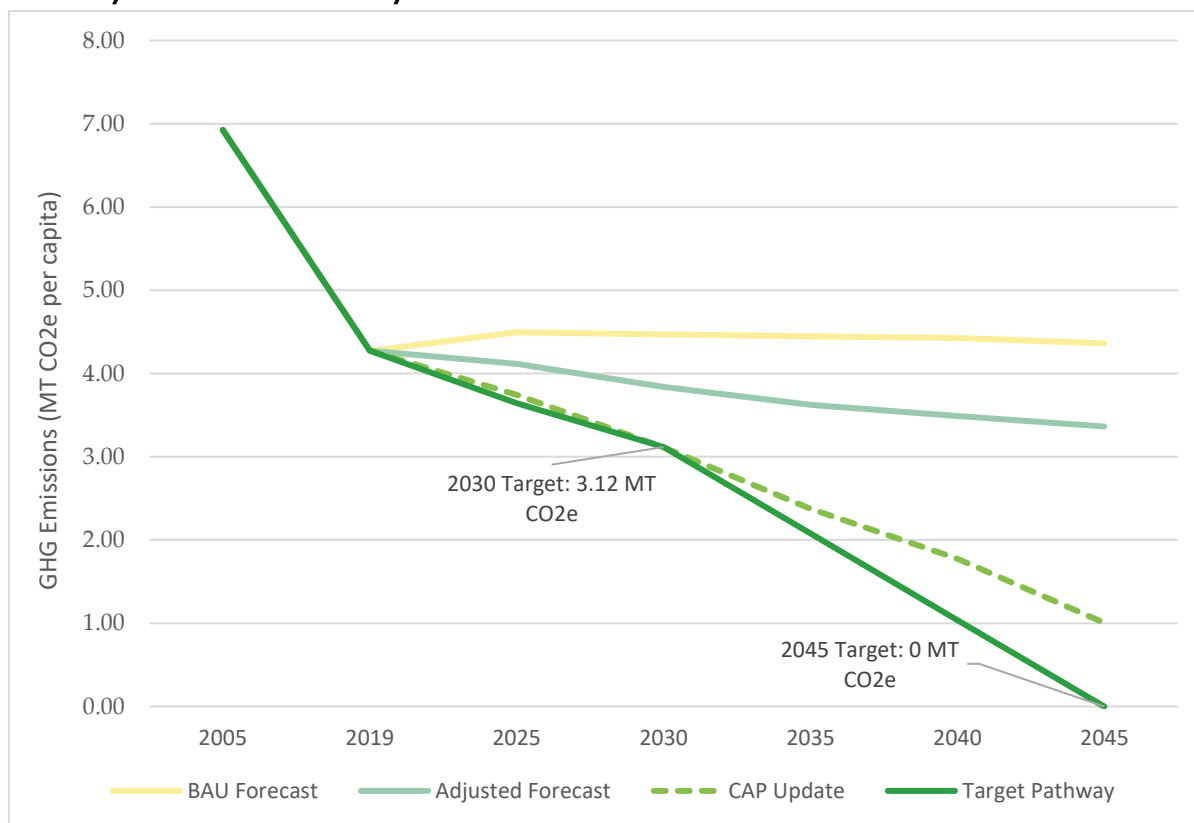
Hayward’s emissions targets are further summarized and compared to the BAU and adjusted emissions forecasts in the tables below, beginning from the 2019 baseline year through 2045. The emissions “gap,” the difference between the adjusted emissions forecast and Hayward’s GHG emissions targets, is shown for each year in the final row of Table 6. Figure 4 shows the per capita baseline emissions compared to forecast scenarios and the target pathway to carbon neutrality.

Table 6 Per Capita GHG Reduction Target Pathway (MT CO₂e/person)

GHG Emissions Pathways	2019	2025	2030	2035	2040	2045
BAU Forecast	4.27	4.50	4.47	4.45	4.43	4.36
Adjusted Forecast	4.27	4.12	3.84	3.62	3.49	3.36
Hayward Emissions Targets	4.27	3.64	3.12	2.08	1.04	0.00
Emissions “Gap” – Per Capita	0.00	0.5	0.7	1.5	2.5	3.4
Emissions “Gap” – Mass Emissions	0	76,568	120,709	267,673	437,922	620,134

²⁴ CARB. 2022 Scoping Plan for Achieving Carbon Neutrality. <https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents>

Figure 4 Baseline Emissions per Capita Compared to Forecast Scenarios and Target Pathway to Carbon Neutrality



Hayward Emissions Gap Analysis

The difference between Hayward’s climate action targets and the adjusted forecast for emissions can be thought of as an “emissions reduction gap,” or the amount of emissions reduction that the City and wider Hayward community must achieve.

Meeting the GHG Emissions Targets

While state regulations and programs will contribute some emissions reductions, Hayward must implement local GHG reduction measures to meet the 2030 emissions targets and make substantial progress towards the 2045 emissions targets. Hayward would be required to reduce 0.7 MT CO₂e per person by 2030, and 3.4 MT CO₂e per person by 2045 to meet the chosen targets that align with state goals. Table 6 shows the remaining per capita reductions needed to meet the GHG emissions goals in MT CO₂e per person.

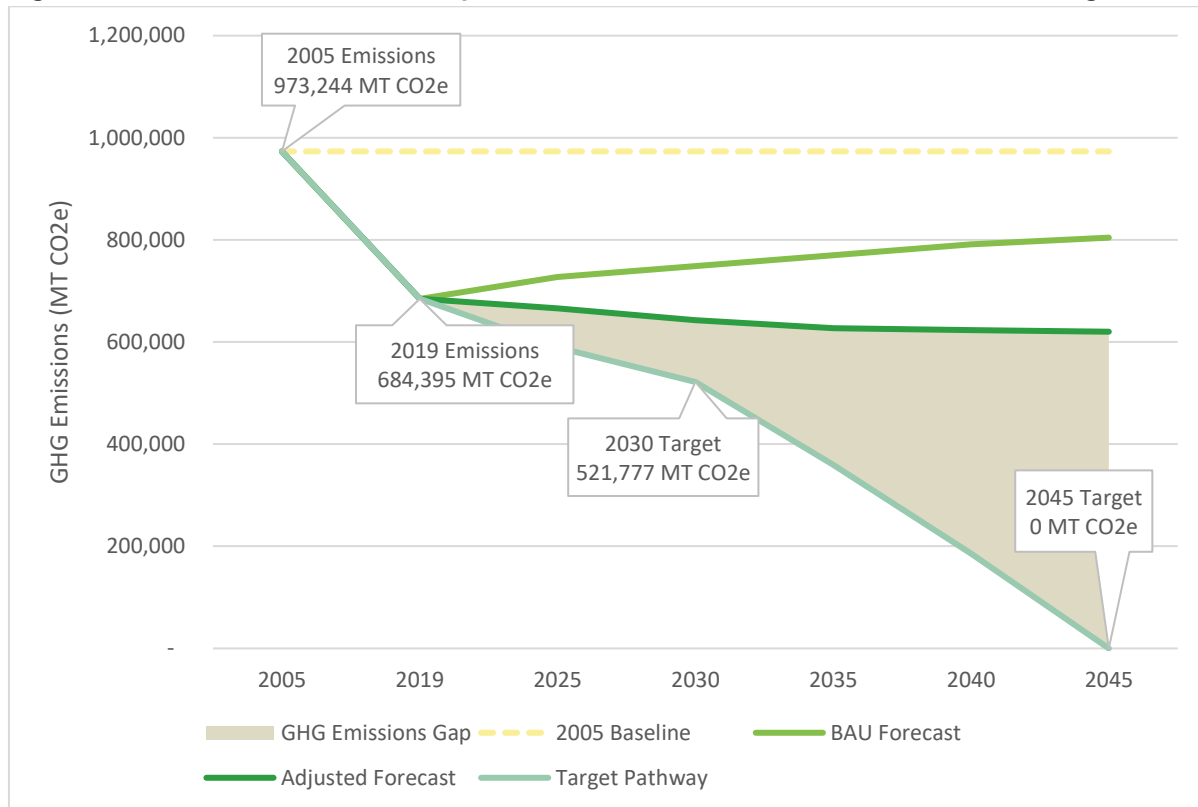
Emission reductions will be achieved by implementing specific policies and programs at the local level. These activities are referred to as “measures” and “actions” and they should be clear, attainable, measurable, equitable, and cost-effective to help achieve the desired emission reductions. The GHG emissions reductions associated with the measures in the CAP are sufficient to meet the state-level target established by SB 32 and meet the City’s 2030 climate action target. The CAP also makes substantial progress towards the City’s 2045 target, which aligns with the state-level carbon neutrality target established by AB 1279.

Additional discussion and details are provided regarding measures and actions in Chapters 6 through 11. Table 7 shows the Hayward climate action target emissions and the emissions reductions expected from implementing the measures and actions described in subsequent chapters. The table also shows that Hayward will meet the 2030 GHG reduction target and make substantial progress towards the 2045 goal of carbon neutrality. Figure 5 shows how Hayward measures would result in GHG reductions in line with the Hayward targets.

Table 7 Targets Versus GHG Reductions

Target/Forecast	2030 GHG Emissions (MT CO ₂ e/person)	2045 GHG Emissions (MT CO ₂ e/person)
Adjusted Forecast	3.84	3.36
Hayward Climate Action Targets	3.12	0.00
GHG Reductions from Full Implementation of CAP Measures	0.73	2.36
GHG Emissions after Measure Reductions (Adjusted Forecast – GHG Emissions Reductions)	3.11	1.01
Target Anticipated to be Met?	Yes	Substantial progress demonstrated

Figure 5 Emissions Reduction Gap Between Forecasted Emissions and State Targets



6 Equity and Outreach

6.1 Climate Equity

Community members experience disproportionate impacts from climate change due to existing vulnerabilities, historical patterns of inequity, systemic environmental injustices, socioeconomic disparities, and historical patterns of inequity. Hayward is committed to developing and implementing equitable solutions to mitigate climate change. This includes efforts to create access to municipal services, public amenities and infrastructure, healthy environmental, and economic prosperity for all City residents and to protect all residents against the impacts of climate change and improve the quality of life for the most vulnerable members of the community. Disadvantaged communities have been marginalized and overburdened by environmental pollution exposure, underinvestment in clean energy infrastructure and programs, and lack of access to sustainable and decarbonized housing and transportation. Equitable climate action planning efforts strive to ensure that economic, health, and social benefits of climate action planning programs, projects, and infrastructure are accessible to individuals across a community, regardless of ethnicity, socioeconomic status, health, age, and physical ability.

6.2 Equitable Engagement Approach

As part of various planning efforts, including this Climate Action Plan, the Hayward General Plan Hazards Element, the Hayward General Plan Housing Element, and the Hayward General Plan Environmental Justice Element, the City conducted a series of public outreach efforts centered around equitable engagement.

Engagement Objectives

The CAP project team made significant efforts to communicate with and obtain input from community members. To facilitate this, the City developed a set of engagement objectives to guide the engagement process:

- To educate the community and decisionmakers on the legal requirements, timelines, and process for the various planning efforts and allow for a fully transparent updates process.
- To educate the community and decisionmakers about historical inequities in housing policy, development, and practices.
- To involve, collaborate and empower the community to act through this process.
- To implement a racial equity lens throughout the earliest phases to ensure that City staff and Rincon Consultants engage with all segments of the community.
- To emphasize engagement with hard-to-reach communities and those that have not yet established trust with the City or do not typically engage in City processes by partnering with trusted community groups and advisors.
- To engage groups including but not limited to special needs populations, communities of color, lower-income communities, communities that have limited or no access to technology, elderly communities, youth communities, and others.
- To define equity goals and guardrails for use in developing policy.

- To develop and execute a creative and innovative outreach process rather than repeating common approaches to engagement.

Engagement Methods and Events

As part of this CAP Update process, the City utilized a multi-pronged approach engagement strategy to engage with Hayward residents, businesses, organizations, and stakeholders.

The City employed multiple engagement approaches, including:

- Public workshops
- Gallery Walks
- Website with Story Map
- Focus groups
- Online Surveys
- Tabling at community events
- Presentations for community groups
- Chabot College student interviews.
- Flyering around Hayward

This section identifies the various engagement methods the City employs to effectively engage community members, particularly Hayward’s disadvantaged communities.

Public Workshops and Gallery Walks

Table 8 below shows the key engagement efforts and community input that was considered during the development of the CAP Update. Public input will continue to be received throughout the public draft comment period and through a third public workshop.



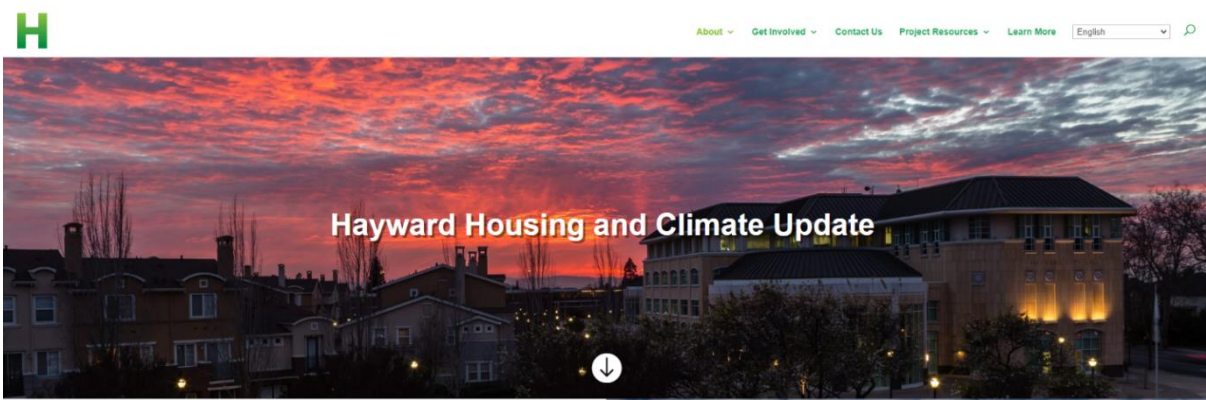
Table 8 CAP Engagement Summary

Engagement Event	Date of Event	Objectives
Gallery Walks	January 2022	- Build early awareness of the CAP process. - Gather high-level ideas, priorities, and concerns. - Build relationships with key stakeholder groups. - Hosted at City Hall, Library, Chabot College, Hayward South Alameda County National Association for the Advancement of Colored People (NAACP), AC Transit.
Flyering	February 2022	- Build early awareness of the CAP process. - City staff flyered (English and Spanish) at: Hayward BART stop, Downtown Hayward Farmers Market, laundromats, grocery stores.
Public Workshop #1	April 13, 2022	- Build early awareness of the CAP goals and process among the general public. - Gather high-level priorities, and concerns about climate action in Hayward. - Gather initial ideas for potential actions to include in the CAP.
Tabling	April – August 2022	- Build early awareness of the CAP process. - Gather feedback on the draft mitigation measures. - Hosted tables at: City of Hayward’s Annual Earth Day Event, Juneteenth, Community Family Fair at Tennyson Park, August Downtown Street Party, Mariachi Festival.
Presentations	May 2022	- Build early awareness of the CAP process. - Present the draft mitigation measures. - Gather feedback on the draft mitigation measures. - Met with: Eden Housing staff, Sierra Club Southern Alameda County Group, Save the Bay staff, Starr King Unitarian Universalist Church.
Chabot College Partnership	June-August 2022	Chabot students interviewed 252 residents about climate change and draft mitigation measures.
Online survey	June-August 2022	Gather feedback on the draft mitigation measures
Focus Groups	May-July 2022	- Build early awareness of the CAP process. - Present the draft mitigation measures. - Gather feedback on the draft mitigation measures. - Hosted at Tennyson High School, Eden Housing Alta Mira, Eden Housing Tennyson Gardens, Eden Housing Montgomery Plaza, and Eden Housing Hayward Senior Facility.
Public Workshop #2	July 19, 2022	- Provide updates about the Hayward CAP’s emission forecasts and GHG reduction targets. - Present the draft mitigation measures. - Gather feedback about the draft mitigation measures.
Public Workshop #3	TBD	Public review of the draft CAP document and to provide input.

Website with Story Map

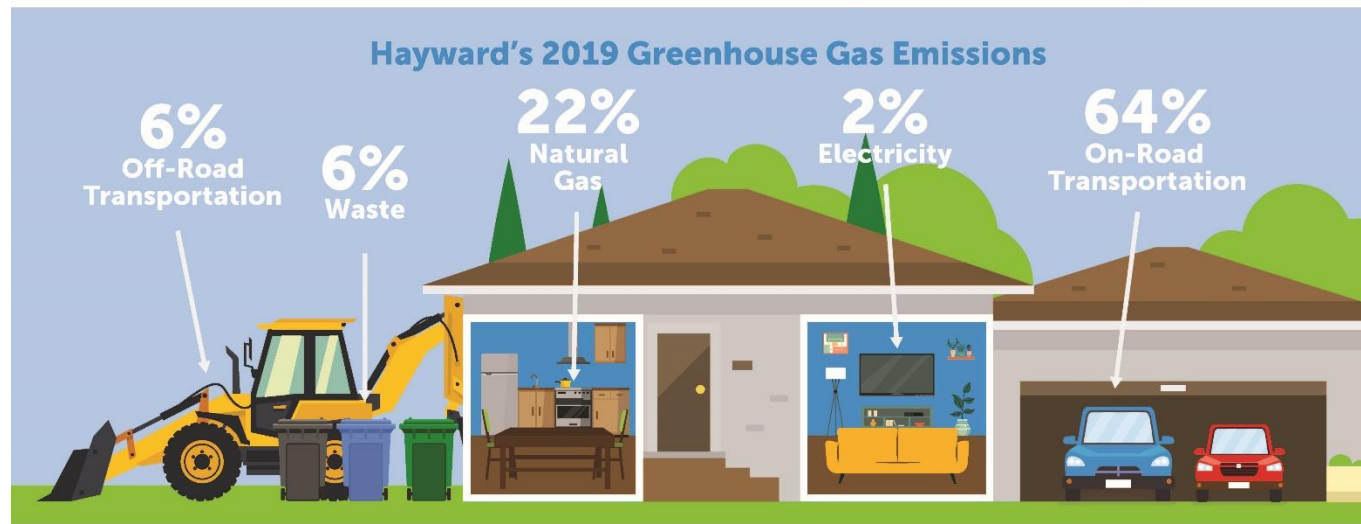
As part of the Hayward General Plan Housing Element, Hazards Element, and Environmental Justice Elements as well as this Climate Action Plan, the City created and hosted a website to serve as a centralized information hub and platform to collect input. The website includes a CAP Story Map with information on the CAP goals, benefits of the CAP, the CAP scope, and the City’s climate action planning steps. The Hayward Housing and Climate Update website is located here:

<https://haywardhousingandclimateupdate.com/>



CLIMATE CHANGE IN HAYWARD

ROADMAP TO CARBON NEUTRALITY*



Climate Action Plan Process



Scan the QR code
to tell your
Climate Story.

Climate Change Impacts



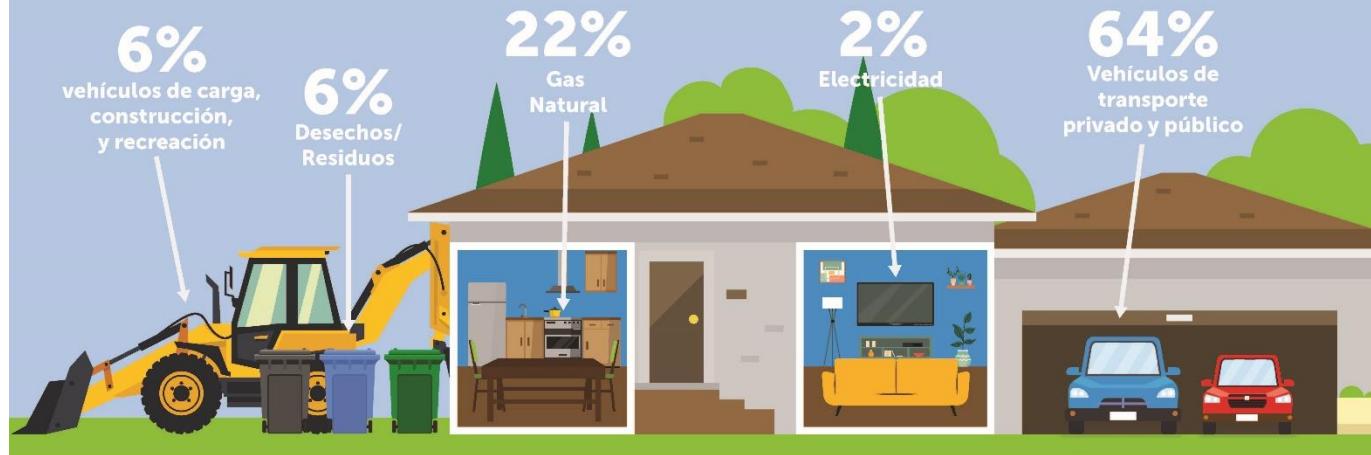
*The City of Hayward's goals are to reduce emissions by 55% by 2030 and achieve carbon neutrality by 2045. Carbon neutrality means net zero community GHG emissions by reducing existing GHG emissions and balancing remaining emissions using new technology and strategies.

Please send all climate questions and comments to: environment@hayward-ca.gov

EL CAMBIO CLIMÁTICO EN HAYWARD

EL CAMINO HACIA LA NEUTRALIDAD DE CARBONO*

Las emisiones de gases de efecto invernadero de Hayward en el año de 2019



Proceso de actualización del Plan de Acción Climática



Para más información, visite nuestro sitio web.

Por favor envíenos sus preguntas o comentarios acerca del cambio climático y la acción climática a:
environment@hayward-ca.gov

Impactos del Cambio Climático



*La Ciudad de Hayward ha establecido una meta para reducir las emisiones de gases de efecto invernadero en un 55% para el año 2030, y para lograr la neutralidad del carbono para el año 2045. La neutralidad de carbono significa lograr cero emisiones de gases de efecto invernadero en la comunidad, lo cual se lograría reduciendo las emisiones existentes y balanceando las emisiones residuales a través del uso de la tecnología y otras estrategias.

6.3 Equitable Climate Action Planning

CAP measures require changes in the way members of the community operate their homes and businesses, mobilize throughout the community, utilize water, dispose of waste, and consume products. As such, much of the costs and impacts related to climate change are carried by the community. Therefore, it is imperative that the CAP measures are developed with equity as a central pillar of the measure development process.

Climate equity requires local leaders and policy developers to acknowledge that disadvantaged communities are knowledgeable in creating solutions to protect and preserve their air, water, land, and communities, despite their previous exclusion from decision-making and from public resources and services. Therefore, it is critical that disadvantaged communities are involved in the policy development process so that policies reflect and align with the concerns and needs of these communities.

Disadvantaged communities are those that experience continuing injustice and face a legacy of systemic, largely racialized, inequity that influences their living and working places, the quality of their air and water, and their economic opportunities. Disadvantaged communities in Hayward include People of Color, Immigrants, People with Lower Incomes, People Experiencing Houselessness, Individuals with Physical Disabilities, Seniors, Linguistically Isolated (Limited or Non-English Speakers).

6.4 Hayward Equity Guardrails

Disadvantaged communities in Hayward have previously and continue to face systemic discriminatory practices that perpetuate systems of inequitable power and resource distribution. GHG reduction measures included in the CAP Update, as seen in Section 6, are intended to help address systemic discrimination and create a sustainable and equitable path forward for disadvantaged communities. Equity guardrails, as seen in the table below, were developed in coordination with City staff to provide specific criteria that GHG reduction measures proposed for the CAP Update need to include to address equity concerns specific to Hayward.

Table 9 Hayward Equity Guardrails

Equity Guardrails	Description
Integrate Health and Safety	Provide access to health, safety, and comfort benefits associated with the CAP by prioritizing access for disadvantaged communities.
Provide Economic Support	Establish funding and financing opportunities that are designed for and can be accessed by disadvantaged communities and that additional financial burdens on these groups are avoided.
Provide Social and Cultural Support	Provide meaningful support for disadvantaged communities through the addition/expansion of programs in partnership with community-based organizations that educate, engage, provide resources, and respond to barriers.
Mitigate Displacement Potential	Protect disadvantaged communities from displacement and increased cost of living.
Continue Investment and Engagement	Include specific mechanisms for continued investment in and engagement with disadvantaged communities throughout implementation of the CAP (unforeseen equity barriers may arise as the CAP is implemented and may need to be addressed through policy changes or additional support programs).

The Hayward equity guardrails were used to analyze each of the GHG reduction measures proposed for the CAP to generate a list of concerns and potential solutions. Potential solutions and supportive actions specific to equity were developed to address the equity concerns identified and are included under the relevant GHG reduction measures.

7 GHG Reduction Measures Framework

7.1 Structure of GHG Reduction Measures

As part of the CAP Update process, the City developed a comprehensive set of measures to reduce communitywide GHG emissions and achieve the City's climate action targets. Each measure is supported by a set of actions that provide measurable GHG emissions reduction that is supported by substantial evidence. The City also developed a set of measures and actions for offsetting GHG emissions through carbon sequestration, established under a sector called "Carbon Sequestration." Measures and actions are organized according to the following hierarchy:

1. **Sectors.** Sectors define the GHG emissions category in which the GHG reductions will take place and include Building Energy, Transportation, Solid Waste, Water and Wastewater, and Carbon Sequestration.
2. **Measures.** Measures identify specific goals (i.e., activity data targets by 2030 and 2045) to address GHG emissions in each sector.
3. **Actions.** Actions identify the programs, policies, funding pathways, and other specific commitments that the City will implement. Each measure contains a suite of actions, which together have been designed to accomplish the measure goal.

7.2 Type of GHG Reduction Measures

Measures and actions can be either quantitative or supportive, depending on whether they directly result in GHG emissions reductions or support direct reductions.

- **Quantitative.** Quantitative measures and actions result in GHG emissions reductions that can be quantified and summed to show how Hayward will make progress towards and meet its climate action targets. The emissions reductions expected from implementation of these measures and actions are supported by substantial evidence such as peer-reviewed research that establishes their effectiveness for reducing GHG emissions.
- **Supportive.** Supportive measures and actions are critical to the overall success of a CAP and provide support so that the quantitative measures and actions will be successfully and equitably implemented. Though these measures and actions may also be quantifiable and have substantial evidence to support their overall contribution to GHG reduction, they are not quantified for one or more factors – including a low GHG reduction benefit, indirect GHG reductions, or potential for double-counting – and do not contribute directly to the expected GHG reduction targets.

7.3 CAP Measures Cost Ranges

Climate action plans exhibit high variability in implementation costs depending on the GHG emissions reduction measures identified, their level of specificity, and the accompanying funding and financing strategies, which may vary depending on the scope of the project. The cost range estimates are based on cost data derived from existing and past projects, case studies, and available research. For each GHG emissions reduction measure, the cost description focuses on both internal (City) costs and external (community) costs and provides insight into the variability of these costs, including the primary variables that may affect cost effectiveness such as upfront costs, lifecycle costs, incremental or marginal costs, and the cost of doing nothing.

This GHG emissions reduction measures cost range estimate analysis is not intended to provide exact and precise cost estimates for each of the measures. The costs described for each GHG emissions reduction measure are variable and provide a general range carried by differed parties associated with the measures. For more details regarding specific cost consideration and variables, refer to Appendix E. The GHG measures proposed for the CAP and listed below have been broken down into three cost segments, as summarized in Table 10.

Table 10 Cost Categories

Cost Category	City	Community
Low-Cost	Goals associated with low upfront costs and will only require staff time to implement, such as: ▪ Developing partnerships ▪ Policy Updates ▪ Community Outreach	Goals associated with low upfront costs compared to existing alternatives, such as: ▪ Additional energy bill costs for renewable energy compared to fossil fuel-based energy
Moderate-Cost	Goals associated with moderate upfront costs to the City and require moderate capital costs or consultant time along with staff time, such as: ▪ Feasibility Studies ▪ Incentive and Compliance Programs ▪ Pilot Projects	Goals associated with moderate upfront costs that are not comparable to existing costs nor are offset over lifetime, such as: ▪ New fees from utilities or city taxes ▪ Upfront costs partially offset by rebate opportunities
High-Cost	Goals associated with high upfront costs and require substantial investments into infrastructure and technology system upgrades, such as: ▪ Bike Lanes ▪ Energy Storage Systems ▪ EV Charging Networks	Goals associated with high upfront costs that are not comparable to existing cost nor are offset over lifetime, such as: ▪ New electric vehicle purchase prior to existing vehicle replacement

7.4 Key Pillars of GHG Reduction Measures

Community-focused climate action often requires community-level behavioral changes and buy-in to be implementable and successful. This means that many factors aside from GHG emissions reductions need to be considered and balanced. To position a CAP to best achieve the City's targets, the actions supporting each measure were developed to be consistent with a set of key pillars. Each key pillar emphasizes specific criteria that play an essential role in the implementation of climate action. The key pillars are:

- **Structural Change.** Includes ordinances, codes, requirements, new programs, pilot programs, or other policy that provides some guarantee of behavior change going forward. Structural change actions are usually quantitative actions and provide the GHG emissions reduction mechanism for the associated measure to be effective.
- **Feasibility Studies.** Includes feasibility studies, City-led plans, or other investigative or strategy documents that help the City develop a strategy for measure or action implementation, especially for measures or actions that are more controversial or complicated.
- **Funding.** Includes grants, rebates, financing, and other capital avenues for ensuring that the associated measure's costs are supported.
- **Equity.** Includes actions to mitigate potential equity impacts of other actions, such as re-investment into underserved communities, or policies and programs to protect against an increased potential for displacement or increased cost burdens in the community. Equity actions help ensure the overall measure and approach can pass the equity guardrails, as described in Section 5.
- **Education.** Includes outreach, educational events, and engagement campaigns to incentivize community participation in the CAP and the new programs, policies, and incentives that have the potential to move the needle on GHG reductions.
- **Partnerships.** Includes actions that focus on partnerships with community-based organizations, other public agencies, and private-sector partners to create new programs the City cannot achieve alone.

7.5 Co-Benefits of GHG Reduction Measures

Climate action measures will also produce additional co-benefits beyond GHG emissions reductions that the community will see from implementing the CAP. These co-benefits will have long-term positive impacts that will help Hayward reach its community goals. The co-benefits identified for each CAP Update measure include the following.



Improved Health and Safety

Developing a healthier community with reduced respiratory illnesses through improving both indoor and outdoor air quality, enhancing overall safety and property protection by bolstering adaptive capacity, and elevating quality of life by fostering more avenues for physical activity, increasing access to green spaces, and maintaining thermal comfort.



Climate Change Resilience

Increased ability of community to prepare for, mitigate, and recover from climate hazards including extreme heat, sea level rise, flooding, wildfire, landslides, and drought.



Environmental Quality & Ecosystem Services

Actions that improve the health of local ecosystems can also result in a variety of public benefits including reducing pollutants in local creeks and runoff to the bay, providing species habitat which supports a more biodiverse landscape, improving water and air quality, reducing local flood risk, and providing recreation benefits for the community enjoyment.



Sustainable Land Use Planning

Through alignment with CEQA and the Housing Element Update, this CAP can help focus development in a manner that enhances human-centered economic corridors including transit-oriented development. A key co-benefit of a comprehensive and updated CAP is the promotion of thoughtful development that will complement the City's sustainability goals. This is achieved by creating a clear pathway for new development so it can align with Hayward's plan for reducing GHG emissions.



Jobs Development

Initiative aimed at advancing clean energy adoption and sustainable business practices constitute a fundamental element in fostering the establishment of lucrative, well-compensated, and all-encompassing employment opportunities. These efforts will reciprocally uphold Hayward's climate targets and sustained economic well-being.

8 Building Energy Sector Measures

8.1 Context

CAP measures for the building energy sector focus on transiting to renewable energy sources, carbon-free electricity, and building electrification. When all-electric buildings are powered by carbon-free electricity, their operating energy footprint becomes carbon-free.

Renewable Energy and Carbon-Free Electricity

Hayward's building energy (BE) measures are dependent on leveraging the renewable energy that Ava Community Energy provides the community. Using 100 percent carbon-free electricity from Ava Community Energy, instead of natural gas, propane, or other non-renewable electricity sources, to power buildings reduces the GHG emissions associated with building operations to zero or near-zero. Measure BE-4 directs the City to work with Ava Community Energy to provide only 100 percent carbon-free electricity to residents and businesses and limit opt-out rates. Measure BE-6 commits the City to generating carbon-neutral electricity meeting 80 percent of the City's electricity needs by 2030.

Electrification

Electrification of buildings can be a cost-effective and socially equitable way to reduce GHG emissions and protect public health. All-electric buildings can be more efficient and can result in lower energy bills.²⁵ Natural gas prices are expected to rise in the future, making it less cost-effective for building owners that don't electrify.²⁶ All-electric buildings also provide a critical step towards improving public health. Burning natural gas in poorly ventilated areas (i.e., through gas stoves in particular) can cause a significant increase of harmful indoor pollutants that are linked to increased risk of respiratory illnesses.²⁷

While the City has already adopted an electrification reach code for new construction which requires developers for residential and non-residential building types to provide all-electric systems, existing buildings must be electrified in order for Hayward to reach its climate action targets. Measures BE-2 and BE-3 provide frameworks of updated regulations, programs, funding mechanisms, education, and advocacy to drive electrification of existing single-family, multi-family, and commercial buildings.

Reducing both electricity and natural gas use is a fundamental strategy for the City to encourage and support as the electrical grid becomes increasingly renewable and ultimately carbon-free. Measure BE-5 aims to reduce GHG emissions by increasing energy efficiency in homes and businesses by reducing electricity and natural gas use. To further support communitywide GHG emissions reductions, the City will generate carbon-neutral electricity meeting 80 percent of the electricity needs at City facilities by 2030 (Measure BE-6). Appendix D provides more background

²⁵ Kenney et al., (California Energy Commission (CEC). "California Building Decarbonization Assessment". 2021. Available: <https://www.energy.ca.gov/publications/2021/california-building-decarbonization-assessment>

²⁶ Aas et. al., CEC. "The Challenge of Retail Gas in California's Low-Carbon Future - Technology Options, Customer Costs, and Public Health Benefits of Reducing Natural Gas Use". <https://www.energy.ca.gov/publications/2019/challenge-retail-gas-californias-low-carbon-future-technology-options-customer>

²⁷ RMI. "Gas Stoves: Health and Air Quality Impacts and Solutions." 2020. Available: <https://rmi.org/insight/gas-stoves-pollution-health/>

information on each CAP measure and action as well as detailed summaries of GHG quantification methodologies.

8.2 Measures and Actions Detail

Measure BE-1: Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure BE-1 are included in Table 11.



Table 11 Measure BE-1 Actions

Action ID	Action Description
BE 1.1	Continue to enforce the adopted Hayward Electrification Ordinance for new residential buildings banning natural gas. <i>Key Pillar: Structural Change</i>
BE 1.2	Adopt an ordinance, reach code, or zero NOx threshold, effective January 1, 2026, that establishes mandatory requirements that all newly constructed buildings avoid natural gas use by 2026. <i>Key Pillar: Structural Change</i>
BE 1.3	Compile case studies conducted by BayREN, the Building Decarbonization Coalition and other relevant sources that show cost effective strategies for electric buildings by prototype and detail the cost savings associated with all-electric construction. Share the information on the City's website. <i>Key Pillar: Education/Funding</i>
BE 1.4	Partner with BayREN to provide/share technical resources, including hosting workforce development training for installers, local contractors, and building owners/operators, to discuss benefits and technical requirements of electrification within Hayward. Promote the cost savings, environmental benefits, and versatility of electrification to builders, property owners, and contractors on the City website and at the City permit counters. <i>Key Pillar: Education/ Partnership</i>
BE 1.5	Engage with stakeholders, both internal stakeholders, such as City staff and officials, and external stakeholders, such as local developers and community groups regarding the purpose and impact of the Hayward Electrification Reach Code and to identify equity concerns. <i>Key Pillar: Partnership/Equity</i>
BE 1.6	Engage with an organization such as Building Decarbonization Coalition to work with local building industry stakeholders in educating developers and other stakeholders on new appliances and approaches to building electrification. <i>Key Pillar: Partnership</i>
BE 1.7	Partner with Ava Community Energy to conduct an electrification infrastructure and capacity feasibility study to identify expected increases in electricity demand due to building and vehicle electrification, ensure capacity to meet that demand, and identify any infrastructure improvements. <i>Key Pillar: Feasibility Studies</i>
BE 1.8	Utilize the Low Carbon Concrete Code Amendment Toolkit and review current best practices to develop implementation strategies, compliance forms, and specifications for compliant mixes. <i>Key Pillar: Feasibility Studies</i>

Action ID	Action Description
BE 1.9	Promote the use of low carbon concrete in construction projects (residential and commercial). Coordinate with the California Air Resources Board as they develop rules and guidance pursuant to AB2446. <i>Key Pillar: Education</i>
Total GHG Emissions Reduction from Measure: 2030: 5,392 MT CO ₂ e, 2045: 18,761 MT CO ₂ e	
City Cost: Moderate	
Community Cost: Moderate	
Co-Benefits: Improved Public Health & Safety, Sustainable Land Use Planning	

Measure BE-2: Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure BE-2 are included in Table 12.



Table 12 Measure BE-2 Actions

Action ID	Action Description
BE 2.1	Once costs and funding/financing options are identified (BE-2.5), adopt a decarbonization ordinance for existing single-family residential buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure, and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. <i>Key Pillar: Structural Change</i>
BE 2.2	Adopt an ordinance requiring existing single-family homes to be 100% all-electric by 2045. <i>Key Pillar: Structural Change</i>
BE 2.3	Adopt a time of retrofit ordinance that requires all buildings with retrofit work who meet a certain threshold, to complete energy efficiency/electrification actions. To be part of the reach code to take effect January 2026. <i>Key Pillar: Structural Change</i>
BE 2.4	Work with community stakeholders including realtors and contractors to develop electrification readiness requirements to be completed within 120 days of completion of a home sale. Include a potential waiver process for distressed sales. <i>Key Pillar: Structural Change/Partnership</i>
BE 2.5	Develop a single-family residential building electrification feasibility study with a detailed existing building analysis and electrification costs analysis to understand cost implications, identify potential equity concerns/impacts, and develop strategies to electrify existing buildings such that natural gas usage in single-family residential buildings is reduced by 10% by 2030. <i>Key Pillar: Feasibility Studies</i>
BE 2.6	Support BAAQMD's efforts to require zero-NOx furnaces and water heaters at time of replacement with compliant technologies such as electric heat pumps. Advocate that BAAQMD ensure discounted electric appliances are offered to lower income households and upfront rebates are available. <i>Key Pillar: Partnership</i>

Action ID	Action Description
BE 2.7	Partner with BayREN, Ava Community Energy, and StopWaste to work with the local contractors, realtors, homeowner associations, and labor unions to develop a comprehensive building code and compliance training program, including hosting workforce development trainings discussing the benefits and technical requirements of electrification. <i>Key Pillar: Partnership/ Education</i>
BE 2.8	Conduct engagement efforts for the general public and targeted to low-income communities of color during development of the electrification strategy to understand the community's concerns around electrification. <i>Key Pillar: Education</i>
BE 2.9	Partner with Hayward Below Market Rate (BMR) housing stock owners (such as Eden Housing) to commit to electrifying all BMR housing by 2045. Establish a plan, financing strategies, and schedule for implementing this action by 2026.²⁸ <i>Key Pillar: Equity</i>
BE 2.10	Identify and partner with local community-based organizations with connections to low-income communities of color to assist in development of the electrification strategy. <i>Key Pillar: Equity</i>
BE 2.11	Devote staff time to collaborate with PG&E, Ava Community Energy, and other cities in the region to advocate for regulatory changes at the State level (e.g., CARB) to allow neighborhood level electrification and pruning of natural gas to reduce the change of stranded asset, provide potential funding, and establish an efficient transition to carbon neutral buildings. <i>Key Pillar: Partnership/Funding</i>
BE 2.12	Work with Pacific Gas & Electric (PG&E), and Ava Community Energy to conduct a feasibility study assessing the cost and funding strategy for incentivizing all-electric retrofits through on-bill financing. <i>Key Pillar: Partnership/Funding</i>
BE 2.13	Review incentives, rebates, and financing options for procedural equity and ensure that existing and updated incentive programs are being equitably distributed to the community. Hurdles to equitable implementation could include credit checks, excessive procedural hurdles, and lack of targeted outreach. <i>Key Pillar: Equity</i>
BE 2.14	Partner with a financing/management company such as BlocPower to provide electrification services and financing to the community with prioritization of historically under-invested communities. <i>Key Pillar: Partnerships</i>
Total GHG Emissions Reduction from Measure: 2030: 13,872 MT CO ₂ e, 2045: 68,020 MT CO ₂ e	
City Cost: High	
Community Cost: High	
Co-Benefits: Improved Public Health & Safety, Jobs Development	

²⁸ <https://www.hayward-ca.gov/services/city-services/finding-affordable-housing>.

Measure BE-3: Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure BE-3 are included in Table 13.



Table 13 Measure BE-3 Actions

Action ID	Action Description
BE 3.1	Based on the results of the feasibility studies (BE- 3.4) adopt a decarbonization ordinance for existing commercial buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. As part of this ordinance, implement the following steps: 1. Develop requirements that satisfy the federal Energy Policy and Conservation Act (EPCA) seven criteria for an exemption from preemption; 2. Establish specific metrics for standard benchmarking; 3. Identify a regulatory mechanism for eliminating natural gas use in existing commercial buildings that addresses legal and feasibility considerations; and 4. Enforce requirement compliance through the same permitting compliance program as for residential building electrification. <i>Key Pillar: Structural Change</i>
BE 3.2	Based on the results of the feasibility studies (BE- 3.4) adopt a decarbonization ordinance for existing multi-family buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. As part of this ordinance, implement the following steps: 1. Develop requirements that satisfy the federal Energy Policy and Conservation Act (EPCA) seven criteria for an exemption from preemption; 2. Establish specific metrics for standard benchmarking; 3. Identify a regulatory mechanism for eliminating natural gas use in existing multi-family buildings that addresses legal and feasibility considerations; and 4. Enforce requirement compliance through the same permitting compliance program as for residential building electrification. <i>Key Pillar: Structural Change</i>
BE 3.3	Adopt a Commercial Energy Performance Assessment and Disclosure Ordinance for commercial and multi-family buildings, which requires energy use disclosure consistent with State law (AB 1103) and the use of the ENERGY STAR Portfolio Manager benchmarking tool. <i>Key Pillar: Structural Change</i>
BE 3.4	Conduct feasibility studies to identify commercial and multi-family building decarbonization barriers and develop a commercial and multi-family building decarbonization strategy with analysis supporting future adoption of a commercial and multi-family building decarbonization ordinance. <i>Key Pillar: Feasibility Studies</i>
BE 3.5	Partner with an electrification/efficiency expert to provide guidance to commercial buildings covered by the building performance standard.

Action ID	Action Description
<i>Key Pillar: Education/ Partnership</i>	
BE 3.6	Develop an education campaign to promote commercial electrification and include items in the program such as: 1. Continue to engage with local business and business organizations (e.g., Chamber of Commerce, the Alameda County Green Business Program) to inform and facilitate electrification for commercial business owners. 2. Continue to promote the use of the Energy Star Portfolio Manager program and energy benchmarking training programs for nonresidential building owners. 3. Advertise via utility bill inserts the incentive programs or grants available and the cost benefits of electric appliances. 4. Conduct targeted outreach to builders, developers, local contractors, and property managers with an informational brochure describing the financial benefits of replacing natural gas appliances with all electric appliances when they apply for permits. 5. Provide informational webinars and an updated website to advertise and promote all-electric building initiative rebates and incentives.
<i>Key Pillar: Education</i>	
BE 3.7	Conduct outreach to small businesses and minority-owned businesses to understand potential equity impacts of a decarbonization policy as part of the existing building decarbonization study.
<i>Key Pillar: Funding</i>	
BE 3.8	Conduct feasibility study to evaluate the current uptake and effectiveness of Property Assessed Clean Energy (PACE) financing for installation of renewable energy systems in commercial and industrial properties. If feasibility study indicates effectiveness, continue to offer PACE financing for commercial and industrial properties to install renewable energy systems.
<i>Key Pillar: Funding</i>	
BE 3.9	Continue to work with Bay Area Regional Energy Networks (BayREN), Ava Community Energy, and StopWaste to continue to improve and implement commercial electrification rebates and financing opportunities and other offered incentives.
<i>Key Pillar: Partnerships</i>	
Total GHG Emissions Reduction from Measure: 2030: 20,667 MT CO ₂ e, 2045: 114,200 MT CO ₂ e	
City Cost: High	
Community Cost: Moderate	
Co-Benefits: Improved Public Health & Safety, Jobs Development	

Measure BE-4: Support Ava Community Energy in providing 100% carbon-free electricity by 2030.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure BE-4 are included in Table 14.



Table 14 Measure BE-4 Actions

Action ID	Action Description
BE 4.1	Adopt a resolution establishing a policy that if Ava Community Energy does not meet the 2030 goal of its entire portfolio being 100% carbon-free, all Hayward customers will be enrolled in Renewable 100 in by 2030. Resolution should include identification of funding or subsidies to ensure no cost increase to CARE/FERA customers. This may include subsidization costs to CARE/FERA customers to be funded by a rate increase for non-discounted customers. <i>Key Pillar: Structural Change</i>
BE 4.2	Engage with community (residential and non-residential) to advertise/highlight Ava Community Energy's plan to provide 100% carbon-free electricity by 2030. Provide information on the importance of this goal and the impact of buying electricity from Ava Community Energy. <i>Key Pillar: Education</i>
BE 4.3	In collaboration with Ava Community Energy, implement a pilot program to provide Hayward's affordable housing units Ava Community Energy's Renewable 100 service. Identify funding options with Ava Community Energy such as subsidies funded by non-discounted customers or grant funding. <i>Key Pillar: Equity</i>
BE 4.4	Work with Ava Community Energy to conduct an annual analysis of opt-out rates in the City of Hayward to understand why residents and businesses opt out of Ava Community Energy or opt-down to Bright Choice over Renewable 100. <i>Key Pillar: Feasibility Studies</i>
Total GHG Emissions Reduction from Measure: 2030: 4,802 MT CO₂e, 2045: 0 MT CO₂e	
City Cost: Moderate	
Community Cost: Low	
Co-Benefits: Improved Health and Safety, Job Development	

Measure BE-5: Continue to promote energy efficiency improvement, in alignment with the 2014 Climate Action Plan.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure BE-5 are included in Table 15.



Table 15 Measure BE-5 Actions

Action ID	Action Description
BE 5.1	Continue to promote the efficient use of energy in the design, construction, maintenance, and operation of public and private facilities, infrastructure, and equipment. <i>Key Pillar: Structural Change</i>
BE 5.2	Continue to collaborate with partner agencies, utility providers, and the business community to support a range of energy efficiency, conservation, and waste reduction measures, including the development of green buildings and infrastructure, weatherization programs, installation of energy-efficient appliances and equipment in homes and offices, promotion of energy efficiency retrofit programs, use of green power options, and heightened awareness of the benefits of energy efficiency and conservation issues. <i>Key Pillar: Partnership/Education</i>
BE 5.3	Continue to collaborate with regional entities and others to promote incentive programs for energy efficiency retrofits such as the Energy Upgrade California program for residential properties. <i>Key Pillar: Partnership/Funding</i>
BE 5.4	Continue to promote the use of the Energy Star Portfolio Manager program and energy benchmarking training programs for nonresidential building owners. <i>Key Pillar: Partnership/Funding</i>
BE 5.5	Obtain and prioritize funding for the weatherization program specifically for low, very low, and low-income homeowners, landlords, and renters, to make energy efficiency improvement and improve health and safety of residences. <i>Key Pillar: Partnership/Funding</i>
Total GHG Emissions Reduction from Measure: Supportive Measure & Actions	
City Cost: Moderate	
Community Cost: Moderate	
Co-Benefits: Improved Public Health & Safety, Climate Change Resilience	

Measure BE-6: Generate carbon-neutral electricity on City facilities meeting 80% of the municipal operational electricity needs by 2030.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure BE-6 are included in Table 16.



Table 16 Measure BE-6 Actions

Action ID	Action Description
BE 6.1	Obtain battery storage in City buildings and critical facilities, including community-based resilience hubs, identified to need power during emergencies or power outages. <i>Key Pillar: Structural Change</i>
BE 6.2	Develop partnerships with organizations, such as the Urban Sustainability Directors Network (USDN) or California Resilience Partnership (CRP), to conduct a feasibility study to identify locations for community resilience hubs within the City, identify grant opportunities, and to develop a plan to implement resilience hubs. <i>Key Pillar: Partnership/ Feasibility Study</i>
BE 6.3	Conduct analysis on risks and benefits associated with relying on battery storage to achieve carbon neutral electricity and grid resiliency goals in the City and set a MW capacity goal for installed battery storage by 2030 and 2045. <i>Key Pillar: Structural Change</i>
BE 6.4	Formally include City facilities that serve as cooling centers to disadvantaged communities in the Energy Assurance Plan (Community Safety program 13) and develop and implement energy resiliency strategies like on-site renewable energy generation or energy storage to ensure center remains active even in power shortages. <i>Key Pillar: Equity</i>
BE 6.5	As part of Energy Assurance Plan (Community Safety program 13), include identifications of locations or complexes (i.e., City facilities, college campuses, critical facilities) in the City for installation of local renewable energy generation, energy storage projects, and/or ideal locations for development of a micro-grid as evaluated in Ava Community Energy feasibility study. <i>Key Pillar: Feasibility Study</i>
BE 6.6	Develop the study estimating renewable energy generation on City facilities and schedule implementing of the prioritized solar projects identified. The plan should include an identification of barriers and needs for implementation of the prioritized projects as well as identify funding sources and partnerships needed for successful implementation. <i>Key Pillar: Feasibility Study</i>
BE 6.7	Partner with PG&E and/or Ava Community Energy to ensure smooth integration of renewable energy systems from the identified prioritized projects or other individual solar projects into the grid. <i>Key Pillar: Partnership</i>
BE 6.8	Identify and advertise incentives available for the community members for installing solar on homes such as Net Metering Programs through PG&E for bill credits, or the Disadvantaged Communities-Single-family Solar Homes (DAC-SASH) program. Identify incentives available for businesses and homeowners to install energy storage systems, such as Self Generation Incentive Program (SGIP) and Equity Resiliency rebates that provides an upfront rebate for battery storage and/or the federal investment tax credit for solar batteries installed. Provide resource information to the community through websites, workshops, and partnerships. <i>Key Pillar: Funding/Education</i>

Action ID	Action Description
BE 6.9	Partner with affordable housing providers to conduct a feasibility analysis of battery storage and solar projects at the affordable housing in Hayward that are eligible for Equity Resilience Incentives under the SGIP Program. <i>Key Pillar: Funding /Equity</i>
BE 6.10	Determine opportunities for the Water Pollution Control Facility to expand existing biogas (i.e., methane) capturing and utilization as part of the Biosolids Master Plan currently underway. The Master Plan document will plan for and phase in improvements for utilizing biogas for the next 20-years including potentially expanding the existing cogeneration facility to produce more energy, or possibly converting to renewable natural gas for pipeline injection off-setting the need to purchase non-renewable natural gas. The Master Plan is consistent with General Plan Policy PFS-4.12 to develop, enhance, and maintain clean, green, and renewable energy systems at the Water Pollution Control Facility (WPCF) <i>Key Pillar: Funding/Partnership</i>
BE 6.11	Provide educational materials and workshops to large commercial developers and large business property owners of the benefits of microgrids and energy resiliency. Provide resources to identify opportunities for solar installations and/or battery storage on site. <i>Key Pillar: Education</i>
BE 6.12	Prepare a plan to facilitate the transition of natural gas appliances to electric in City Facilities. Plan should include an inventory of appliances available for replacement, identify cost where possible, and establish a timeline for replacement. <i>Key Pillar: Feasibility Study</i>
Total GHG Emissions Reduction from Measure: Supportive Measure & Actions	
City Cost: Moderate	
Community Cost: No expected community cost	
Co-Benefits: Improved Public Health & Safety, Climate Change Resilience, Jobs Development	

9 Transportation Sector Measures

9.1 Context

Transportation accounts for the largest portion of GHG emissions in Hayward.

The City of Hayward strives to promote transportation options that provide a robust set of health, mobility, and livability benefits for all community members. The City is committed to developing a thriving transportation network to encourage residents to make more sustainable and healthy choices.

Reducing Vehicle Miles Travelled

These transportation measures (T) prioritize reducing vehicle miles travelled (VMT) first, by improving active and public transportation, then shifting the remaining VMT to electric vehicles. While in theory, 100 percent electrification of all vehicles in Hayward could achieve zero-emissions in the transportation sector without reducing VMT, the City recognizes that cars and roadways carry huge amounts of embodied emissions not accounted for in the inventory, over which the City has little control. Beyond decreasing GHG emissions, there are other benefits associated with reducing VMT. These include alleviating traffic congestion, requiring less space for roads and parking, promoting local economic revitalization, and enhancing overall quality of life.

In line with the Hayward 2020 Bicycle and Pedestrian Master Plan, the City will increase active transportation mode share to 15 percent by 2030 and 20 percent by 2045 (Measure T-1). The City will implement public and share transit programs to increase mode shift to public and shared transit mode to 15 percent by 2030 and 30 percent by 2045. While Measures T-1 and T-2 can be effective in changing community choices around transportation, the impacts of incentive-based policies increase when coupled with disincentives for less favorable choices, such as making it less convenient to drive a gasoline-fueled single passenger vehicle. Through Measure T-3, the City will develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals.

Electrification

While the City cannot require its residents or businesses to buy Zero-Emission Vehicles (ZEVs), Measures T-4 and T-5 will ensure the infrastructure and incentives are present in the City to begin to remove present barriers to passenger and commercial ZEV adoption. In line with this, the City will increase municipal passenger ZEV adoption to align with the State of California's ZEV goals. Measure T-6 establishes a goal of decarbonizing 15 percent of off-road equipment by 2030 and 80 percent by 2045 to further contribute to the City's overall GHG emissions reductions.

9.2 Measures and Actions Detail

Measure T-1: Increase active transportation mode share to 15% by 2030 and to 20% by 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure T-1 are included in Table 17.



Table 17 Measure T-1 Actions

Action ID	Action Description
T 1.1	Amend the Off-Street Parking Regulation of Municipal Code to incorporate smart growth principles and to incentivize walking, biking, and public transit. 1. Create a single “blended” parking requirement for commercial uses to facilitate future changes of use (i.e., changing a retail store to a restaurant). 2. Provide requirements or incentives for bicycle parking. 3. Allow on-street parking along the property’s frontage to count towards satisfying a portion of the property’s off-street parking requirements. 4. Create parking preferences or incentives for residents who rideshare or use low- or zero-emissions vehicles. 5. Allow property owners to develop and implement parking demand management plans that consider ways to reduce the need for off-street parking by using shared parking arrangements, valet parking services, paid parking, and other appropriate techniques. 6. Establish design standards or retrofit standards for Complete Streets. 7. Promote multi-modal use. <i>Key Pillar: Structural Change</i>
T 1.2	In support of the General Plan and City land-use policies, maximize infill development, increase land-use and transit efficiencies to support the regional Sustainable Communities Strategy²⁹ and promote a jobs-housing match. In addition, work with developers to prioritize infill development projects and transit-oriented development zones.
T 1.3	Based on the completed Complete Streets Assessment (existing Mobility program 6), the Complete Streets Inventory Baseline, and the 2020 Bicycle and Pedestrian Master Plan, develop a priority list of complete streets improvements such as retrofits, design standards, and green infrastructure that would accommodate walking, biking, transit use and carpooling. This effort should include a schedule for implementation, prioritization of improvements, identification of whether improvement will aid in walking, biking or transit access, and the plan should ensure equitable roll-out to low-income communities. <i>Key Pillar: Structural Change</i>
T 1.4	Adopt and implement a micro-mobility policy that promotes ownership of micro-mobility devices, especially among lower income community members. Promote equitable access to charging facilities for electric micro-mobility devices. <i>Key Pillar: Structural Change</i>
T 1.5	Continue to implement 2020 Bicycle and Pedestrian Master Plan goals of developing 153 new bicycle facilities and 32 miles of multi-use paths for pedestrians and cyclists.

²⁹ To support achievement of the State’s GHG emissions reduction goals, California established the Sustainable Communities and Climate Protection Act. It requires regional metropolitan planning organizations in California to develop Sustainable Communities Strategies that align transportation, housing, and land use decisions towards achieving GHG emissions reductions.

Action ID	Action Description
	<i>Key Pillar: Structural Change</i>
T 1.6	Evaluate and, if necessary, update the City's Zoning Code, Transportation Demand Management Plan (or Administrative Rule 2.26), and California Green Building Code to reflect current transportation demand management opportunities and to ensure the City requires sufficient bicycle parking for new commercial development and retrofits. <i>Key Pillar: Structural Change</i>
T 1.7	Update and conduct Underused Rights-of-Way Study such that a community/business survey and evaluation is completed to understand community perspective on potential barriers to conversions and identify barrier solutions. Based on findings, convert recommended amount miles of under used roadways thoroughfare to active transportation corridors to create a connected environment City (i.e., downtown areas). As part of the program, launch a public campaign to gain public and business support to ensure success of such efforts. Consider having pilot programs (i.e., shutting down street lanes for specific events/periods of time) to demonstrate the advantages of proposed improvements. <i>Key Pillar: Structural Change/Feasibility Study</i>
T 1.8	Identify streets for permanent through traffic closures to promote walking, biking, and other forms of active transportation. <i>Key Pillar: Structural Change</i>
T 1.9	Identify areas of the City to remove parking and/or additional traffic lanes to prioritize outdoor seating and make permanent outdoor dining established during Covid 19. <i>Key Pillar: Structural Change</i>
T 1.10	Prioritize active transportation and mobility projects in historically under-invested neighborhoods. <i>Key Pillar: Equity</i>
T 1.11	Partner with schools, employers, transit agencies, Hayward Area Recreation and Park District (HARD), and community groups to teach bicycle and pedestrian safety in schools and workplaces and to educate residents and businesses about the health and environmental benefits of walking, bicycling, and using public transit. <i>Key Pillar: Partnership/Education</i>
T 1.12	Partner with community organizations and local bike shops to provide rebates for low-income community members to purchase bicycles, helmets, pumps, e-bikes, e-scooters, and other related equipment. Work with community partners to provide incentives to promote bicycle, e-bike and e-scooter ownership. <i>Key Pillar: Partnership</i>
T 1.13	Partner with community groups to obtain funding through the California Air Resources Board Car Sharing and Mobility Options program for a pilot bike-share program in low-income communities and to connect low-income communities with the E-Bike Purchase Incentive Program through CalBike. <i>Key Pillar: Equity/Funding</i>
T 1.14	Ensure there is equitable access to safe bicycle and pedestrian infrastructure in all areas of the city. Prioritize the development of pedestrian and bicycle infrastructure in low-income communities where there is currently no or limited pedestrian and bicycle infrastructure. <i>Key Pillar: Equity</i>
T 1.15	Based on the identified barriers to completing the Complete Streets Evaluation including limited staff and fiscal resources, develop strategies to reduce or eliminate barriers, such as identifying staff to assign the Complete Streets Evaluation to. <i>Key Pillar: Feasibility Studies</i>
T 1.16	Devote staff time to managing, tracking and applying for grant funding to complete projects that would improve active transportation or mobility in the community. <i>Key Pillar: Funding</i>
Total GHG Emissions Reduction from Measure: 2030: 6,485 MT CO₂e, 2045: 8,755 MT CO₂e	
City Cost: High	
Community Cost: Low	

Action ID	Action Description
Co-Benefits: Improved Public Health & Safety, Sustainable Land Use Planning, Environmental Quality & Ecosystem	

Measure T-2: Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure T-2 are included in Table 18.



Table 18 Measure T-2 Actions

Action ID	Action Description
T 2.1	Continue to promote infill development and/or new development that is compact, mixed use, pedestrian friendly, and transit oriented. <i>Key Pillar: Structural Change</i>
T 2.2	Adopt a policy or code into the Municipal code that establishes specific standards for new development of public space to be transit accessible and multi-functional by co-locating public facilities. <i>Key Pillar: Structural Change</i>
T 2.3	Consistent with the Downtown Parking Management Plan and Downtown Specific Plan, adopt parking requirements into the Municipal code that are appropriate for a mixed-use, walkable, and transit-oriented district. Evaluate opportunities in the Downtown area to designate streets for transit only. <i>Key Pillar: Structural Change</i>
T 2.4	Develop and adopt an ordinance requiring new multi-family development projects to install a car share or provide e-bikes/e-scooters to each new tenant. <i>Key Pillar: Structural Change</i>
T 2.5	Evaluate and prioritize transit stops needing renovations that do not meet the adopted Pedestrian Design Standard for Transit Stop. Upgrade transit stops such that they include bicycle parking and shade trees or structures and are designed to promote use. <i>Key Pillar: Structural Change</i>
T 2.6	Consistent with the intention of Senate Bill 10, allow developers to build housing without off-street parking if they're close to frequent transit service. <i>Key Pillar: Structural Change</i>
T 2.7	Through the adoption of an ordinance or incorporation into large commercial building codes, require all employers to develop a Transportation Demand Management (TDM) Plan. TDM plans should include money-based incentives for employees to bike, walk, carpool, or take the bus to work. In alignment with BAAQMD requirement, large employers (more than 50 employees) shall subsidize biking, walking, or bus travel. <i>Key Pillar: Funding/Structural Change</i>
T 2.8	Expand the Student Transit Pass Program (STPP), which provides free youth clipper cards with unlimited bus rides to middle and high schools students, to provide free AC transit to college students and low-income community members. <i>Key Pillar: Partnership/Equity</i>
T 2.9	Collaborate and engage with AC Transit to understand how they are addressing the Innovative Clean Transit Rule and their plan to electrify their bus fleet. <i>Key Pillar: Partnership</i>

Action ID	Action Description
T 2.10	Dedicate staff time or create a staff position to pursue funding opportunities to implement planned City transit/TDM projects and programs and to support AC Transit in obtaining grant funding for region-wide service expansion. <i>Key Pillar: Funding</i>
T 2.11	Conduct local transportation surveys to better understand the community's needs and motivation for traveling by car versus other alternatives such as AC Transit or BART. Use survey results to inform policy development and education/outreach campaigns that are transit focused. Consistent with the previous CAP policy M-3 (Survey Transportation and Transit Gaps and Barriers) <i>Key Pillar: Feasibility Study</i>
T 2.12	Assess the feasibility and GHG reduction impact of banning cars in high-traffic zone(s) or on individual roads in the City where other transit options are available by implementing a congestion charge that applies to passenger cars and car-sharing services like Uber and Lyft with exceptions for handicap drivers and residents of those areas. <i>Key Pillar: Feasibility Study</i>
T 2.13	Partner with AC Transit to conduct a study to determine transit priority corridors and prioritize infrastructure improvements in existing neighborhoods that enable people to better access and use public transit. <i>Key Pillar: Feasibility Studies/ Partnerships</i>
Total GHG Emissions Reduction from Measure: 2030: 7,585 MT CO ₂ e, 2045: 25,092 MT CO ₂ e	
City Cost: High	
Community Cost: Low	
Co-Benefits: Improved Public Health & Safety, Sustainable Land Use Planning, Jobs Development	

Measure T-3: Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-1 and T-2.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure T-3 are included in Table 19.



Table 19 Measure T-3 Actions

Action ID	Action Description
T 3.1	Develop and adopt a Citywide Transportation Demand Management (TDM) Plan including strategies to reduce peak-hour traffic, such as staggered work hours, flexible schedule options, and telecommuting from home offices. Include updated policy incentives or disincentive options to achieve reductions in peak-hour traffic, reduce traffic congestions and promotes alternative transportation (biking, walking, and use of transit) <i>Key Pillar: Structural Change</i>
T 3.2	Continue to require new development adopt transportation demand management strategies to reduce use of single occupancy vehicles and encourage the use of alternative modes of travel. Update

Action ID	Action Description
	development requirements, ordinances, and/or building codes requiring TDM as part of new developments as part of enforcement. <i>Key Pillar: Structural Change</i>

Action ID	Action Description
T 3.3	Develop consistent standards for parking minimums and maximums across the city. Reduce parking minimums and parking maximums citywide, as improved active and public transit infrastructure becomes more available. Additionally, price all public parking spaces for all areas of the city based on available transportation options, travel demand, and land use. <i>Key Pillar: Structural Change</i>
T 3.4	Evaluate parking pricing structures that would best work with the City of Hayward. Based on evaluation, implement dynamic parking pricing in downtown parking areas and earmark parking revenues to implement other active transportation and transit projects. <i>Key Pillar: Structural Change</i>
T 3.5	Conduct an analysis of the potential community impacts and benefits of implementing disincentive-based policies for driving single passenger vehicles, including a congestion charge program, limiting parking options, increased local taxes (income tax, gasoline tax, or car registration tax), and Transportation Network Company (TNC) user taxes. <i>Key Pillar: Feasibility Study</i>
T 3.6	Conduct engagement efforts for the general public and target low-income communities of color during analysis of the disincentive-based transportation policies to understand the community's potential concerns. <i>Key Pillar: Equity</i>
T 3.7	Define equity metrics for implementation of disincentives based on feedback from local low-income communities of color and structure the disincentive programs to meet these metrics. <i>Key Pillar: Equity</i>
T 3.8	Fund active and public transit programs through a local gasoline tax and/or through paid parking fees. <i>Key Pillar: Funding</i>
T 3.9	Implement a Transportation Network Company (TNC) user tax which would put a small fee on the use of Uber and Lyft and generate funds to pay for transit and mobility infrastructure. <i>Key Pillar: Funding</i>
T 3.10	Implement a gasoline/diesel car registration tax starting in 2028 with exemption criteria established for low-income residents. <i>Key Pillar: Funding/ Equity</i>
T 3.11	Increase Broadband Internet Access. Add a program to encourage more working from home and reduce the need to travel for work. <i>Key Pillar: Structural Change</i>
Total GHG Emissions Reduction from Measure: Supportive Measure & Actions	
City Cost: Low	
Community Cost: Moderate	
Co-Benefits: Improved Public Health & Safety, Sustainable Land Use Planning	

Measure T-4: Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure T-4 are included in Table 20.



Table 20 Measure T-4 Actions

Action ID	Action Description
T 4.1	Continue to enforce the Hayward EV Charger Reach Code requiring electric vehicle charging stations in new development projects. <i>Key Pillar: Structural Change</i>
T 4.2	Work with Ava Community Energy to install 100 new publicly accessible EV chargers by 2030 through public private partnerships and on City owned properties. <i>Key Pillar: Structural Change</i>
T 4.3	Continue to maintain a streamlined EV infrastructure permitting process and ordinance in accordance with AB 1236. <i>Key Pillar: Structural Change</i>
T 4.4	Require that new private parking lots grant zero emission vehicles (ZEVs) access to preferred parking spaces. <i>Key Pillar: Structural Change</i>
T 4.5	Coordinate with local agencies and community-based organizations, agencies, and non-profits to conduct zero-emission vehicle (ZEV) education events for residents and targeted events for low-income communities that would evaluate the barriers to ZEV adoption, include information on costs/benefits of owning ZEVs, steps on how to receive incentives for ZEVs, and other benefits. <i>Key Pillar: Structural Change</i>
T 4.6	Explore opportunities with CARB, BAAQMD, or other agencies to start a purchase rebate program and provide higher trade-in value for combustion vehicles to assist lower-income households to purchase EVs. <i>Key Pillar: Education/Equity</i>
T 4.7	Develop outreach and education materials and distribute to local businesses and organizations on the financial, environmental, and health and safety benefits of ZEVs. Provide information on available funding opportunities. <i>Key Pillar: Equity</i>
T 4.8	Work with Ava Community Energy and PG&E to incentivize residential electric vehicle charger installations through on-bill financing. <i>Key Pillar: Education</i>
T 4.9	Evaluate opportunities for EV or hydrogen charging infrastructure through State and utility programs, like LCFS or PG&E EV Fast Charge Program. Disseminate information via outreach and education materials. <i>Key Pillar: Funding</i>
T 4.10	Partner with Ava Community Energy to aid in Ava's survey of existing publicly accessible electric vehicle chargers and their locations and identify a prioritized list of locations in Hayward for new electric vehicle charging stations with particular consideration for equitable distribution of chargers to residents of multi-family homes, low-income people, people on a fixed income, and communities of color. <i>Key Pillar: Funding</i>

Action ID	Action Description
T 4.11	Support zero-emission vehicle (ZEV) car share companies in coming to the City. Coordinate with car share companies and community groups to develop an affordable, zero-emission vehicle (ZEV) car share to serve affordable housing and/or multifamily developments with a priority to target low-income communities of color. <i>Key Pillar: Feasibility Study/Partnership</i>
T 4.12	Collaborate with neighboring jurisdictions and the Alameda County Transportation Commission to develop a connected network of ZEV car share. <i>Key Pillar: Partnership</i>
Total GHG Emissions Reduction from Measure: 2030: 16,014 MT CO ₂ e, 2045: 88,718 MT CO ₂ e	
City Cost: Moderate	
Community Cost: Moderate	
Co-Benefits: Improved Public Health & Safety, Jobs Development	

Measure T-5: Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure T-5 are included in Table 21.



Table 21 Measure T-5 Actions

Action ID	Action Description
T 5.1	Work with stakeholders to develop and implement a plan for City-supported accelerated fleet electrification. As part of the plan, identify opportunities for accelerated fleet electrification and promote ZEV/EV adoption within business fleets. <i>Key Pillar: Structural Change</i>
T 5.2	Identify incentives for accelerated business fleet electrification and communicate that information to local businesses. <i>Key Pillar: Funding</i>
T 5.3	Engage with local employers and business fleet owners in the City to identify opportunities for accelerated fleet conversion to ZEV/EV. Provide information on the requirements of the Advanced Clean Fleets rule and available funding sources for fleet replacements (e.g., LCFS, Clean Truck and Bus Voucher). <i>Key Pillar: Education</i>
T 5.4	Develop and maintain a collaborative of stakeholders (e.g., local major employers, commercial business) to lead the creation of best practices and the pursuit of funding for ZEV/EV infrastructure as well as public and private zero-emission business vehicle fleets. <i>Key Pillar: Partnership</i>
T 5.5	Conduct an inventory of business vehicle fleets in Hayward and identify employers and businesses subject to the Advanced Clean Fleets rule as well as those to target for accelerating ZEV/EV adoption. <i>Key Pillar: Feasibility Studies</i>
Total GHG Emissions Reduction from Measure: 2030: 3,161 MT CO ₂ e, 2045: 37,461 MT CO ₂ e	
City Cost: Low	
Community Cost: Moderate	
Co-Benefits: Improved Public Health & Safety, Jobs Development	

Measure T-6: Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure T-6 are included in Table 22.



Table 22 Measure T-6 Actions

Action ID	Action Description
T 6.1	Support and promote CARB's regulations requiring most newly manufactured small off-road engines such as those found in leaf blowers, lawn mowers, and other equipment to be zero emission starting in Model Year 2024. Phase 2 of the regulations will be implemented in Model Year 2028, when the emission standards for generators and large pressure washers will be zero. In addition, work with Hayward Chamber of Commerce to disseminate information regarding the regulation to impacted businesses (e.g., lawn equipment dealers, commercial landscapers, construction companies) and promote transition of equipment sales and equipment use to electric alternatives. <i>Key Pillar: Education/Partnership</i>
T 6.2	Develop and implement a plan to replace all City owned end-of-life off-road equipment with zero-emission equipment. Plan should include evaluation of current City-owned equipment, alternative low or zero-emission options, prioritize equipment to replace first (e.g., largest GHG emission reduction potential), and a timeline for replacements that align with goals and feasibility of replacement. <i>Key Pillar: Structural Change</i>
T 6.3	Develop an Off-road Equipment Replacement Program and Outreach Campaign that provides information to contractors, residents, and fleet operators in Hayward regarding alternatives to fossil-fueled off-road equipment, public health and safety benefits of alternative equipment technology, and funding opportunities available (i.e., Clean Off-Road Equipment Voucher Incentive Program [CORE], Zero-Emission Landscaping Equipment Incentive Programs). <i>Key Pillar: Education</i>
T 6.4	Partner with BAAQMD to identify funding opportunities to encourage residents to replace gas-powered landscaping equipment and off-road engines with zero emission equipment. <i>Key Pillar: Funding</i>
T 6.5	Partner with BAAQMD to develop a rebate and incentive program for upgrading off-road equipment and switching to biofuels. <i>Key Pillar: Partnership/Funding</i>
T 6.6	Conduct a study to assess the technological and economic feasibility of replacing the City-owned off-road equipment fleets. <i>Key Pillar: Feasibility Study</i>
T 6.7	Conduct an inventory of major off-road equipment fleets in Hayward and identify fleets with highest decarbonization potential. <i>Key Pillar: Feasibility Study</i>
Total GHG Emissions Reduction from Measure: 2030: 4,312 MT CO₂e, 2045: 22,542 MT CO₂e	
City Cost: Moderate	
Community Cost: Moderate	
Co-Benefits: Improved Public Health & Safety, Environmental Quality & Ecosystem	

Measure T-7: Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure T-7 are included in Table 23.



Table 23 Measure T-7 Actions

Action ID	Action Description
T 7.1	Establish and adopt Zero-emission Fleet Conversion and Purchase Policy that requires new, and replacement municipal fleet vehicle purchases are EVs or ZEVs. The policy will also include a schedule for replacement of fleet vehicles to meet a 100% carbon neutral fleet by 2040. <i>Key Pillar: Structural Change</i>
T 7.2	Conduct feasibility and cost assessment to determine the number of EV/ZEV chargers and funds needed to support the fleet transition to 50% EV/ZEV by 2030. Expand EV/ZEV charging infrastructure for city fleet and employees in alignment with feasibility study. <i>Key Pillar: Structural Change/Feasibility Study</i>
T 7.3	Secure funding from programs such as the California Air Resources Board's Clean Vehicle Rebate Project and the Clean Truck and Bus Voucher Incentive Program to increase procurement of EV or ZEV cars, trucks, and other vehicles and installation of EV/ZEV charging/fueling infrastructure at municipal facilities. <i>Key Pillar: Funding</i>
T 7.4	Evaluate credit generation opportunities within the Low Carbon Fuel Standard (LCFS) program for ZEV/EV fueling and charging stations for the municipal fleet to offset cost of infrastructure development needed to support transition. <i>Key Pillar: Funding</i>
Total GHG Emissions Reduction from Measure: Supportive Measure & Actions	
City Cost: High	
Community Cost: Low	
Co-Benefits: Improved Public Health & Safety	

10 Solid Waste Sector Measures

10.1 Context

Sustainable solid waste management is a critical component to a healthy and inclusive community. Hayward defines zero waste as an ongoing set of practices to conserve resources and protect humans and the environment by responsibly producing, consuming, reusing, and recovering food and goods. Striving toward zero waste can create climate benefits beyond Hayward's borders and the measures in this section support Hayward's overall goal of working toward zero waste of resources.

The City has a goal of attaining a 75 percent communitywide waste diversion from the landfill and is exploring adopting the Alameda County Waste Management Authority's goal of eventual landfill obsolescence. Working toward zero waste requires two main strategies. First, maximizing waste diversion (including recycling and composting) and second, minimizing waste generation. Through Measure solid waste (SW)-1, the City will implement and enforce SB 1383 requirements to reduce communitywide landfilled organics 75 percent by 2025 and 90 percent by 2045. Measure SW-2 will ensure that City increases communitywide overall landfill diversion of waste to 75 percent by 2030 and 85 percent by 2045.

Less Waste to Landfill

Minimizing the amount of organic waste, including yard and food waste, sent to landfills will help the City achieve its climate goals because methane released from landfilled organic waste is the main source of waste related GHG emissions from the community. Actions for reducing organic waste to the landfill are already clearly defined by State requirements under SB 1383, which lay out specific programs, policies, and objectives for the City to support the State goal. Under SB 1383, cities are required to rescue edible food, divert organic waste from landfill, and procure compost and/or other materials from recycled organic waste.

To support this, Hayward also seeks to reduce inorganic waste (such as plastic, paper, and metal) going to landfill.

Waste Prevention

The best way to manage waste is to prevent it in the first place. This is because creating items and disposing of them as waste requires raw materials, time, energy, and other resources, which can all be conserved when waste is prevented. In addition, not all waste is reusable or recyclable, so the best way to keep it out of landfill as technologies develop is prevention.

The GHG emissions produced during the production and transportation of goods prior to their consumption are referred to as lifecycle emissions. Usually, these emissions exceed any emissions generated within Hayward from local waste disposal. While recycling and waste recovery play a role in preventing landfill accumulation, they do not tackle the lifecycle emissions and additional costs associated with material production.

To make progress towards zero waste and reduce GHG emissions as much as possible, Hayward will prioritize waste prevention so that waste can be eliminated at the source before management and disposal are necessary. Although actions that address inorganic waste will have a minimal impact

toward meeting Hayward’s communitywide GHG emissions reduction goals, reducing inorganic waste reduces the need for production and disposal of these materials. As a result, this will curtail the lifecycle emissions linked to the waste beyond Hayward’s borders.

10.2 Measures and Actions Detail

Measure SW-1: Implement and enforce SB 1383 requirements to reduce community-wide landfilled organics 75% by 2025 and 90% by 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure SW-1 are included in Table 24.



Table 24 Measure SW-1 Actions

Action ID	Action Description
SW 1.1	Adopt procurement policies to comply with SB 1383 requirements for jurisdictions to purchase recovered organic waste products. <i>Key Pillar: Structural Change</i>
SW 1.2	Continue to implement exclusive hauling agreement with Waste Management of Alameda County (WMAC) that regulates haulers collecting organic waste, including collection program requirements and identification of organic waste receiving facilities. <i>Key Pillar: Structural Change</i>
SW 1.3	Continue to implement edible food recovery ordinance for edible food generators, food recovery services, or organizations that are required to comply with SB 1383. Ordinance requires all residential and commercial customers to subscribe to an organic waste collection program and/or report self-hauling or backhauling of organics. <i>Key Pillar: Structural Change</i>
SW 1.4	Implement enforcement and fee for incorrectly sorted materials with sensitivity to shared collection. Utilize funding to implement programs and efforts to increase communitywide organic waste diversion. <i>Key Pillar: Structural Change</i>
SW 1.5	Work with StopWaste to conduct targeted outreach with food recovery organizations, generators, haulers, facilities, and local agencies to promote strategies to implement requirements of SB 1383 <i>Key Pillar: Education</i>
SW 1.6	Encourage businesses to educate their employees about organic waste diversion and proper sorting annually by providing training resources and rebate programs to fund employee time for training. <i>Key Pillar: Education</i>
SW 1.7	Partner with local community organizations, public agencies like StopWaste and businesses to implement all required activities under SB 1383. <i>Key Pillar: Partnership</i>
SW 1.8	Provide free compost bins and kitchen-top food waste containers to low-income communities of colors and elderly households in order to increase compost participation. Evaluate opportunities to have a community compost hub that is easily accessible to disadvantaged neighborhoods. <i>Key Pillar: Equity</i>
SW 1.9	Establish relationships with multi-family property owners/managers to develop signage for their properties. Present at Homeowner Associations in Hayward annually and provide supplies and education for proper sorting. <i>Key Pillar: Equity</i>

Action ID	Action Description
SW 1.10	Establish an edible food recovery program to minimize food waste. Leverage CalRecycle supports projects that prevent food waste or rescue edible food. Partner with existing food pantries like CSUEB, South Hayward Parish to identify and advertise locations for surplus food to be taken in the community. <i>Key Pillar: Partnership</i>
SW 1.11	Work with contracted hauler to: ▪ Provide quarterly route reviews to identify prohibited contaminants potentially found in containers that are collected along route. ▪ Clearly label all new containers indicating which materials are accepted in each container, and by January 1, 2024, place or replace labels on all containers. ▪ Develop and implement a comprehensive monitoring and quality control program with a focus on consumer behavior change. <i>Key Pillar: Partnership</i>
SW 1.12	Work with local organizations, StopWaste, and investigate various funding/grant opportunities to fund edible food recovery organizations so they can expand and handle increased volume. <i>Key Pillar: Partnership/Funding</i>
SW 1.13	Partner with schools, retirement communities, and other large institutions to create waste diversion and prevention program/procedure/plan. <i>Key Pillar: Partnerships</i>
SW 1.14	Partner with StopWaste to conduct a feasibility study and identify next steps to ensure edible food reuse infrastructure in Hayward is sufficient to accept capacity needed to recover 20% of edible food disposed of within Hayward. <i>Key Pillar: Feasibility Studies/Partnership</i>
Total GHG Emissions Reduction from Measure: 2030: 35,925 MT CO ₂ e, 2045: 47,101 MT CO ₂ e	
City Cost: Moderate	
Community Cost: Moderate	
Co-Benefits: Environmental Quality & Ecosystem Services, Jobs Development	

Measure SW-2: Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure SW-2 in Table 25.



Table 25 Measure SW-2 Actions

Action ID	Action Description
SW 2.1	Continue to implement the Organics Reduction and Recycling Ordinance (ORRO) adopted in November 2021 in alignment with the Countywide ORRO ordinance. Support StopWaste and County Environmental Health in the enforcement of the ORRO within the City. <i>Key Pillar: Structural Change</i>
SW 2.2	Review recent circular economy bills signed by the governor (i.e., SB 343, AB 881, AB 1201, AB 962, AB 1276) and incorporate requirements into hauling agreements, and municipal codes for full-service restaurants and local manufacturing businesses. <i>Key Pillar: Structural Change</i>
SW 2.3	Continue to enforce the Hayward Construction and Demolition Debris Recycling Ordinance. <i>Key Pillar: Structural Change</i>
SW 2.4	Adopt a citywide Zero Waste Goal and develop a Zero Waste Strategic Plan to increase diversion from the landfill by 85% 2045. <i>Key Pillar: Structural Change</i>
SW 2.5	Create a requirement for large events to hire an event waste management team. <i>Key Pillar: Structural Change</i>
SW 2.6	Regularly evaluate and update new franchise agreement with Waste Management of Alameda County to meet SB 1383 requirements and to implement new components to further divert waste from landfills. Work with WMAC to determine data necessary to meet zero waste goals and establish protocol for regular collection and reporting of associated metrics. Identify dedicated staff responsible for this. <i>Key Pillar: Partnership</i>
SW 2.7	Require food service providers to implement a fee for single-use food ware. <i>Key Pillar: Structural Change/ Funding</i>
SW 2.8	Partner with StopWaste to conduct targeted, multi-lingual, culturally appropriate, and geographically diverse waste prevention educational and technical assistance campaigns based on outcomes of a waste characterization study (WCS). Such as food waste prevention, edible food recovery strategies, proper storage, how to fix clothes/electronics, how to donate, reusable alternatives, effects of over consumption, sustainable consumption habits, buying second hand, buying durable, sharing, repurposing. Continue to conduct outreach regarding AB 1276 to full-service restaurants. <i>Key Pillar: Education/Equity</i>
SW 2.9	Continue to work with StopWaste and haulers to monitor participation in residential recycling programs, create education materials for the community, provide technical assistance to business to implement mandatory recycling, and identify other opportunities and means to promote zero waste efforts. <i>Key Pillar: Partnership</i>
SW 2.10	Work with StopWaste and the business community to design and promote extended producer responsibility such as take-back programs. <i>Key Pillar: Partnership</i>

Action ID	Action Description
SW 2.11	Conduct a consumption-based GHG emissions inventory to understand the community's worst consumption habits and emission reduction potential and provide educational materials on a closed-loop circular economy. <i>Key Pillar: Feasibility Study</i>
SW 2.12	Work with local businesses to establish post-consumer recycled content requirements that meet SB 343 recyclability claims as part of their purchasing criteria. <i>Key Pillar: Structural Change</i>
SW 2.13	Partner with local organizations, schools, and libraries to establish pop-up repair cafes for commonly broken and easily repaired items. Partner with library to promote reuse by increasing accessibility to shared tools through a tool lending library. <i>Key Pillar: Partnership/Equity</i>
SW 2.14	Based on existing StopWaste waste characterization studies and Litterati litter assessment, increase bans on "problem materials" (i.e., items without means of recycling or recycling markets, such as sale of polystyrene, plastic packaging, straws, plastics #4-7, mixed materials). Enforce the single-use plastic pre-checkout ban, by January 1, 2025, in alignment with SB 1046. <i>Key Pillar: Structural Change</i>
SW 2.15	Explore funding opportunities to increase the circular food economy. <i>Key Pillar: Funding</i>
Total GHG Emissions Reduction from Measure: Supportive Measure and Actions	
City Cost: Moderate	
Community Cost: Moderate	
Co-Benefits: Environmental Quality & Ecosystem Services,	

11 Water and Wastewater Measures

11.1 Context

Water and wastewater infrastructure can be managed to reduce the energy needed to transport water and wastewater, and associated GHG emissions. Residential and commercial buildings use water both indoors for cooking, cleaning, bathing, and toilet flushing, and outdoors to irrigate landscaping and maintain pools and fountains. Water efficiency measures not only reduce the amount of water used but also reduce the amount of energy needed to convey, treat, and distribute water. Additionally, water consumption and wastewater generation are interconnected, therefore water conservation efforts will lead to decreases in wastewater generated, as less water is treated through the wastewater system. Water conservation efforts also have the added benefit of putting less pressure on water resources across California during times of drought and ensuring more long-term resilience of this vital resource. The CAP Update’s water and wastewater (WW) measures focus on reducing indirect electricity usage from water use and wastewater generation and do not directly address wastewater process emissions.

Water and Wastewater

While only a small part of the City’s GHG emissions, water conservation is an important aspect of a community’s overall sustainability. Through Measure WW-1, the City will reduce water consumption by 15 percent by 2030 and maintain it through 2045.

11.2 Measures and Actions Detail

Measure WW-1: Reduce water consumption by 15% by 2030 and maintain it through 2045.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure WW-1 are included in Table 26.



Table 26 Measure WW-1 Actions

Action ID	Action Description
WW 1.1	Continue to implement the City’s Bay-Friendly Water Efficient Landscape ordinance applicable to all land use types to decrease water consumption. <i>Key Pillar: Structural Change</i>
WW 1.2	Continue to implement and enforce the Water Conservation Standards within the Municipal Code via the Prohibition of Wasteful Water Practices Ordinance for households, businesses, industries, and public infrastructure. <i>Key Pillar: Structural Change</i>
WW 1.3	Continue to implement rebate and water conservation device tracking system to track the number of rebates and water devices distributed. <i>Key Pillar: Structural Change</i>

Action ID	Action Description
WW 1.4	Continue to implement the Recycled Water Program which includes expanding facilities if necessary to deliver recycled water to additional customers, working with customers to complete site retrofits, connecting customers to the recycled water system, and ensuring customer deliveries. <i>Key Pillar: Structural Change</i>
WW 1.5	Continue to offer water conservation programs to the community including educational programs like water education program for schools and water wise landscape classes as well as incentives like free water conserving devices, and rebates for rain barrels and turf replacement. <i>Key Pillar: Education/Funding</i>
WW 1.6	As part of the water conservation programs offered, implement a public education campaign that in addition to highlighting water conservation practices, with focus on low-income households with high utility bill burdens. <i>Key Pillar: Education/Equity</i>
WW 1.7	Ensure that water conservation educational materials, programs and outreach efforts are in multiple languages and accessible for low-income or disadvantaged communities. <i>Key Pillar: Equity</i>
WW 1.8	Perform targeted outreach to low-income communities and elderly households to provide free water conservation devices and aid disadvantaged community members in obtaining available rebates for water conservation devices. <i>Key Pillar: Equity</i>
WW 1.9	Partner with programs such as Green House Call or other similar programs to support community members with installation of water saving devices with a particular focus of support for low-income, elderly, or disadvantaged elderly residents. <i>Key Pillar: Partnerships/Equity</i>
WW 1.10	Continue to coordinate with commercial and industrial customers including the Hayward Area Recreation and Park District and the Hayward Unified School District to advance water recycling programs. <i>Key Pillar: Partnerships</i>
WW 1.11	Develop a Recycled Water Master Plan to assess the feasibility of expanding the recycled water system and establish a roadmap for a recycled water expansion program. The plan will identify the locations available for recycled water use, the capacity needed to fully replace potable water use at identified locations and establish a schedule for potable water replacement with recycled water for appropriate applications. <i>Key Pillar: Feasibility Studies</i>
WW 1.12	Promote the use of on-site gray water and rainwater collection systems. <i>Key Pillar: Education</i>
Total GHG Emissions Reduction from Measure: 2030: 35 MT CO ₂ e, 2045: 0 MT CO ₂ e	
City Cost: Moderate	
Community Cost: Low	
Co-Benefits: Climate Change Resilience, Environmental Quality & Ecosystem Services	

12 Carbon Sequestration Measures

12.1 Context

A carbon neutral future includes leveraging the greenspace within the City to reduce GHG emissions. For example, greenspace – like trees and planted landscapes – can be expanded and maintained to remove carbon from the atmosphere through natural biological processes called carbon sequestration, helping to reduce GHG emissions in the City.

Carbon Sequestration

To achieve carbon neutrality in 2045, Hayward will reduce GHG emissions across all sectors to minimize emissions to nearly zero. However, due to limitations in technology and the length of time that it takes to normalize new low-carbon behaviors, it is expected that some GHG emissions will remain under the City’s jurisdiction in 2045. Therefore, a carbon-neutral future incorporates methods for carbon sequestration to offset residual GHG emissions. Carbon sequestration strategies include enhancing and converting green spaces, planting trees, composting, and removing carbon from the atmosphere. The City will increase carbon sequestration by planting 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect (Measure CS-1). Applying compost to the land boosts soil health and allows for microbes to further sequester carbon in the soil from photosynthesis. The City will increase sequestration by applying 0.08 tons of compost per capita annually in the community through 2030 (Measure CS-2). Carbon sequestration strategies will be increasingly important as other sector emissions are reduced, state guidance is developed, and technologies come online.

12.2 Measures and Actions Detail

Measure CS-1: Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.

Actions, co-benefits, City costs, community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure CS-1 are included in Table 27.



Table 27 Measure CS-1 Actions

Action ID	Action Description
CS 1.1	Update the Tree Preservation Ordinance by Q2 2024 to maintain existing carbon stock is maintained and that replacement trees that are climate resilient and drought tolerant for Hayward’s climate. Ordinance updates may include development requirements to protect or replace value-to-value existing trees and greenspace; and a requirement for a cash mitigation fee equal to the value of trees removed. <i>Key Pillar: Structural Change</i>
CS 1.2	Develop and adopt an Urban Forest Management Plan that identifies: City’s potential capacity for new tree planting; timeframe and mechanism for implementation; a management plan for existing trees; and a tracking system to assess progress towards annual benchmark.

Action ID	Action Description
	<i>Key Pillar: Structural Change</i>
CS 1.3	Identify and map public spaces that can be converted to green space, including freeway airspace that can be made into green space, vertical walls that can be planted with vines, and rooftops of public buildings that can be developed into gardens. <i>Key Pillar: Feasibility Study</i>
CS 1.4	Partner with community groups to apply for community garden grants and develop new or expand existing community gardens based on the identified public spaces available for green space conversion. <i>Key Pillar: Partnership/Funding</i>
CS 1.5	Adopt a standard policy and set of practices for expanding the urban tree canopy and placing vegetative barriers between busy roadways and developments to reduce exposure to air pollutants from traffic. <i>Key Pillar: Equity</i>
CS 1.6	Conduct an urban canopy study to identify areas in Hayward that have below average canopy coverage and implement a tree planting program focusing on the least covered portions of the City. Establish a goal of having no significant difference in canopy coverage between high and low-income areas citywide by 2030. <i>Key Pillar: Feasibility Study/Equity</i>
CS 1.7	In addition, or as an expansion to the Adopt-a-Block Program, establish an adopt-a-tree or adopt-a-street program that is specific to further greening and tree planting. The program will enable individuals, businesses, and community organizations to plant and care for trees in selected communities. The program should provide formalized information on appropriate trees eligible for planting in Hayward (i.e., native, drought tolerant, locations). <i>Key Pillar: Education</i>
CS 1.8	Dedicate staff time to obtaining grant funding for tree planting. Identify and apply for applicable federal (e.g., USDA) and state (e.g., California ReLeaf, Affordable Housing and Sustainable Communities Program (AHSC), Urban and Community Forestry Program) grants for tree planting and maintenance projects. <i>Key Pillar: Funding</i>
CS 1.9	Explore opportunities to fund the Urban Forest Management Program. Possibilities include use of general tax revenues, permit fees, or revenues from the municipal tree ordinance enforcement. <i>Key Pillar: Funding</i>
CS 1.10	Establish a Tree Trust or Tree Endowment where the interest on the principal can be used for purchasing trees, paying for tree maintenance, or for staff resources for the Urban Forest Management Program. <i>Key Pillar: Funding</i>
CS 1.11	Partner with private developers, CSUEB, Chabot College, HARD, HUSD, and other community-based organizations to support and contribute to the Urban Forest Management Program <i>Key Pillar: Partnerships</i>
CS 1.12	Establish alternative fee mechanisms, similar to the SF Carbon Fund, to fund nature-based solutions. By 2026, create permanent code and financial incentives for homeowners and other private landowners to preserve existing mature trees and shrubs and to plant local native species. <i>Key Pillar: Funding</i>
CS 1.13	Identify existing greenbelts and the best locations for new greenbelts for wildfire defense and risk reduction. Incorporate these locations into comprehensive wildfire planning at regional, county, city, and community levels and in all municipal service reviews. <i>Key Pillar: Feasibility Study</i>
Total GHG Emissions Reduction from Measure: 2030: 212 MT CO ₂ e, 2045: 743 MT CO ₂ e	
City Cost: Moderate	
Community Cost: Low	
Co-Benefits: Improved Public Health & Safety, Climate Change Resilience, Environmental Quality & Ecosystem Services	

Measure CS-2: Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030.

Actions, co-benefits, City costs community costs, and specific quantitative GHG emissions reductions associated with implementation of Measure CS-2 are included in Table 28.



Table 28 Measure CS-2 Actions

Action ID	Action Description
CS 2.1	Enforce compliance with SB 1383 by establishing a minimum level of compost application per year on applicable/appropriate land throughout the City including City-owned land. <i>Key Pillar: Structural Change</i>
CS 2.2	Adopt procurement policies to comply with SB 1383 requirements for jurisdictions to purchase recovered organic waste products. <i>Key Pillar: Structural Change</i>
CS 2.3	Work with Hayward Area Recreation and Park District to develop and adopt urban park guidelines that: 1) Provide flexible solutions for developing urban parks in infill areas where traditional neighborhood and community parks are not feasible; 2) Establish guidelines for achieving the greatest carbon sequestration potential of parks via design; 3) Are equitable in ensuring such urban parks are accessible for lower-income residents while avoiding displacement, in alignment with the Parks Master Plan. <i>Key Pillar: Structural Change/ Equity</i>
CS 2.4	Identify locations within Hayward to apply compost to help meet the procurement requirements of SB 1383. <i>Key Pillar: Feasibility Study</i>
CS 2.5	Work with StopWaste to provide residents, businesses, and developers with educational material on best practices for using compost in landscaping. <i>Key Pillar: Education</i>
CS 2.6	Explore opportunities to use the parkland in-lieu fees from the updated City's Property Developers - Obligations for Parks and Recreation Ordinance (Article 16 of City's municipal code) to implement the Carbon Management Activities Program (NR 15). <i>Key Pillar: Funding</i>
CS 2.7	Collaborate with Chabot College, CSUEB, and local schools to identify opportunities to apply compost to landscaping. <i>Key Pillar: Partnerships</i>
CS 2.8	Work with Alameda County and StopWaste to identify opportunities for a regional compost procurement program to help meet the organics procurement provisions of SB 1383. <i>Key Pillar: Partnerships</i>
CS 2.9	Work with the City's franchisee under the new franchise agreement with Waste Management of Alameda County to provide compost throughout the community. <i>Key Pillar: Partnership</i>
CS 2.10	Conduct a study to identify opportunities to enhance or create new natural areas in existing open spaces, parklands, and fields with native species, biodiverse ecology, higher carbon sequestration potential and improved recreational connectivity for the community. <i>Key Pillar: Feasibility Study</i>

Action ID	Action Description
CS 2.11	Create and deliver a range of resources to train residents, city gardening staff, and other institutions on how to incorporate biodiversity, soil, and carbon sequestration techniques into landscaping and gardening projects. <i>Key Pillar: Education</i>
Total GHG Emissions Reduction from Measure: 2030: 3,081 MT CO ₂ e, 2045: 3,392 MT CO ₂ e	
City Cost: Low	
Community Cost: Low	
Co-Benefits: Improved Public Health & Safety, Climate Change Resilience, Environmental Quality & Ecosystem Services	

13 CAP Implementation

13.1 Tracking, Monitoring, and Reporting

The CAP serves as roadmap for Hayward to implement actions to achieve the 2030 GHG emission reduction target and make progress towards reaching carbon neutrality by 2045. The underlying assumptions and data informing this plan including adoption rates of measures and actions, the emergence of new or improved technologies, changes in costs of technology, legislative changes, and co-benefits will continue to change and evolve over time. As a result, the CAP shall serve as a strategic framework that will undergo regular re-evaluation.

The City maintains its dedication to the ongoing, incremental, and all-encompassing endeavor necessary for achieving the long-term climate targets specified in this CAP. The City will continue to engage the community, provide informative progress updates, and create ongoing opportunities to solicit and incorporate community feedback as policies and programs are developed and infrastructure is constructed. The City will report publicly on its progress towards its high-impact GHG reduction measures no less than every two years.

Continual monitoring and assessment of Hayward's progress will be a vital aspect of the ongoing communitywide efforts to reduce GHG emissions. The City will regularly conduct communitywide GHG emissions inventories on a routine basis in alignment with GHG standard protocols and climate commitments,³⁰ but no less than every three years. If the City's 2025 GHG emissions reductions are on track to reach the 2030 targets, it is anticipated that no additional CAP measure adjustments would be necessary.

Table 29 outlines the implementation timeframe of each CAP action and the City department(s) responsible for leading the implementation and monitoring.



³⁰ Global Covenant of Mayors current guidance is to conduct GHG inventory updates every two years: globalcovenantofmayors.org

Table 29 CAP Update Implementation and Monitoring

Action ID	Pillar	Action	Lead City Department	Timeframe
Measure BE-1 Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.				
BE-1.1	Structural Change	Continue to enforce the adopted Hayward Electrification Ordinance for new residential buildings banning natural gas.	Development Services – Code Enforcement Public Works – Environmental Services	Starts 2023- complete by end of 2025
BE-1.2	Structural Change	Adopt an ordinance, reach code, or zero NOx threshold, effective January 1, 2026, that establishes mandatory requirements that all newly constructed buildings avoid natural gas use by 2026.	Development Services – Code Enforcement Public Works – Environmental Services	Starts 2026
BE-1.3	Education/Funding	Compile case studies conducted by BayREN, the Building Decarbonization Coalition and other relevant sources that show cost effective strategies for electric buildings by prototype and detail the cost savings associated with all-electric construction. Share the information on the City's website.	Public Works – Environmental Services	2024-2025
BE-1.4	Education/ Partnership	Partner with BayREN to provide/share technical resources, including hosting workforce development training for installers, local contractors, and building owners/operators, to discuss benefits and technical requirements of electrification within Hayward. Promote the cost savings, environmental benefits, and versatility of electrification to builders, property owners, and contractors on the City website and at the City permit counters.	City Manager's Office – Economic Development Division Public Works – Environmental Services	2024
BE-1.5	Partnerships/Equity	Engage with stakeholders, both internal stakeholders, such as City staff and officials, and external stakeholders, such as local developers and community groups regarding the purpose and impact of the Hayward Electrification Reach Code and to identify equity concerns.	Development Services – Code Enforcement Public Works – Environmental Services	2024-2025
BE-1.6	Partnership	Engage with an organization such as Building Decarbonization Coalition to work with local building industry stakeholders in educating developers and other stakeholders on new appliances and approaches to building electrification.	Development Services – Code Enforcement Public Works – Environmental Services	2024
BE-1.7	Feasibility Studies	Partner with Ava Community Energy to conduct an electrification infrastructure and capacity feasibility study to identify expected increases in electricity demand due to building and vehicle electrification, ensure capacity to meet that demand, and identify any infrastructure improvements.	Development Services – Code Enforcement Public Works – Environmental Services	2023-2025
BE-1.8	Feasibility Studies	Utilize the Low Carbon Concrete Code Amendment Toolkit and review current best practices to develop implementation strategies, compliance forms, and specifications for compliant mixes.	Development Services – Code Enforcement Public Works – Environmental Services	2025

Action ID	Pillar	Action	Lead City Department	Timeframe
BE-1.9	Education	Promote the use of low carbon concrete in construction projects (residential and commercial). Coordinate with the California Air Resources Board as they develop rules and guidance pursuant to AB2446.	Development Services – Code Enforcement Public Works – Environmental Services	2026
Measure BE -2 Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.				
BE-2.1	Structural Change	Once costs and funding/financing options are identified (BE-2.5), adopt a decarbonization ordinance for existing single-family residential buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure, and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective.	Development Services – Code Enforcement Public Works – Environmental Services	2025-2026
BE-2.2	Structural Change	Adopt an ordinance requiring existing single-family homes to be 100% all-electric by 2045.	Development Services – Code Enforcement Public Works – Environmental Services	2030
BE-2.3	Structural Charge	Adopt a time of retrofit ordinance that requires all buildings with retrofit work who meet a certain threshold, to complete energy efficiency/electrification actions. To be part of reach code to take effect January 2026.	Development Services – Code Enforcement Public Works – Environmental Services	2026
BE-2.4	Structural Change/ Partnership	Work with community stakeholders including realtors and contractors to develop electrification readiness requirements to be completed within 120 days of completion of a home sale. Include a potential waiver process for distressed sales.	Development Services – Code Enforcement Public Works – Environmental Services	2027
BE-2.5	Feasibility Studies	Develop a single-family residential building electrification feasibility study with a detailed existing building analysis and electrification costs analysis to understand cost implications, identify potential equity concerns/impacts, and develop strategies to electrify existing buildings such that natural gas usage in single-family residential buildings is reduced by 10% by 2030.	Development Services – Code Enforcement Public Works – Environmental Services	2024
BE-2.6	Partnership	Support BAAQMD’s efforts to require zero-NOx furnaces and water heaters at time of replacement with compliant technologies such as electric heat pumps. Advocate that BAAQMD ensure discounted electric appliances are offered to lower income households and upfront rebates are available.	Public Works – Environmental Services City Manager’s Office – Housing Division	2024
BE-2.7	Partnership/ Education	Partner with BayREN, Ava Community Energy and StopWaste to work with the local contractors, realtors, homeowner associations, and labor unions to develop a comprehensive building code and compliance training program, including hosting workforce development trainings discussing the benefits and technical requirements of electrification.	Public Works – Environmental Services	Start planning in 2024 and begin implementation in 2025

Action ID	Pillar	Action	Lead City Department	Timeframe
BE-2.8	Education	Conduct engagement efforts for the general public and targeted to low-income communities of color during development of the electrification strategy to understand the community's concerns around electrification.	Public Works – Environmental Services	Start in 2023 and ongoing
BE-2.9	Equity	Partner with Hayward Below Market Rate (BMR) housing stock owners (such as Eden Housing) to commit to electrifying all BMR housing by 2045. Establish a plan, financing strategies, and schedule for implementing this action by 2026	Public Works – Environmental Services City Manager's Office – Housing Division	2026-2030
BE-2.10	Equity	Identify and partner with local community-based organizations with connections to low-income communities of color to assist in development of the electrification strategy	Public Works – Environmental Services	Start in 2023 and ongoing
BE-2.11	Partnership/ Funding	Devote staff time to collaborate with PG&E, Ava Community Energy, and other cities in the region to advocate for regulatory changes at the State level (e.g., CARB) to allow neighborhood level electrification and pruning of natural gas to reduce the change of stranded asset, provide potential funding, and establish an efficient transition to carbon neutral buildings.	Public Works – Environmental Services	Start in 2026 and ongoing
BE-2.12	Partnership/ Funding	Work with Pacific Gas & Electric (PG&E), and Ava Community Energy to conduct a feasibility study assessing the cost and funding strategy for incentivizing all-electric retrofits through on-bill financing.	Public Works – Environmental Services	2025
BE-2.13	Equity	Review incentives, rebates, and financing options for procedural equity and ensure that existing and updated incentive programs are being equitably distributed to the community. Hurdles to equitable implementation could include credit checks, excessive procedural hurdles and lack of targeted outreach.	Public Works – Environmental Services	2025
BE-2.14	Partnerships	Partner with a financing/management company such as BlocPower to provide electrification services and financing to the community with prioritization of historically under-invested communities.	Public Works – Environmental Services	2024
Measure BE-3 Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.				
BE-3.1	Structural Change	Based on the results of the feasibility studies (BE- 3.4) adopt a decarbonization ordinance for existing commercial buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. As part of this ordinance, implement the following steps: 1. Develop requirements that satisfy the federal Energy Policy and Conservation Act (EPCA) seven criteria for an exemption from preemption; 2. Establish specific metrics for standard benchmarking; 3. Identify a regulatory mechanism for eliminating natural gas use in existing commercial buildings that addresses legal and feasibility considerations; and 4. Enforce requirement compliance through the same permitting compliance program as for residential building electrification.	Development Services – Code Enforcement Public Works – Environmental Services	2026
BE-3.2	Structural Change	Based on the results of the feasibility studies (BE- 3.4) adopt a decarbonization ordinance for existing multi-family buildings by 2026 that, based on legislative feasibility, establishes mandatory	Development Services – Code Enforcement	2026

Action ID	Pillar	Action	Lead City Department	Timeframe
		requirements that eliminates expansion of natural gas infrastructure and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. As part of this ordinance, implement the following steps: 1. Develop requirements that satisfy the federal Energy Policy and Conservation Act (EPCA) seven criteria for an exemption from preemption; 2. Establish specific metrics for standard benchmarking; 3. Identify a regulatory mechanism for eliminating natural gas use in existing commercial buildings that addresses legal and feasibility considerations; and 4. Enforce requirement compliance through the same permitting compliance program as for residential building electrification.	Public Works – Environmental Services	
BE-3.3	Structural Change	Adopt a Commercial Energy Performance Assessment and Disclosure Ordinance for commercial and multi-family buildings, which requires energy use disclosure consistent with State law (AB 1103) and the use of the ENERGY STAR Portfolio Manager benchmarking tool.	Development Services – Code Enforcement Public Works – Environmental Services	2026
BE-3.4	Feasibility Studies	Conduct feasibility studies to identify commercial and multi-family building decarbonization barriers and develop a commercial and multi-family building decarbonization strategy with analysis supporting future adoption of a commercial and multi-family building decarbonization ordinance.	Development Services – Code Enforcement Public Works – Environmental Services	2026
BE-3.5	Education/ Partnership	Partner with an electrification/efficiency expert to provide guidance to commercial buildings covered by the building performance standard.	Public Works – Environmental Services	2025
BE-3.6	Education	Develop an education campaign to promote commercial electrification and include items in the program such as: ▪ Continue to engage with local business and business organizations (e.g., Chamber of Commerce, the Alameda County Green Business Program) to inform and facilitate electrification for commercial business owners. ▪ Continue to promote the use of the Energy Star Portfolio Manager program and energy benchmarking training programs for nonresidential building owners. ▪ Advertise via utility bill inserts the incentive programs or grants available and the cost benefits of electric appliances. ▪ Targeted outreach to builders, developers, local contractors, and property managers with an informational brochure describing the financial benefits of replacing natural gas appliances with all electric appliances when they apply for permits. ▪ Provide informational webinars and an updated website to advertise and promote All-Electric Building Initiative rebates and incentives.	Public Works – Environmental Services	2026

Action ID	Pillar	Action	Lead City Department	Timeframe
BE-3.7	Equity	Conduct outreach to small businesses and minority-owned businesses to understand potential equity impacts of a decarbonization policy as part of the existing building decarbonization study.	Public Works – Environmental Services	Start in 2024 through 2025
BE-3.8	Funding	Conduct feasibility study to evaluate the current uptake and effectiveness of Property Assessed Clean Energy (PACE) financing for installation of renewable energy systems in commercial and industrial properties. If feasibility study indicates effectiveness, continue to offer PACE financing for commercial and industrial properties to install renewable energy systems.	Public Works – Environmental Services	2024
BE-3.9	Partnerships	Continue to work with Bay Area Regional Energy Network (BayREN), Ava Community Energy, and StopWaste to continue to improve and implement commercial electrification rebates and financing opportunities and other offered incentives.	Public Works – Environmental Services	Start in 2023 and ongoing
Measure BE-4: Support Ava Community Energy in providing 100% carbon-free electricity by 2030				
BE-4.1	Structural Change	Adopt a resolution establishing a policy that if Ava Community Energy does not meet the 2030 goal of its entire portfolio being 100% carbon-free, all Hayward customers will be enrolled in Renewable 100 by 2030. Resolution should include identification of funding or subsidies to ensure no cost increase to CARE/FERA customers. This may include subsidization cost to CARE/FERA customers to be funded by a rate increase for non-discounted customers.	Public Works – Environmental Services	Start in 2028, adopt and implement before 2030
BE-4.2	Education	Engage with community (residential and non-residential) to advertise/highlight Ava Community Energy's plan to provide 100% carbon-free electricity by 2030. Provide information on the importance of this goal and the impact of buying electricity from Ava Community Energy.	Public Works – Environmental Services	2028
BE-4.3	Equity	In collaboration with Ava Community Energy, implement a pilot program to provide Hayward's affordable housing units Ava Community Energy's Renewable 100 service. Identify funding options with Ava Community Energy such as subsidies funded by non-discounted customers or grant funding.	Public Works – Environmental Services City Manager's Office – Housing Division	Start in 2027, implementation in 2028
BE-4.4	Feasibility Studies	Work with Ava Community Energy to conduct an annual analysis of opt-out rates in the City of Hayward to understand why residents and businesses opt out of Ava Community Energy or opt-down to Bright Choice over Renewable 100.	Public Works – Environmental Services	Start in 2023 and ongoing
Measure BE-5 Continue to promote energy efficiency improvement, in alignment with the 2014 Climate Action Plan				
BE-5.1	Structural Change	Continue to promote the efficient use of energy in the design, construction, maintenance, and operation of public and private facilities, infrastructure, and equipment.	Public Works – Environmental Services	Ongoing
BE-5.2	Partnership/Education	Continue to collaborate with partner agencies, utility providers, and the business community to support a range of energy efficiency, conservation, and waste reduction measures, including the development of green buildings and infrastructure, weatherization programs, installation of energy-efficient appliances and equipment in homes and offices, promotion of energy efficiency retrofit programs, use of green power options, and heightened awareness of the benefits of energy efficiency and conservation issues.	Public Works – Environmental Services	2025 and ongoing
BE-5.3	Partnership/Funding	Continue to collaborate with regional entities and others to promote incentive programs for energy efficiency retrofits such as the Energy Upgrade California program for residential properties.	Public Works – Environmental Services	2024 and ongoing

Action ID	Pillar	Action	Lead City Department	Timeframe
BE-5.4	Structural Change	Continue to promote the use of the Energy Star Portfolio Manager program and energy benchmarking training programs for nonresidential building owners.	Public Works – Environmental Services	Ongoing
BE-5.5	Equity/Funding	Obtain and prioritize funding for the weatherization program specifically for low, very low, and low-income homeowners, landlords, and renters, to make energy efficiency improvement and improve health and safety of residences.	Public Works – Environmental Services	2026
Measure BE-6 Generate carbon-neutral electricity on City facilities meeting 80% of the municipal electricity needs by 2030.				
BE-6.1	Structural Change	Obtain battery storage in City buildings and critical facilities, including community-based resilience hubs, identified to need power during emergencies or power outages.	Maintenance Services Department – Facility Management	2025
BE-6.2	Partnership/ Feasibility Study	Develop partnerships with organizations, such as the Urban Sustainability Directors Network (USDN) or California Resilience Partnership (CRP), to conduct a feasibility study to identify locations for community resilience hubs within the City, identify grant opportunities, and to develop a plan to implement resilience hubs.	Maintenance Services Department – Facility Management Public Works – Environmental Services Department	2027
BE-6.3	Structural Change	Conduct analysis on risks and benefits associated with relying on battery storage to achieve carbon neutral electricity and grid resiliency goals in the City and set a MW capacity goal for installed battery storage by 2030 and 2045.	Maintenance Services Department – Facility Management Public Works – Environmental Services Department	2026
BE-6.4	Equity	Formally include City facilities that serve as cooling centers to disadvantaged communities in the Energy Assurance Plan (Community Safety program 13) and develop and implement energy resiliency strategies like on-site renewable energy generation or energy storage to ensure center remains active even in power shortages.	Maintenance Services Department – Facility Management Public Works – Environmental Services Department	2024
BE-6.5	Feasibility Study	As part of Energy Assurance Plan (Community Safety program 13), include identifications of locations or complexes (i.e., City facilities, college campuses, critical facilities) in the City for installation of local renewable energy generation, energy storage projects, and/or ideal locations for development of a micro-grid as evaluated in Ava Community Energy feasibility study.	Maintenance Services Department – Facility Management Public Works – Environmental Services Department	2025
BE-6.6	Feasibility Study	Develop the study estimating renewable energy generation on City facilities and schedule for implementing the prioritized solar projects identified. The plan should include an identification of	Maintenance Services Department – Facility Management	2025

Action ID	Pillar	Action	Lead City Department	Timeframe
		barriers and needs for implementation of the prioritized projects as well as identify funding sources and partnerships needed for successful implementation.	Public Works – Environmental Services Department	

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BE-6.7	Partnership	Partner with PG&E and/or Ava Community Energy to ensure smooth integration of renewable energy systems from the identified prioritized projects or other individual solar projects into the grid.	Maintenance Services Department – Facility Management Public Works – Environmental Services Department	2026
BE-6.8	Funding/Education	Identify and advertise incentives available for the community members for installing solar on homes such as Net Metering Programs through PG&E for bill credits, or the Disadvantaged Communities-single-family Solar Homes (DAC_SASH) program. Identify incentives available for businesses and homeowners to install energy storage systems, such as Self Generation Incentive Program (SGIP) and Equity Resiliency rebates that provides an upfront rebate for battery storage and/or the federal investment tax credit for solar batteries installed. Provide resource information to the community through websites, workshops, and partnerships.	Public Works – Environmental Services Department	2025
BE-6.9	Funding /Equity	Partner with affordable housing providers to conduct a feasibility analysis of battery storage and solar projects at the affordable housing in Hayward that are eligible for Equity Resilience Incentives under the SGIP Program.	Public Works – Environmental Services Department City Manager’s Office – Housing Division	2027
BE-6.10	Funding/Partnership	Determine opportunities for the Water Pollution Control Facility to expand existing biogas (i.e., methane) capturing and utilization as part of the Biosolids Master Plan currently underway. The Master Plan document will plan for and phase in improvements for utilizing biogas for the next 20-years including potentially expanding the existing cogeneration facility to produce more energy, or possibly converting to renewable natural gas for pipeline injection off-setting the need to purchase non-renewable natural gas. This master plan is consistent with General Plan policy PFS-4.12 to develop, enhance and maintain clean, green and renewable energy systems at the Water Pollution Control Facility (WPCF).	Public Works – Utilities Division	2024
BE-6.11	Education	Provide educational materials and workshops to large commercial developers and large business property owners of the benefits of microgrids and energy resiliency. Provide resources to identify opportunities for solar installations and/or battery storage on site.	Public Works – Environmental Services	2027
BE-6.12	Feasibility Study	Prepare a plan to facilitate the transition of natural gas appliances to electric in City Facilities. Plan should include an inventory of appliances available for replacement, identify cost where possible, and establish a timeline for replacement.	Public Works – Environmental Services Public Works – Environmental Services Department	2024

Action ID	Pillar	Action	Lead City Department	Timeframe
Measure T-1 Increase active transportation mode share to 15% by 2030 and to 20% by 2045.				
T-1.1	Structural Change	Amend the Off-Street Parking Regulation of Municipal Code to incorporate smart growth principles and to incentivize walking, biking, and public transit.	Public Works – Transportation Division	2026
T-1.2	Structural Change	In support of the General Plan and City land-use policies, maximize infill development, increase land-use and transit efficiencies to support the regional Sustainable Communities Strategy and promote a jobs-housing match. Wlin addition, work with developers to prioritize infill development projects and transit-oriented development zones.	Public Works – Transportation Division City Manager’s Office – Economic Development Division	2027
T-1.3	Structural Change	Based on the completed Complete Streets Assessment, the Complete Streets Inventory Baseline, and the 2020 Bicycle and Pedestrian Master Plan, develop a priority list of complete streets improvements such as retrofits, design standards, and green infrastructure that would accommodate walking, biking, transit use and carpooling. This effort should include a schedule for implementation, prioritization of improvements, identification of whether improvement will aid in walking, biking or transit access, and the plan should ensure equitable roll-out to low-income communities.	Public Works – Transportation Division Public Works – Engineering Division	2027
T-1.4	Structural Change	Adopt and implement a micro-mobility policy that promotes ownership of micro-mobility devices, especially among lower income community members. Promote equitable access to charging facilities for electric micro-mobility devices.	Public Works – Transportation Division	2023 and ongoing
T-1.5	Structural Change	Continue to implement 2020 Bicycle and Pedestrian Master Plan goals of developing 153 new bicycle facilities and 32 miles of multi-use paths for pedestrians and cyclists.	Public Works – Transportation Division	2023 and ongoing
T-1.6	Structural Change	Evaluate and, if necessary, update the City's Zoning Code, Transportation Demand Management Plan (or Administrative Rule 2.26), and California Green Building Code to reflect current transportation demand management opportunities and ensure the City requires sufficient bicycle parking for new commercial development and retrofits.	Public Works – Transportation Division	2027
T-1.7	Structural Change/ Feasibility Study	Update and conduct Underused Rights-of-Way Study such that a community/business survey and evaluation is completed to understand community perspective on potential barriers to conversions and identify barrier solutions. Based on findings, convert recommended amount miles of under used roadways thoroughfare to active transportation corridors to create a connected environment City (i.e., downtown areas). As part of the program, launch a public campaign to gain public and business support to ensure success of such efforts. Consider having pilot programs (i.e., shutting down street lanes for specific events/periods of time) to demonstrate the advantages of proposed improvements.	Public Works – Transportation Division	2026
T-1.8	Structural Change	Identify streets for permanent through traffic closures to promote walking, biking, and other forms of active transportation.	Public Works – Transportation Division	2026
T-1.9	Structural Change	Identify areas of the City to remove parking and/or additional traffic lanes to prioritize outdoor seating and make permanent outdoor dining established during Covid 19.	Public Works – Transportation Division	2024

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T-1.10	Equity	Prioritize active transportation and mobility projects in historically under-invested neighborhoods.	Public Works – Transportation Division	2024 and ongoing
T-1.11	Partnership/ Education	Partner with schools, employers, transit agencies, Hayward Area Recreation and Park District (HARD), and community groups to teach bicycle and pedestrian safety in schools and workplaces and to educate residents and businesses about the health and environmental benefits of walking, bicycling, and using public transit.	Public Works – Transportation Division	2028
T-1.12	Partnership	Partner with community organizations and local bike shops to provide rebates for low-income community members to purchase bicycles, helmets, pumps, e-bikes, e-scooters, and other related equipment. Work with community partners to provide incentives to promote bicycle, e-bike and e-scooter ownership.	Public Works – Transportation Division City Manager’s Office - Economic Development	2025
T-1.13	Equity/Funding	Partner with community groups to obtain funding through the California Air Resources Board Car Sharing and mobility Options program for a pilot bike-share program in low-income communities and to connect low-income communities with the E-Bike Purchase Incentive Program through CalBike.	Public Works – Transportation Division City Manager’s Office - Economic Development	2025
T-1.14	Equity	Ensure there is equitable access to safe bicycle and pedestrian infrastructure in all areas of the city. Prioritize the development of pedestrian and bicycle infrastructure in low-income communities where there is currently no or limited pedestrian and bicycle infrastructure	Public Works – Transportation Division	2024
T-1.15	Feasibility Studies	Based on the identified barriers to completing the Complete Streets Evaluation including limited staff and fiscal resources, develop strategies to reduce or eliminate barriers, such as identifying staff to assign the Complete Streets Evaluation to.	Public Works – Transportation Division	2026
T-1.16	Funding	Devote staff time to managing, tracking and applying for grant funding to complete projects that would improve active transportation or mobility in the community.	Public Works – Transportation Division City Manager’s Office - Economic Development	2024 and ongoing
Measure T-2 Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.				
T-2.1	Structural Change	Continue to promote infill development and/or new development that is compact, mixed use, pedestrian friendly, and transit oriented.	Public Works – Transportation Division	2023 and ongoing
T-2.2	Structural Change	Adopt a policy or code into the Municipal code that establishes specific standards for new development of public space to be transit accessible and multi-functional by co-locating public facilities.	Public Works – Transportation Division	2030
T-2.3	Structural Change	Consistent with the Downtown Parking Management Plan and Downtown Specific Plan, adopt parking requirements into the Municipal code that are appropriate for a mixed-use, walkable, and transit-oriented district. Evaluate opportunities in the Downtown area to designate streets for transit only.	Public Works – Transportation Division	2025

Action ID	Pillar	Action	Lead City Department	Timeframe
T-2.4	Structural Change	Develop and adopt an ordinance requiring new multi-family development projects to install a car share or provide e-bikes/e-scooters to each new tenant.	Public Works – Transportation Division	2029
T-2.5	Structural Change	Evaluate and prioritize transit stops needing renovations that do not meet the adopted Pedestrian Design Standard for Transit Stop. Upgrade transit stops such that they include bicycle parking and shade trees or structures and are designed to promote use.	Public Works – Transportation Division	2028
T-2.6	Structural Change	Consistent with the intention of Senate Bill 10, allow developers to build housing without off-street parking if they're close to frequent transit service.	City Manager's Office – Housing Division Public Works – Transportation Division	2024
T-2.7	Funding/Structural	Through the adoption of an ordinance or incorporation into large commercial building codes, require all employers to develop a Transportation Demand Management (TDM) Plan. TDM plans should include money-based incentives for employees to bike, walk, carpool, or take the bus to work. In alignment with BAAQMD requirement, require large employers (more than 50 employees) to subsidize biking, walking, or bus travel.	Public Works – Transportation Division	2025
T-2.8	Partnership/Equity	Expand the Student Transit Pass Program (STPP), which provides free youth clipper cards with unlimited bus rides to middle and high schools students, to provide free AC transit to college students and low-income community members.	Public Works – Transportation Division City Manager's Office – Economic Development	2025
T-2.9	Partnership	Collaborate and engage with AC Transit to understand how they are addressing the Innovative Clean Transit Rule and their plan to electrify their bus fleet.	Public Works – Transportation Division	2024
T-2.10	Funding	Dedicate staff time or create a staff position to pursue funding opportunities to implement planned City transit/TDM projects and programs and to support AC Transit in obtaining grant funding for region-wide service expansion.	Public Works – Transportation Division City Manager's Office – Economic Development	2024
T-2.11	Feasibility Study	Conduct local transportation surveys to better understand the community's needs and motivation for traveling by car versus other alternatives such as AC Transit or BART. Use survey results to inform policy development and education/outreach campaigns that are transit focused. Consistent with the previous CAP policy M-3 (Survey Transportation and Transit Gaps and Barriers)	Public Works – Transportation Division	2025
T-2.12	Feasibility Study	Assess the feasibility and GHG reduction impact of banning cars in high-traffic zone(s) or on individual roads in the City where other transit options are available by implementing a congestion charge that applies to passenger cars and car-sharing services like Uber and Lyft with exceptions for handicap drivers and residents of those areas.	Public Works – Transportation Division Public Works – Environmental Services Division	2029
T-2.13	Feasibility Studies/ Partnerships	Partner with AC Transit to conduct a study to determine transit priority corridors and prioritize infrastructure improvements in existing neighborhoods that enable people to better access and use public transit	Public Works – Transportation Division	2026

Action ID	Pillar	Action	Lead City Department	Timeframe
Measure T-3 Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-1 and T-2.				
T-3.1	Structural Change	Develop and adopt a Citywide Transportation Demand Management (TDM) Plan including strategies to reduce peak-hour traffic, such as staggered work hours, flexible schedule options, and telecommuting from home offices. Include updated policy incentives or disincentive options to achieve reductions in peak-hour traffic, reduce traffic congestions and promotes alternative transportation (biking, walking, and use of transit)	Public Works – Transportation Division City Manager’s Office – Economic Development	2024
T-3.2	Structural Change	Continue to require new development adopt transportation demand management strategies to reduce use of single occupancy vehicles and encourage the use of alternative modes of travel. Update development requirements, ordinances, and/or building codes requiring TDM as part of new developments as part of enforcement.	Public Works – Transportation Division	2023 and ongoing
T-3.3	Structural Change	Develop consistent standards for parking minimums and maximums across the city. Reduce parking minimums and parking maximums citywide, as improved active and public transit infrastructure becomes more available. Additionally, price all public parking spaces for all areas of the city based on available transportation options, travel demand, and land use.	Development Services – Planning Division Public Works – Transportation Division	2027
T-3.4	Feasibility Study/ Funding	Evaluate parking pricing structures that would best work with the City of Hayward. Based on evaluation, implement dynamic parking pricing in downtown parking areas and earmark parking revenues to implement other active transportation and transit projects.	Public Works – Transportation Division City Manager’s Office – Economic Development	2029
T-3.5	Feasibility Study	Conduct an analysis of the potential community impacts and benefits of implementing disincentive-based policies for driving single passenger vehicles, including a congestion charge program, limiting parking options, increased local taxes (income tax, gasoline tax, or car registration tax), and Transportation Network Company (TNC) user taxes.	Public Works – Transportation Division City Manager’s Office – Economic Development	2029
T-3.6	Equity	Conduct engagement efforts for the general public and targeted to low-income communities of color during analysis of the disincentive-based transportation policies to understand the community's potential concerns	Public Works – Transportation Division	2026
T-3.7	Equity	Define equity metrics for implementation of disincentives based on feedback from local low-income communities of color and structure the disincentive programs to meet these metrics	Public Works – Transportation Division	2026
T-3.8	Funding	Fund active and public transit programs through a local gasoline tax and/or through paid parking fees.	Public Works – Transportation Division City Manager’s Office – Economic Development	2029
T-3.9	Funding	Implement a Transportation Network Company (TNC) user tax which would put a small fee on the use of Uber and Lyft and generate funds to pay for transit and mobility infrastructure.	Public Works – Transportation Division City Manager’s Office – Economic Development	2029

Action ID	Pillar	Action	Lead City Department	Timeframe
T-3.10	Funding/ Equity	Implement a gasoline/diesel car registration tax starting in 2028 with exemption criteria established for low-income residents.	Public Works – Transportation Division City Manager’s Office – Economic Development	2028
T-3.11	Structural Change	Increase Broadband Internet Access. Add a program to encourage more working from home and reducing the need to travel for work.	Public Works – Transportation Division City Manager’s Office – Community Services Division	2026
Measure T-4 Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045				
T-4.1	Structural Change	Continue to enforce the Hayward EV Charger Reach Code requiring electric vehicle charging stations in new development projects.	Development Services – Planning Division Public Works – Environmental Services Division	2023 and ongoing
T-4.2	Structural Change	Work with Ava Community Energy to install 100 new publicly accessible EV chargers by 2030 through public private partnerships and on City owned properties.	Public Works – Environmental Services Division	2023 and ongoing
T-4.3	Structural Change	Continue to maintain a streamlined EV infrastructure permitting process and ordinance in accordance with AB 1236.	Development Services – Building Division	2023 and ongoing
T-4.4	Structural Change	Require that new private parking lots grant zero emission vehicles (ZEVs) access to preferred parking spaces.	Development Services – Planning Division	2028
T-4.5	Structural Change	Coordinate with local agencies and community-based organizations, agencies, and non-profits to conduct zero-emission vehicle (ZEV) education events for residents and targeted events for low-income communities that would evaluate the barriers to ZEV adoption, include information on costs/benefits of owning ZEVs, steps on how to receive incentives for ZEVs, and other benefits.	Public Works – Transportation Division Public Works – Environmental Services Division	2025 and ongoing
T-4.6	Education/Equity	Explore opportunities with CARB, BAAQMD, or other agencies to start a purchase rebate program and provide higher trade-in value for combustion vehicles to assist lower-income households to purchase EVs.	Public Works – Transportation Division	2025

Action ID	Pillar	Action	Lead City Department	Timeframe
			Public Works – Environmental Services Division	
T-4.7	Equity	Develop outreach and education materials and distribute to local businesses and organizations on the financial, environmental, and health and safety benefits of ZEVs. Provide information on available funding opportunities.	Public Works – Transportation Division Public Works – Environmental Services Division	2028
T-4.8	Education	Work with Ava Community Energy and PG&E to incentivize residential electric vehicle charger installations through on-bill financing	Public Works – Transportation Division Public Works – Utilities Division Public Works – Environmental Services Division	2028
T-4.9	Funding	Evaluate opportunities for EV or hydrogen charging infrastructure through State and utility programs, like LCFS or PG&E EV Fast Charge Program. Disseminate information via outreach and education materials.	Public Works – Transportation Division Public Works – Utilities Division Public Works – Environmental Services Division	2025 and ongoing
T-4.10	Funding	Partner with Ava Community Energy to aid in Ava Community Energy’s survey of existing publicly accessible electric vehicle chargers and their locations and identify a prioritized list of locations in Hayward for new electric vehicle charging stations with particular consideration for equitable distribution of chargers to residents of multi-family homes, low-income people, people on a fixed income, and communities of color.	Public Works – Transportation Division Public Works – Environmental Services Division	2023 and ongoing
T-4.11	Feasibility Study/Partnership	Support zero-emission vehicle (ZEV) car share companies in coming to the City. Coordinate with car share companies and community-groups to develop an affordable, zero-emission vehicle (ZEV) car share to serve affordable housing and/or multifamily developments with a priority to target low-income communities of color.	Public Works – Transportation Division Public Works – Environmental Services Division	2026-2030
T-4.12	Partnership	Collaborate with neighboring jurisdictions and the Alameda County Transportation Commission to develop a connected network of ZEV car share.	Public Works – Transportation Division Public Works – Environmental Services Division	2029

Action ID	Pillar	Action	Lead City Department	Timeframe
Measure T-5 Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.				
T-5.1	Structural Change	Work with stakeholders to develop and implement a plan for City-supported accelerated fleet electrification. As part of the plan, identify opportunities for accelerated fleet electrification and promote ZEV/EV adoption within business fleets.	Public Works – Transportation Division Public Works – Environmental Services Division	2028
T-5.2	Funding	Identify incentives for accelerated business fleet electrification and communicate that information to local businesses.	Public Works – Transportation Division Public Works – Environmental Services Division	2026
T-5.3	Education	Engage with local employers and business fleet owners in the City to identify opportunities for accelerated fleet conversion to ZEV/EV. Provide information on the requirements of the Advanced Clean Fleets rule and available funding sources for fleet replacements (e.g., LCFS, Clean Truck and Bus Voucher).	Public Works – Transportation Division Public Works – Environmental Services Division	2026
T-5.4	Partnership	Develop and maintain a collaborative of stakeholders (e.g., local major employers, commercial business) to lead the creation of best practices and the pursuit of funding for ZEV/EV infrastructure as well as public and private zero-emission business vehicle fleets.	Public Works – Transportation Division Public Works – Environmental Services Division	2026
T-5.5	Feasibility Studies	Conduct an inventory of business vehicle fleets in Hayward and identify employers and businesses subject to the Advanced Clean Fleets rule as well as those to target for accelerating ZEV/EV adoption.	Public Works – Transportation Division Public Works – Environmental Services Division	2029
Measure T-6 Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045				
T-6.1	Structural Change	Support and promote CARB’s regulations requiring most newly manufactured small off-road engines such as those found in leaf blowers, lawn mowers, and other equipment to be zero emission starting in Model Year 2024. Phase 2 of the regulations will be implemented in Model Year 2028, when the emission standards for generators and large pressure washers will be zero. In addition, work with Hayward Chamber of Commerce to disseminate information regarding the regulation to impacted businesses (e.g., lawn equipment dealers, commercial landscapers, construction companies) and promote transition of equipment sales and equipment use to electric alternatives. <i>Key Pillar: Education/Partnership</i>	Public Works – Transportation Division Public Works – Environmental Services Division	2024 and ongoing

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T-6.2	Structural Change	Develop and implement a plan to replace all City owned end-of-life off-road equipment with zero-emission equipment. Plan should include evaluation of current City-owned equipment, alternative low or zero-emission options, prioritize equipment to replace first (e.g., largest GHG emission reduction potential), and a timeline for replacements that align with goals and feasibility of replacement.	Public Works – Transportation Division Public Works – Environmental Services Division	2027
T-6.3	Education	Develop an Off-road Equipment Replacement Program and Outreach Campaign that provides information to contractors, residents, and fleet operators in Hayward regarding alternatives to fossil-fueled off-road equipment, public health and safety benefits of alternative equipment technology, and funding opportunities available (i.e., Clean Off-Road Equipment Voucher Incentive Program CORE)), Zero-Emission Landscaping Equipment Incentive Programs).	Public Works – Transportation Division Public Works – Environmental Services Division	2026 and ongoing
T-6.4	Funding	Partner with BAAQMD to identify funding opportunities to encourage residents to replace gas-powered landscaping equipment and off-road engines with zero emission equipment.	Public Works – Transportation Division Public Works – Environmental Services Division	2025
T-6.5	Partnership/ Funding	Partner with BAAQMD to develop a rebate and incentive program for upgrading off-road equipment and switching to biofuels.	Public Works – Transportation Division Public Works – Environmental Services Division	2026
T-6.6	Feasibility Study	Conduct a study to assess the technological and economic feasibility of replacing the City-owned off-road equipment fleets.	Public Works – Transportation Division Public Works – Environmental Services Division	2025
T-6.7	Feasibility Study	Conduct an inventory of major off-road equipment fleets in Hayward and identify fleets with highest decarbonization potential.	Public Works – Transportation Division Public Works – Environmental Services Division	2029

Action ID	Pillar	Action	Lead City Department	Timeframe
Measure T-7 Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.				
T-7.1	Structural Change	Establish and adopt Zero-emission Fleet Conversion and Purchase Policy that requires new, and replacement municipal fleet vehicle purchases are EVs or ZEVs. The policy will also include a schedule for replacement of fleet vehicles to meet a 100% carbon neutral fleet by 2040.	Public Works – Transportation Division Public Works – Environmental Services Division	2023
T-7.2	Structural Change/Feasibility Study	Conduct feasibility and cost assessment to determine the number of EV/ZEV chargers and funds needed to support the fleet transition to 50% EV/ZEV by 2030. Expand EV/ZEV charging infrastructure for city fleet and employees in alignment with feasibility study.	Public Works – Transportation Division Public Works – Environmental Services Division	2023 and ongoing
T-7.3	Funding	Secure funding from programs such as the California Air Resources Board's Clean Vehicle Rebate Project and the Clean Truck and Bus Voucher Incentive Program to increase procurement of EV or ZEV cars, trucks, and other vehicles and installation of EV/ZEV charging/fueling infrastructure at municipal facilities.	Public Works – Transportation Division Public Works – Environmental Services Division	2023 and ongoing
T-7.4	Funding	Evaluate credit generation opportunities within the Low Carbon Fuel Standard (LCFS) program for ZEV/EV fueling and charging stations for the municipal fleet to offset cost of infrastructure development needed to support transition.	Public Works – Transportation Division Public Works – Environmental Services Division	2025
Measure SW-1 Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics 75% by 2025 and 90% by 2045.				
SW-1.1	Structural Change	Adopt procurement policies to comply with SB 1383 requirements for jurisdictions to purchase recovered organic waste products.	Public Works – Environmental Services Division	2024
SW-1.2	Structural Change	Continue to implement exclusive hauling agreement with Waste Management of Alameda County (WMAC) that regulates haulers collecting organic waste, including collection program requirements and identification of organic waste receiving facilities.	Public Works – Environmental Services Division	2023 and ongoing
SW-1.3	Structural Change	Continue to implement edible food recovery ordinance for edible food generators, food recovery services, or organizations that are required to comply with SB 1383. Ordinance requires all residential and commercial customers to subscribe to an organic waste collection program and/or report self-hauling or backhauling of organics.	Public Works – Environmental Services Division	2024
SW-1.4	Structural Change	Implement enforcement and fee for incorrectly sorted materials with sensitivity to shared collection. Utilize funding to implement programs and efforts to increase communitywide organic waste diversion.	Public Works – Environmental Services Division	2023

Action ID	Pillar	Action	Lead City Department	Timeframe
SW-1.5	Education	Work with StopWaste to conduct targeted outreach with food recovery organizations, generators, haulers, facilities, and local agencies to promote strategies to implement requirements of SB 1383	Public Works – Environmental Services Division	2023 and ongoing
SW-1.6	Education	Encourage businesses to educate their employees about organic waste diversion and proper sorting annually by providing training resources and rebate program to fund employee time for training.	Public Works – Environmental Services Division	2023 and ongoing
SW-1.7	Partnership	Partner with local community organizations, public agencies like StopWaste and businesses to implement all required activities under SB 1383.	Public Works – Environmental Services Division	2023 and ongoing
SW-1.8	Equity	Provide free compost bins and kitchen-top food waste containers to low-income communities of colors and elderly households in order to increase compost participation. Evaluate opportunities to have a community compost hub that is easily accessible to disadvantaged neighborhoods	Public Works – Environmental Services Division	2023
SW-1.9	Equity	Establish relationships with multi-family property owners/managers to develop signage for their properties. Present at all Home-Owner Associations in Hayward annually and provide supplies and education for proper sorting.	Public Works – Environmental Services Division	2023 and ongoing
SW-1.10	Partnership	Establish an edible food recovery program to minimize food waste. Leverage CalRecycle supports projects that prevent food waste or rescue edible food. Partner with existing food pantries like CSUEB, South Hayward Parish to identify and advertise locations for surplus food to be taken in the community.	Public Works – Environmental Services Division	2025
SW-1.11	Partnership	Work with contracted hauler to: - Provide quarterly route reviews to identify prohibited contaminants potentially found in containers that are collected along route. - Clearly label all new containers indicating which materials are accepted in each container, and by January 1, 2024 place or replace labels on all containers. - Develop and implement a comprehensive monitoring and quality control program with a focus on consumer behavior change.	Public Works – Environmental Services Division	2023 and ongoing
SW-1.2	Partnership/ Funding	Work with local organizations, StopWaste, and investigate various funding/ grant opportunities to fund edible food recovery organizations so they can expand and handle increased volume.	Public Works – Environmental Services Division	2024
SW-1.13	Partnerships	Partner with schools, retirement communities, and other large institutions to create waste diversion and prevention program/procedure/plan.	Public Works – Environmental Services Division	2023 and ongoing
SW-1.14	Feasibility Studies/ Partnership	Partner with StopWaste to conduct a feasibility study and identify next steps to ensure edible food reuse infrastructure in Hayward is sufficient to accept capacity needed to recover 20% of edible food disposed or identify proposed new or expanded food recovery capacity within Hayward.	Public Works – Environmental Services Division	2024

Action ID	Pillar	Action	Lead City Department	Timeframe
Measure SW-2 Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.				
SW-2.1	Structural Change	Continue to implement the Organics Reduction and Recycling Ordinance (ORRO) adopted in November 2021 in alignment with the Countywide ORRO ordinance. Support StopWaste and County Environmental Health in the enforcement of the ORRO within the City.	Public Works – Environmental Services Division	2025
SW-2.2	Structural Change	Review recent circular economy bills signed by the governor (i.e., SB 343, AB 881, AB 1201, AB 962, AB 1276) and incorporate requirements into hauling agreements, and municipal codes for full-service restaurants and local manufacturing businesses.	Public Works – Environmental Services Division	2025
SW-2.3	Structural Change	Continue to enforce the Hayward Construction and Demolition Debris Recycling Ordinance.	Public Works – Environmental Services Division	2023 and ongoing
SW-2.4	Structural Change	Adopt a City wide Zero Waste Goal and develop a Zero Waste Strategic Plan to increase diversion from the landfill by 85% 2045.	Public Works – Environmental Services Division	2027
SW-2.5	Structural Change	Create a requirement for large events to hire an event waste management team.	Public Works – Environmental Services Division	2028
SW-2.6	Partnership	Regularly evaluate and update new franchise agreement with Waste Management of Alameda County to meet SB 1383 requirements and to implement new components to further divert waste from landfills. Work with (WMAC) hauler to determine data necessary to meet zero waste goals and establish protocol for regular collection and reporting of associated metrics. Identify dedicated staff responsible for this.	Public Works – Environmental Services Division	2023 and ongoing
SW-2.7	Structural Change/ Funding	Require food service providers to implement a fee for single-use food ware.	Public Works – Environmental Services Division	2025
SW-2.8	Education/ Equity	Partner with StopWaste to conduct targeted, multi-lingual, culturally appropriate, and geographically diverse waste prevention educational and technical assistance campaigns based on outcomes of a waste characterization study (WCS). Such as food waste prevention, edible food recovery strategies, proper storage, how to fix clothes/electronics, how to donate, reusable alternatives, effects of over consumption, sustainable consumption habits, buying second hand, buying durable, sharing, repurposing. Continue to conduct outreach regarding AB 1276 to full-service restaurants.	Public Works – Environmental Services Division	2024
SW-2.9	Partnership	Continue to work with StopWaste and haulers to monitor participation in residential recycling programs, create education materials for the community, provide technical assistance to business to implement mandatory recycling, and identify other opportunities and means to promote zero waste efforts.	Public Works – Environmental Services Division	2023 and ongoing

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Action ID	Pillar	Action	Lead City Department	Timeframe
SW-2.10	Partnership	Work with StopWaste and the business community to design and promote extended producer responsibility such as take-back programs.	Public Works – Environmental Services Division	2029
SW-2.11	Feasibility Study	Conduct a consumption-based GHG emissions inventory to understand the community’s worst consumption habits and emission reduction potential and provide educational materials on a closed-loop circular economy.	Public Works – Environmental Services Division	2028
SW-2.12	Structural Change	Work with local businesses to establish post-consumer recycled content requirements that meet SB 343 recyclability claims as part of their purchasing criteria.	Public Works – Environmental Services Division	2028
SW-2.13	Partnership/Equity	Partner with local organizations, schools, and libraries to establish pop-up repair cafes for commonly broken and easily repaired items. Partner with the library to promote reuse by increasing accessibility to shared tools through a tool lending library.	Public Works – Environmental Services Division	2026
SW-2.14	Structural Change	Based on existing StopWaste waste characterization studies and Litterati litter assessment, increase bans on “problem materials” (i.e., items without means of recycling or recycling markets, such as sale of polystyrene, plastic packaging, straws, plastics #4-7, mixed materials). Enforce the single-use plastic pre-checkout ban, by January 1, 2025, in alignment with SB-1046.	Public Works – Environmental Services Division	2024
SW-2.15	Funding	Explore funding opportunities to increase the circular food economy.	Public Works – Environmental Services Division	2024
Measure WW-1. Reduce water consumption by 15% by 2030 and maintain it through 2045.				
WW-1.1	Structural Change	Continue to implement the City’s Bay-Friendly Water Efficient Landscape ordinance applicable to all land use types to decrease water consumption.	Public Works – Utilities Division Maintenance Services Department – Landscape Maintenance	2023 and ongoing
WW-1.2	Structural Change	Continue to implement and enforce the Water Conservation Standards within the Municipal Code via the Prohibition of Wasteful Water Practices Ordinance for households, businesses, industries, and public infrastructure.	Public Works – Utilities Division	2023 and ongoing
WW-1.3	Structural Change	Continue to implement rebate and water conservation device tracking system to track the number of rebates and water devices distributed.	Public Works – Utilities Division	2023 and ongoing
WW-1.4	Structural Change	Continue to implement the Recycled Water Program which includes expanding facilities if necessary to deliver recycled water to additional customers, working with customers to complete site retrofits, connecting customers to the recycled water system, and ensuring customer deliveries.	Public Works – Utilities Division	2023 and ongoing

Action ID	Pillar	Action	Lead City Department	Timeframe
WW-1.5	Education/Funding	Continue to offer water conservation programs to the community including educational programs like water education program for schools and water wise landscape classes as well as incentives like free water conserving devices, and rebates for rain barrels and turf replacement.	Public Works – Utilities Division	2023 and ongoing
WW-1.6	Education/Equity	As part of the water conservation programs offered implement a public education campaign that in addition to highlighting water conservation practices, with focus on low-income households with high utility bill burdens.	Public Works – Utilities Division	2023 and ongoing
WW-1.7	Equity	Ensure that water conservation educational materials, programs and outreach efforts are in multiple languages and accessible for low-income or disadvantaged communities.	Public Works – Utilities Division	2024
WW-1.8	Equity	Perform targeted outreach to low-income communities and elderly households to provide free water conservation devices and aid disadvantaged community members in obtaining available rebates for water conservation devices.	Public Works – Utilities Division	2024
WW-1.9	Partnerships/Equity	Partner with programs such as Green House Call or other similar programs to support community members with installation of water saving devices with a particular focus of support for low-income, elderly, or disadvantaged elderly residents.	Public Works – Utilities Division	2023 and ongoing
WW-1.10	Partnership	Continue to coordinate with commercial and industrial customers including the Hayward Area Recreation and Park District and the Hayward Unified School District to advance water recycling programs.	Public Works – Utilities Division Maintenance Services Department – Landscape Maintenance	2023 and ongoing
WW-1.11	Feasibility Studies	Develop a Recycled Water Master Plan to assess the feasibility of expanding the recycled water system and establish a roadmap for a recycled water expansion program. The plan will identify the locations available for recycled water use, the capacity needed to fully replace potable water use at identified locations and establish a schedule for potable water replacement with recycled water for appropriate applications.	Public Works – Utilities Division	2024
WW-1.12	Education	Promote the use of on-site gray water and rainwater collection systems	Public Works – Utilities Division	2026
Measure CS-1 Increase carbon sequestration by planting and maintain 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.				
CS-1.1	Structural Change	Update the Tree Preservation Ordinance by Q2 2024 to maintain existing carbon stock is maintained and that replacement trees that are climate resilient and drought tolerant for Hayward's climate. Ordinance updates may include development requirements to protect or replace value-to-value existing trees and greenspace; and a requirement for a cash mitigation fee equal to the value of trees removed.	Development Services Maintenance Services Department – Landscape Maintenance	Start 2023

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Action ID	Pillar	Action	Lead City Department	Timeframe
CS-1.2	Structural Change	Develop and adopt an Urban Forest Management Plan that identifies: City's potential capacity for new tree planting; timeframe and mechanism for implementation; a management plan for existing trees; and a tracking system to assess progress towards annual benchmark. (Replaces existing General Plan program HQL-5.)	Maintenance Services Department – Landscape Maintenance	2025
CS-1.3	Feasibility Study	Identify and map public spaces that can be converted to green space, including freeway airspace that can be made into green space, vertical walls that can be planted with vines, and rooftops of public buildings that can be developed into gardens.	Public Works-Environmental Services Division Maintenance Services Department – Landscape Maintenance	2024
CS-1.4	Partnership/ Funding	Partner with community groups to apply for community garden grants and develop new or expand existing community gardens based on the identified public spaces available for green space conversion.	Public Works-Environmental Services Division	2024
CS-1.5	Equity	Adopt a standard policy and set of practices for expanding the urban tree canopy and placing vegetative barriers between busy roadways and developments to reduce exposure to air pollutants from traffic.	Public Works-Environmental Services Division Maintenance Services Department – Landscape Maintenance	2026
CS-1.6	Feasibility Study/Equity	Conduct an urban canopy study to identify areas in Hayward that have below average canopy coverage and implement a tree planting program focusing on the least covered portions of the City. Establish a goal of having no significant difference in canopy coverage between high and low-income areas citywide by 2030.	Public Works-Environmental Services Division Maintenance Services Department – Landscape Maintenance	Study: 2023-2024; Adopt Goal: 2024
CS-1.7	Education	In addition, or as an expansion to the Adopt-a-Block Program establish an adopt-a-tree or adopt-a-street program that is specific to further greening and tree planting. The program will enable individuals, businesses, and community organizations to plant and care for trees in selected communities. Program should provide formalized information on appropriate trees eligible for planting in Hayward (i.e., native, drought tolerant, locations)	Public Works-Environmental Services Division Maintenance Services Department – Landscape Maintenance	2026

Action ID	Pillar	Action	Lead City Department	Timeframe
CS-1.8	Funding	Dedicate staff time to obtaining grant funding for tree planting. Identify and apply for applicable federal (e.g., USDA) and state (e.g., California ReLeaf, Affordable Housing and Sustainable Communities Program (AHSC), Urban and Community Forestry Program) grants for tree planting and maintenance projects.	Public Works- Environmental Services Division Maintenance Services Department – Landscape Maintenance	2023
CS-1.9	Funding	Explore opportunities to fund the Urban Forest Management Program. Possibilities include use of general tax revenues, permit fees, or revenues from the municipal tree ordinance enforcement.	Public Works- Environmental Services Division Maintenance Services Department – Landscape Maintenance	2023
CS-1.10	Funding	Establish a Tree Trust or Tree Endowment where the interest on the principal can be used for purchasing trees, paying for tree maintenance, or for staff resources for the Urban Forest Management Program.	Public Works- Environmental Services Division	2027
CS-1.11	Partnerships	Partner with private developers, CSU, Chabot College, HARD, HUSD, and other community-based organizations to support and contribute to the Urban Forest Management Program	Public Works- Environmental Services Division	2027
CS-1.12	Funding	Establish alternative fee mechanisms, similar to the SF Carbon Fund, to fund nature-based solutions. By 2026, create permanent code and financial incentives for homeowners and other private landowners to preserve existing mature trees and shrubs and to plant local native species.	Public Works- Environmental Services Division City Manager's Office – Economic Development Division	2027
CS-1.13	Feasibility Study	Identify existing greenbelts and the best locations for new greenbelts for wildfire defense and risk reduction. Incorporate these locations into comprehensive wildfire planning at regional, county, city, and community levels and in all Municipal Service Reviews.	Public Works- Environmental Services Division Fire Department	2025

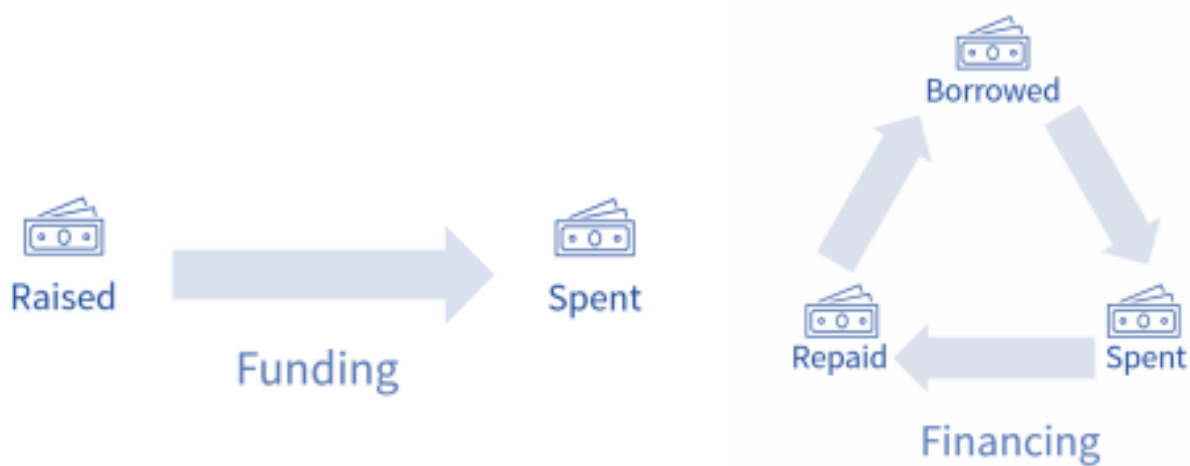
Action ID	Pillar	Action	Lead City Department	Timeframe
Measure CS-2 Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030.				
CS-2.1	Structural Change	Enforce compliance with SB 1383 by establishing a minimum level of compost application per year on applicable/appropriate land throughout the City including City-owned land.	Public Works- Environmental Services Division	Start in 2024 and ongoing
CS-2.2	Structural Change	Adopt procurement policies to comply with SB 1383 requirements for jurisdictions to purchase recovered organic waste products.	Public Works- Environmental Services Division	2024
CS-2.3	Structural Change/ Equity	Work with Hayward Area Recreation and Park District to develop and adopt urban park guidelines that 1) Provide flexible solutions for developing urban parks in infill areas where traditional neighborhood and community parks are not feasible; 2) Establish guidelines for achieving the greatest carbon sequestration potential of parks via design; 3) Are equitable in ensuring such urban parks are accessible for lower-income residents while avoiding displacement, in alignment with the Parks Master Plan.	Public Works- Environmental Services Division	2025
CS-2.4	Feasibility Study	Identify locations within Hayward to apply compost to help meet the procurement requirements of SB 1383.	Public Works- Environmental Services Division	2024
CS-2.5	Education	Work with StopWaste to provide residents, businesses, and developers with educational material on best practices for using compost in landscaping.	Public Works- Environmental Services Division	2023
CS-2.6	Funding	Explore opportunities to use the parkland in-lieu fees from the updated City's Property Developers - Obligations for Parks and Recreation Ordinance (Article 16 of City's municipal code) to implement the Carbon Management Activities Program (NR 15).	Public Works- Environmental Services Division	2029
CS-2.7	Partnerships	Collaborate with Chabot College, CSUEB, and local schools to identify opportunities to apply compost to landscaping.	Public Works- Environmental Services Division Maintenance Services Department – Landscape Maintenance	2024
CS-2.8	Partnerships	Work with Alameda County and StopWaste to identify opportunities for a regional compost procurement program to help meet the organics procurement provisions of SB 1383.	Public Works- Environmental Services Division	2024

Action ID	Pillar	Action	Lead City Department	Timeframe
CS-2.9	Partnership	Work with the City's franchisee under the new franchise agreement with Waste Management of Alameda County to provide compost throughout the community.	Public Works- Environmental Services Division	Start in 2023 and ongoing
CS-2.10	Feasibility Study	Conduct a study to identify opportunities to enhance or create new natural areas in existing open spaces, parklands, and fields with native species, biodiverse ecology, higher carbon sequestration potential and improved recreational connectivity for the community.	Public Works- Environmental Services Division	2028
CS-2.11	Education	Create and deliver a range of resources to train residents, city gardening staff, and other institutions on how to incorporate biodiversity, soil, and carbon sequestration techniques into landscaping and gardening projects.	Public Works- Environmental Services Division Maintenance Services Department – Landscape Maintenance	2025

13.2 Funding Considerations

Identifying funding and financing mechanisms that go beyond municipal sources is central to unlocking investments that generate benefits for Hayward residents and businesses. Funding and financing strategies that supplement City-led approaches may also lessen the burden on low-income residents by funding investments that specifically support disadvantaged communities in Hayward.

Funding refers to the money used for a specific purpose or projects, raised at one time or over time through methods like grants or taxes. Financing refers to the process of receiving money that must eventually be paid back to financial institutions lending it. Therefore, financing presupposes an underlying revenue source for repayment over time.



The City will need to identify and partner with a variety of constituents in order to successfully fund and finance CAP implementation. Examples of constituents the City may engage with include:

- Tenants
- Property Owners
- Business Owners
- Building Developers
- Utility Rate Payers
- Utility Providers (e.g., Ava Community Energy)
- Public Institutions or Non-profits (e.g., schools and colleges)
- Private Institutions (e.g., solar installers)
- State Entities (e.g., California Transportation Commission)
- Regional Entities (e.g., Metropolitan Transportation Commission)
- Federal Entities (e.g., Environmental Protection Agency)
- Taxpayers

Types of funding and financing options to implement the CAP measures and actions may include:

- Funding through an assessment district, which is a charge imposed on property owners in a given district through installments on property tax bills.
- Funding through a neighborhood land trust organization, which is a non-profit organization that owns and manages capital, operations, and maintenance of land in a community ownership model.
- Financing through tariffed on-bill financing (TOBF). For building electrification, in a TOBF, a utility provider pays for upgrades under the terms of an added tariff.
- Federal grant and rebate programs through Inflation Reduction Act (IRA) programs including:
 - IRA Building Electrification Programs for Local Governments,
 - IRA Building Electrification Programs for Residents
 - IRA Commercial or Multi-family Building Electrification and Decarbonization Programs for Local Governments
 - IRA Transportation and Mobility Programs for Local Governments
 - IRA Urban Shade and Forestry Programs for Local Governments
- Public or private grant opportunities
- Power purchase agreements

Hayward's CAP project team has been active in pursuing various funding and financing options. The City will continue to pursue funding and financing options to implement CAP measures and actions. Funding requests to implement measures and actions in this plan will be brought for consideration by the City Council in the respective budget cycle.

13.3 Looking Forward

If the City does not make satisfactory advancements toward its GHG emissions reduction targets before the next review of the CAP, it may be necessary to revise the CAP. This update would set new or stronger goals for emissions reduction, aiming to increase the reduction efforts and maintain its status as a CEQA-qualified GHG emissions reduction plan. The next CAP update could require additional implementation of the existing actions and/or additional actions such as shifting incentive and educational programs to mandatory requirements. A comprehensive CAP update for GHG emissions reduction targets beyond 2030 will be required and the City will initiate this process by 2029.

In 2029, it is expected that the City will commence the process to review and update the CAP to augment or develop new measures and actions to meet the 2045 GHG emissions reduction target. As new technologies are made available and state regulations are adopted, the City will need to augment the CAP to facilitate further GHG emissions reduction and meet the 2045 carbon neutrality goal. The City will conduct ongoing implementation and monitoring of the CAP GHG emissions reduction measures and report on this progress to the City Council on a bi-annual basis beginning in 2025.

14 Conclusion

The City of Hayward boasts a history of robust leadership in addressing the climate crisis. Through the implementation of the 2014 CAP, the City took decisive action to achieve a 20 percent reduction in GHG emissions from 2005 levels, laying solid groundwork for sustained long-term climate action. Hayward's consistent dedication to mitigating climate change has made significant progress toward ambitious emission reduction targets, while simultaneously fostering an improved quality of life within the Hayward community. The City of Hayward can act now and over the next two decades to do its fair share in reducing GHG emissions that contribute to climate change. This updated CAP provides a guiding framework for continued progress towards a more resilient, prosperous, and sustainable Hayward achieved through the collective efforts of all Hayward community members.

15 Acknowledgements

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Hayward City Council Sustainability Committee

Councilmember Angela Andrews
Councilmember Julie Roche
Councilmember Francisco Zermeno
Former Mayor Barbara Halliday
Former Councilmember Elisa Márquez

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Consultant Support

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Hatch

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Appendix A

Climate Regulatory Context

Climate Regulatory Context

As the impacts of climate change are being recognized, many strategies that address climate change have emerged at several different levels of government. This appendix provides an overview of the regulatory context at the international, State, and local levels relative to Hayward's actions toward reducing its communitywide greenhouse gas (GHG) emissions.

International Climate Action Guidance

1992 United Nations Framework Convention on Climate Change

The primary international regulatory framework for GHG reduction is the United Nations Framework Convention on Climate Change Paris Agreement (UNFCCC). The UNFCCC is an international treaty adopted in 1992 with the objective of stabilizing atmospheric GHG concentrations to prevent disruptive anthropogenic climate change. The framework established non-binding limits on global GHG emissions and specified a process for negotiating future international climate-related agreements.¹

1997 Kyoto Protocol

The Kyoto Protocol is an international treaty that was adopted in 1997 to extend and operationalize the UNFCCC. The protocol commits industrialized nations to reduce GHG emissions per country-specific targets, recognizing that they hold responsibility for existing atmospheric GHG levels. The Kyoto Protocol involves two commitment periods during which emissions reductions are to occur, the first of which took place between 2008-2012 and the second of which has not entered into force.²

2015 The Paris Agreement

The Paris Agreement is the first-ever universal, legally binding global climate agreement that was adopted in 2015 and has been ratified by 189 countries worldwide.³ The Paris Agreement establishes a roadmap to keep the world under 2° C of warming with a goal of limiting an increase of temperature to 1.5° C. The agreement does not dictate one specific reduction target, instead relying on individual countries to set nationally determined contributions (NDCs) or reductions based on GDP and other factors. According to the International Panel on Climate Change (IPCC) limiting global warming to 1.5° C will require global emissions to reduce through 2030 and hit carbon neutrality by mid-century.⁴

1 United Nations Framework Convention on Climate Change (UNFCCC). United Nations Framework Convention on Climate Change. https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf

2 UNFCCC. What is the Kyoto Protocol? https://unfccc.int/kyoto_protocol

3 UNFCCC. Paris Agreement - Status of Ratification. <https://unfccc.int/process/the-paris-agreement/status-of-ratification>

4 IPCC. Global Warming of 1.5 C. <https://www.ipcc.ch/sr15/>

California Regulations and State GHG Targets

California remains a global leader in the effort to reduce GHG emissions and combat climate change through mitigation and adaptation strategies. With the passage of Assembly Bill (AB) 32 in 2006, California became the first state in the United States to mandate GHG emission reductions across its entire economy. To support AB 32, California has enacted legislation, regulations, and executive orders (EOs) that put it on course to achieve robust emission reductions and address climate change impacts. Following is a summary of executive and legislative actions relevant to this CAP Update.

2002 Senate Bill 1078

In 2002, SB 1078, established the California Renewables Portfolio Standards (RPS) Program and was accelerated in 2006 by SB 107, requiring that 20 percent of retail electricity sales be composed of renewable energy sources by 2010. EO S-14-08 was signed in 2008 to further streamline California's renewable energy project approval process and increase the State's RPS to the most aggressive in the nation at 33 percent renewable power by 2020.

2002 Assembly Bill 1493

In 2002, AB 1493, also known as Pavley Regulations, directed the California Air Resources Board (CARB) to establish regulations to reduce GHG emissions from passenger vehicles to the maximum and most cost-effective extent feasible. CARB approved the first set of regulations to reduce GHG emissions from passenger vehicles in 2004, initially taking effect with the 2009 model year.

2005 Executive Order S-3-05

EO S-3-05 was signed in 2005, establishing Statewide GHG emissions reduction targets for the years 2020 and 2050. The EO calls for the reduction of GHG emissions in California to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050. The 2050 emission reductions target would put the State's emissions in line with the worldwide reductions needed to reach long-term climate stabilization as concluded by the IPCC 2007 *Fourth Assessment Report*.

2006 Assembly Bill 32

California's major initiative for reducing GHG emissions is outlined in AB 32, the "California Global Warming Solutions Act of 2006," that was signed into law in 2006. AB 32 codifies the Statewide goal of reducing GHG emissions to 1990 levels by 2020 and requires CARB to prepare a Scoping Plan that outlines the main State strategies for reducing GHG emissions to meet the 2020 deadline. AB 32 also requires CARB to adopt regulations requiring reporting and verification of Statewide GHG emissions. Based on this guidance, CARB approved a 1990 Statewide GHG baseline and 2020 emissions limit of 427 million metric tons of CO₂ equivalent (MMT CO₂e). The Scoping Plan was approved by CARB on December 11, 2008, and included measures to address GHG emission reduction strategies related to energy efficiency, water use, and recycling and solid waste, among other measures. Many of the GHG reduction measures included in the Scoping Plan (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards, and Cap-and-Trade) have been adopted since approval of the Scoping Plan. In May 2014, CARB approved an updated Scoping Plan that defined CARB's climate change priorities for the next five years and set the groundwork to reach post-2020 Statewide goals. The update highlighted State progress toward meeting the 2020 GHG emission reduction goals defined in the original Scoping Plan. It evaluated how to align State longer-term GHG reduction strategies with other State policies for water, waste, natural resources, clean energy, transportation, and land use.

2007 Executive Order S-1-07

Also known as the Low Carbon Fuel Standard, EO S-1-07, issued in 2007, established a Statewide goal that requires transportation fuel providers to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. EO S-1-07 was readopted and amended in 2015 to require a 20 percent reduction in carbon intensity by 2030, the most stringent requirement in the nation. The new requirement aligns with California's overall 2030 target of reducing climate changing emissions 40 percent below 1990 levels by 2030, which was set by Senate Bill 32 and signed by the governor in 2016.

2007 Senate Bill 97

Signed in August 2007, SB 97 acknowledges that climate change is an environmental issue that requires analysis in California Environmental Quality Act (CEQA) documents. In March 2010, the California Natural Resources Agency adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted guidelines give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHG and climate change impacts.

2008 Senate Bill 375

SB 375, signed in August 2008, enhances the State's ability to reach AB 32 goals by directing CARB to develop regional GHG emission reduction targets to be achieved from passenger vehicles by 2020 and 2035. In addition, SB 375 directs each of the State's 18 major Metropolitan Planning Organizations (MPOs), including the Metropolitan Transportation Commission (MTC), to prepare a "sustainable communities' strategy" (SCS) that contains a growth strategy to meet these emission targets for inclusion in the MPO's Regional Transportation Plan (RTP). On March 22, 2018, CARB adopted updated regional targets for reducing GHG emissions from 2005 levels by 2020 and 2035.

2009 California Green Building Code

The California Green Building Standards Code (CALGreen) is Part 11 of the California Building Standards Code or Title 24 and is the first Statewide "green" building code in the nation. The purpose of CALGreen is to improve public health, safety, and general welfare by enhancing the design and construction of buildings. Enhancements include reduced negative impact designs, positive environmental impact designs, and encouragement of sustainable construction practices. The first CALGreen Code was adopted in 2009 and has been updated in 2013, 2016, 2019, and 2022. The CALGreen Code will have subsequent, and continually more stringent, updates every three years.

2009 Senate Bill X7-7

In 2009, SB X7-7, also known as the Water Conservation Act, was signed, requiring all water suppliers to increase water use efficiency. This legislation sets an overall goal of reducing per capita urban water use by 20 percent by 2020.

2011 Senate Bill 2X

In 2011, SB 2X was signed, requiring California energy providers to buy (or generate) 33 percent of their electricity from renewable energy sources by 2020.

2012 Assembly Bill 341

AB 341 directed the California Department of Resources Recycling and Recovery (CalRecycle) to develop and adopt regulations for mandatory commercial recycling. As of July 2012, businesses are required to recycle, and jurisdictions must implement a program that includes education, outreach, and monitoring. AB 341 also set a Statewide goal of 75 percent waste diversion by the year 2020.

2014 Assembly Bill 32 Scoping Plan Update

In 2014, CARB approved the first update to the Scoping Plan. This update defines CARB's climate change priorities and sets the groundwork to reach the post-2020 targets set forth in EO S-3-05. The update highlights California's progress toward meeting the near-term 2020 GHG emissions reduction target, defined in the original Scoping Plan. It also evaluates how to align California's longer-term GHG reduction strategies with other Statewide policy priorities, such as water, waste, natural resources, clean energy, transportation, and land use.

2014 Assembly Bill 1826

AB 1826 was signed in 2014 to increase the recycling of organic material. GHG emissions produced by the decomposition of these materials in landfills were identified as a significant source of emissions contributing to climate change. Therefore, reducing organic waste and increasing composting and mulching are goals set out by the AB 32 Scoping Plan. AB 1826 specifically requires jurisdictions to establish organic waste recycling programs by 2016, and phases in mandatory commercial organic waste recycling over time.

2015 Senate Bill 350

SB 350, the Clean Energy and Pollution Reduction Act of 2015, has two objectives: to increase the procurement of electricity from renewable sources from 33 percent to 50 percent by 2030 and to double the energy efficiency of electricity and natural gas end users through energy efficiency and conservation.

2015 Executive Order B-30-15

In 2015, EO B-30-15 was signed, establishing an interim GHG emissions reduction target to reduce emissions to 40 percent below 1990 levels by 2030. The EO also calls for another update to the CARB Scoping Plan.

2016 Senate Bill 32

On September 8, 2016, the governor signed SB 32 into law, extending AB 32 by requiring the State to further reduce GHGs to 40 percent below 1990 levels by 2030 (the other provisions of AB 32 remain unchanged). The bill charges CARB to adopt the regulation so that the maximum technologically feasible emissions reductions are achieved in the most cost-effective way.

2016 Senate Bill 1383

Adopted in September 2016, SB 1383 requires CARB to approve and begin implementing a comprehensive strategy to reduce emissions of short-lived climate pollutants. The bill requires the strategy to achieve the following reduction targets by 2030:

- Methane – 40 percent below 2013 levels

- Hydrofluorocarbons – 40 percent below 2013 levels
- Anthropogenic black carbon – 50 percent below 2013 levels

SB 1383 also requires CalRecycle, in consultation with CARB, to adopt regulations that achieve specified targets for reducing organic waste in landfills. The bill further requires 20% of edible food disposed of at the time to be recovered by 2025.

2017 Scoping Plan Update

On December 14, 2017, CARB adopted the 2017 Scoping Plan, which provides a framework for achieving the 2030 goal set by SB 32. The 2017 Scoping Plan relies on the continuation and expansion of existing policies and regulations, such as the Cap-and-Trade Program, as well as implementation of recently adopted policies, such as SB 350 and SB 1383. The 2017 Scoping Plan also puts an increased emphasis on innovation, adoption of existing technology, and strategic investment to support its strategies. As with the 2014 Scoping Plan Update, the 2017 Scoping Plan does not provide project-level thresholds for land use development. Instead, it recommends that local governments adopt policies and locally appropriate quantitative thresholds consistent with Statewide per capita goals of six metric tons (MT) CO₂e by 2030 and two MT CO₂e by 2050. As stated in the 2017 Scoping Plan, these goals may be appropriate for plan-level analyses (city, county, subregional, or regional level), but not for specific individual projects because they include all emissions sectors in the State.

2018 Senate Bill 100

Adopted on September 10, 2018, SB 100 supports the reduction of GHG emissions from the electricity sector by accelerating the State's Renewables Portfolio Standard Program, which was last updated by SB 350 in 2015. SB 100 requires electricity providers to increase procurement from eligible renewable energy resources to 33 percent of total retail sales by 2020, 60 percent by 2030, and 100 percent by 2045.

2018 Executive Order B-55-18

Also, on September 10, 2018, the governor issued Executive Order B-55-18, which established a new Statewide goal of achieving carbon neutrality by 2045 and maintaining net negative emissions thereafter. This goal is in addition to the existing Statewide GHG reduction targets established by SB 375, SB 32, SB 1383, and SB 100.

2020 Advanced Clean Trucks Regulation

The Advanced Clean Trucks Regulation was approved on June 25, 2020. The regulation establishes a zero-emissions vehicle sales requirement for trucks or on-road vehicles over 8,500 lbs gross vehicle weight and set a one-time reporting requirement for large entities and fleets. Under the regulation, manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines are required to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2035. By 2035, zero-emission truck/chassis sales need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales. Additionally, the regulation established a one-time reporting requirement for large entities and fleets where fleet owners, with 50 or more trucks, are required to report about their existing fleet operations by March 15, 2021.

2022 Scoping Plan Update

In November 2022, CARB adopted the 2022 Scoping Plan, which provides a framework for achieving the 2045 carbon neutrality goal set forth by AB 1279. The 2022 Scoping Plan relies on the continuation and expansion of existing policies and regulations, such as the Cap-and-Trade Program, as well as implementation of recently approved legislation, such as AB 1279. The 2022 Scoping Plan includes discussion of the Natural and Working Lands sector as both an emissions source and carbon sink. The Plan centers equity in terms of State climate investments and climate mitigation strategies.

2022 Senate Bill 1020

Adopted in September 2022, SB 1020 advances the State's trajectory to 100 percent clean energy procurement by 2045 by creating clean energy targets of 90 percent by 2035 and 95 percent by 2040. SB 1020 builds upon SB 100, which accelerated the State's RPS and requires electricity providers to increase procurement from eligible renewable energy resources to 60 percent by 2030 and 100 percent by 2045.

2022 Assembly Bill 1279

Adopted in September 2022, AB 1279, codifies the Statewide carbon neutrality goal into a legally binding requirement for California to achieve carbon neutrality no later than 2045 and ensure 85 percent GHG emissions reduction under that goal. AB 1279 builds upon EO B-55-18 that originally established California's 2045 goal of carbon neutrality.

2022 Advanced Clean Cars II

The Advanced Clean Cars II regulation was adopted in August 2022. The regulation amends the Zero-emission Vehicle Regulation to require an increasing number of zero-emission vehicles, and relies on advanced vehicle technologies, including battery electric, hydrogen fuel cell electric and plug-in hybrid electric-vehicles, to meet air quality, climate change emissions standards, and Executive Order N-79-20, which requires that all new passenger vehicles sold in California be zero emissions by 2035. The regulation also amends standards for gasoline cars and heavier passenger trucks to continue to reduce smog-forming emissions.

2023 Advanced Clean Fleet

Approved by CARB on April 28, 2023, the Advanced Clean Fleets Regulation requires fleets, businesses, and public entities that own or direct the operation of medium- and heavy-duty vehicles in California to transition to 100 percent zero-emission capable utility fleets by 2045. Under the regulation, fleet operators may choose to purchase only ZEVs beginning in 2024 and remove internal combustion engine vehicles at the end of their useful life or fleet operators may elect to meet the State's ZEV milestone targets as a percentage of the total fleet starting with vehicle types that are most suitable for electrification.

Appendix B

GHG Inventory Methodology and Modeling

GHG Inventory

The Hayward community greenhouse gas (GHG) inventories (2005, 2010, 2015, 2017, 2018, and 2019) were prepared by Hayward City staff utilizing the same excel-based inventory tool used to assess GHG emissions for all 35 communities in the East Bay region. The inventory tool has the capability for each individual jurisdiction to modify data inputs to develop their own inventories. East Bay Energy Watch prepared the *East Bay Energy Watch Regional Greenhouse Gas Inventory Phase III Methodology Summary*¹ to detail the methodology utilized in the inventory tool including the activity data to use, where to obtain the activity data, where emission factors come from, and how annual emissions are calculated from the activity data and emission factors. In general, the methodology and calculated emissions using the East Bay tool align with the principles and methods outlined in the Local Governments for Sustainability USA (ICLEI) U.S. Community Protocol.

As a result of a GHG inventory data consistency and analysis review of the previous Hayward inventories, some methodologies were updated from those detailed in the *East Bay Energy Watch Regional Greenhouse Gas Inventory Phase III Methodology Summary*. Hayward staff prepared the *City of Hayward GHG Inventory Technical Memorandum*, attached to this Appendix, to detail the methodology changes by sector including the addition of AC Transit emissions to the inventory, updating transportation emission factors to using EMFAC2021, and updating the energy calculations to include California specific CH₄ and N₂O emission factors for electricity. Additionally, as part of the CAP, Hayward has decided to begin using Google EIE Model vehicle miles traveled (VMT) data for the on-road transportation sector. This decision was made as the travel demand model previously used to obtain VMT data for historic inventories, Metropolitan Transportation Commission (MTC), is anticipated to not be updated for future years so the data source may not be available. The use of different methodologies across GHG inventories and for forecasting GHG emissions from a sector limits the ability to discern changes related to GHG emissions trends versus changes due to methodology change. For consistency it is recommended that the same VMT data source be used for all inventories, forecasts, and for tracking progress against established emission targets.² As such, all Hayward inventories were updated to use VMT data based on the Google EIE Model. The methodology and results of the update to the on-road transportation sector using Google EIE VMT data are detailed in the *Vehicles Miles Traveled Data Source and Methodology Evaluation Memorandum*, attached as part of this Appendix.

Appendix C, GHG Forecast Methodology and Modeling, of the CAP further details updates made to the inventories and methodology or emission factor changes. Appendix C also provides a detailed summary of the updated 2019 GHG emissions inventory that was utilized for forecasting future emissions.

¹ Easy Bay Energy Watch. 2020. East Bay Energy Watch Regional Greenhouse Gas Inventory Phase III Methodology Summary.

² The ICLEI Community Protocol recommends recalculation of previous inventories to ensure consistent comparisons of GHGs over time. Local Governments for Sustainability (ICLEI). 2019. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Available: <<https://iclei.org/us-community-protocol/>>.

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City of Hayward GHG Inventory Technical Memorandum

Adding AC Transit Calculation

The City of Hayward has the AC Transit system that operates multiple fixed bus routes within the City. Rincon recommended including the emissions from community use of the AC Transit bus system because MTC data does not include bus vehicle classes. Following ICLEI's Community Protocol Method *TR.4 Emissions from Transit*, Hayward staff attributed AC Transit emissions from the City of Hayward based on the City's geographic boundary, bus routes, and bus schedules.

Total transit emissions for AC Transit were first calculated using ICELI methods *TR.4.A Carbon Dioxide Emissions from Mobile Combustion* and *TR.4.B Methane and Nitrous Oxide Emissions from Mobile Combustion*. Operation information from the National Transit Database (NTD)¹ and gasoline and diesel emission factors from The Climate Registry² were used to calculate total MTCO₂e for all AC Transit services.

Next, ICLEI method *TR.4.D Attribution of Fixed Route Transit* was used to determine the attribution from the City of Hayward. The AC Transit lines that operate in Hayward are listed on the City's [Streets and Transportation](#) webpage. GIS shapefiles of the transit routes in Hayward were used to determine the number of miles the buses travel within the City boundary. To avoid double counting, the route was measured in two segments: "Start in Hayward" and "End in Hayward". The schedule of each bus route was then used to calculate the annual vehicle revenue miles (VRM) travelled within Hayward based on mileage travelled during weekdays and weekends/holidays.

After calculating the total emissions from AC Transit with method TR.4.A and TR.4.B and determining the VRM attribution for the City of Hayward with method TR.4.D, the total fixed route emissions (MTCO₂e) and average emissions factor (MTCO₂e/mile) were calculated.

It should be noted that for inventory year 2005, Fuel Consumption (gal) and Miles Traveled by Fuel (NTD Fuel and Energy Data) were unavailable for both gasoline and diesel vehicles. Additionally, emission estimates should be used with caution because this method does not factor in the proportion of AC Transit users that live in Hayward.

Updating EMFAC 2017 to EMFAC 2021

Rincon noted in the GHG Inventory Review that the use of EMFAC2017 may overestimate GHG emissions from on-road vehicles because it does not accurately factor in the transition to electric vehicles.

Following Rincon's recommendation, Hayward staff updated EMFAC tabs for all nine inventory years with EMFAC's Model Version 2021 v1.0.1. No changes were made to the methodology in the [Regional Greenhouse Gas Inventory Phase III Methodological Summary](#). With the incorporation of the updated EMFAC data, the table on page 16-17 should now read (for Alameda County):

¹ Annual Metrics data (<https://www.transit.dot.gov/ntd/data-product/2018-metrics>) and annual Fuel and Energy data (<https://www.transit.dot.gov/ntd/data-product/2018-fuel-and-energy>)

² Assumed that for gasoline, DR uses EPA tier 2 vans, and both MB and CB are EPA Tier 2 buses. For Diesel, DR and all buses are Advanced.

YEAR	ALAMEDA COUNTY MTCO2E/VMT			CONTRA COSTA COUNTY MTCO2E/VMT		
	LIGHT DUTY	HEAVY DUTY	COMBINED	LIGHT DUTY	HEAVY DUTY	COMBINED
2005	0.000401	0.001464	0.000514	N/A	N/A	N/A
2010	0.000393	0.001449	0.000499	N/A	N/A	N/A
2015	0.000361	0.001422	0.000457	N/A	N/A	N/A
2017	0.000346	0.001395	0.000447	N/A	N/A	N/A
2018	0.000339	0.001386	0.000438	N/A	N/A	N/A
2019	0.000333	0.001383	0.000432	N/A	N/A	N/A
2020	0.000326	0.001391	0.000436	N/A	N/A	N/A
2021	0.00032	0.001359	0.000418	N/A	N/A	N/A
2022	0.000313	0.001342	0.00041	N/A	N/A	N/A

Updating eGRID/Energy Calculations

In Rincon's GHG inventory assessment, Rincon noticed that the Methodological Summary and inventory workbook indicates that CH₄ and N₂O emission factor is regionally specific to California. However, the CH₄ and N₂O emission factors using in the GHG calculations, reported on the Energy calculations tab, are not consistent with California specific CH₄ and N₂O emission factors as calculated on the eGRID tabs in the inventory workbook.

To address this inconsistency, Hayward staff updated the Energy Calculations tab, row 199 and 200, with CH₄ and N₂O emissions factors calculated on the eGRID tab.

Since there was no eGRID2019 tab, 2019 emissions factors were pulled from the EPA's website. Table 3 from eGRID2019 Summary Tables was used for the emissions factors within the spreadsheet. Data source: https://www.epa.gov/sites/default/files/2021-02/documents/egrid2019_summary_tables.pdf

The spreadsheet now follows the methodology provided by the Methodological Summary. However, with the updates in emission factors, the table on page 6 should now be as follows:

Electricity Emissions	2005	2010	2015	2017	2018	2019
Carbon dioxide (lbs CO ₂ /kWh)	0.489	0.445	0.405	0.210	0.206	0.206
Methane (lbs CH ₄ /MWh)	0.0306	0.0308	0.0311	0.0233	0.0271	0.0270
Nitrous oxide (lbs N ₂ O/MWh)	0.0045	0.0044	0.0038	0.0029	0.0034	0.0030
Combined (MTCO ₂ e/kWh)	0.000223	0.000203	0.000185	0.000096	0.000094	0.000094

Updating Water/Wastewater

No changes were made to the methodology described in the Methodological Summary. Hayward staff obtained water and wastewater data and input the data into the spreadsheet and emissions were calculated as described in the Methodological Summary.



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Project: **Hayward Climate Action Plan Update**

Re: Vehicle Miles Traveled Data Source and Methodologies Evaluation Memorandum

Rincon Consultants, Inc. (Rincon) has conducted an evaluation of four different data sources for purposes of estimating Hayward vehicle miles traveled (VMT) for use in estimated greenhouse gas (GHG) emissions related to the transportation sector. The goal of the analysis was to determine the most appropriate VMT data source for inclusion in the Hayward greenhouse gas (GHG) emissions inventory and forecast that would provide accurate and comparable VMT data over time and be consistent with methodologies defined by the ICLEI U.S. Community Protocol.¹ Specifically, this effort included a review of the VMT data and methodologies used by Metropolitan Transportation Commission (MTC), traffic engineers using the Alameda County Transportation Commission (ACTC) travel model, Google Environmental Insights Explorer (Google EIE), and California Air Resources Board (CARB) Emission FAcTor (EMFAC) 2021 online database to determine the existing and forecasted VMT associated with on-road transportation within the community of Hayward. This evaluation utilizing

¹ Local Governments for Sustainability (ICLEI). 2019. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Available: <<https://icleiusa.org/us-community-protocol/>>. Accessed May 20, 2022.

criteria agreed upon by the city resulted in the identification of Google EIE VMT data as the preferred option for purposes of updating past GHG emissions inventories, updating the existing GHG emissions inventory, conducting future GHG emissions inventories, and estimating future GHG emissions. Because the VMT data set from Google EIE VMT is based on location-based GPS data that is continuously tracked, VMT data from Google EIE is more accurate than modeled data from a transportation demand model.² Additionally, Google EIE VMT data is advantageous as it is reflective of local conditions in a community and is able to capture change year over year, unlike traditional transportation demand models, such as the MTC, ACTC, and EMFAC models, that are forecasted based on a series of historic base assumptions and anticipated land use and population changes that may not be actualized. This increased sensitivity to local changes will allow Hayward to better monitor the efficacy of its VMT reduction measures as well as limit the risk of over or underestimating changes in VMT that are an artifact of modeling assumptions.

VMT Data Source Review Purpose

The City of Hayward is in the process of updating its Climate Action Plan (CAP). As part of this effort, GHG emissions associated with on-road transportation are calculated based on community VMT for inclusion in the community GHG inventories (i.e., 2005, 2010, 2015, 2017, 2018, and 2019) and for forecasting GHG emissions in future years (i.e., 2025, 2030, 2035, 2040, and 2045). For the previously developed inventories (i.e., 2005, 2010, 2015, 2017, 2018, and 2019), VMT data was obtained for the community from the MTC Traffic demand model. However, Rincon understands the MTC may not be updating the traffic model for future years limiting the ability to obtain future VMT projections beyond 2040. Therefore, Hayward is considering the use of alternative VMT data sources, including the ACTC Countywide Transportation Demand Model, EMFAC 2021 Model, and Google EIE Model, to update the GHG inventories.

As detailed in the *Hayward GHG Inventory Data Consistency and Analysis Approach Review Memorandum* dated November 5, 2021, the use of different methodologies across GHG inventories and for forecasting GHG emissions from a sector limits the ability to discern changes related to GHG emissions trends versus changes due to methodology change. For consistency it is recommended that the same VMT data source be used for all inventories, forecasts, and for tracking progress against established emission targets.³ Prior to use of a new VMT data source in the forecast and updating of the inventories, Rincon evaluated four different VMT data sources available for the Hayward community including MTC provided data, modeled VMT data provided by traffic engineers using the ACTC travel model, VMT data obtained from the EMFAC 2021 online database, and Google EIE VMT data.

This memorandum provides the following:

- Background review of the methodology used by each data source to calculate VMT for the Hayward community and evaluation of the limitations that exist with use for each data source;
- Comparison of the annual VMT data for the Hayward community obtained from each data source for the years 2018 and 2019;
- Determination of the data source to be utilized for Hayward GHG inventories and forecasts; and

² Local Governments for Sustainability (ICLEI). (2021, May 11). 4 Ways Google EIE Transformed Transportation Data Collection. Available: <

³ The ICLEI Community Protocol (cited in footnote 1) recommends recalculation of previous inventories to ensure consistent comparisons of GHGs over time.

- Results of final updates to on-road transportation sector GHG emissions.

Activity data and associated emissions detailed within this memorandum include activities under the jurisdictional control or significant influence of the City of Hayward, as recommended by the Association of Environmental Professionals (AEP) in preparing Community Protocol and CEQA-compliant GHG inventories.⁴

Methodology Review and Evaluation of VMT Data Sources

This section includes 1) a review of the various models to determine on-road VMT attributed to the Hayward community; and, 2) an evaluation of the limitations and/or advantages associated with each model.

MTC Travel Demand Model

Background Review

Haywards previous GHG emissions baselines were modeled using the MTC data for years 2005 and 2015, while future years were modeled for years 2020, 2030, 2035, and 2040. MTC uses an activity-based travel demand model that generates simulations based on “agents” or the activities carried out by the households and people, that reside in the Bay Area to determine VMT for communities under typical conditions (i.e., weekday, normal weather). VMT changes are based on the land use assumptions that have been input into the model or transportation projects that would influence the *agents* trip. The MTC model is based on previous and prospective populations, households and land use developments in the nine-county Bay Area and accounts for interregional travel amongst those nine counties. The MTC model uses an origin-destination method, the recommended VMT estimation approach,⁵ to assign light-duty VMT to individual communities. Under this method, the model separates out trips that begin and end in the community, trips that begin in the community but end elsewhere (or vice-versa), and trips that do not begin or end in the community (although they may pass through). 100% of the VMT is applied to the trips that originate and end within a jurisdiction and 50% of VMT is applied to trips that originate or end within a specific jurisdiction. MTC’s data outputs label this data as “Entirely within,” “Partially in,” and “Entirely outside,” respectively.

MTC uses the transportation demand model to calculate light-duty VMT for each community, while MTC provides heavy-duty VMT obtained from a regional dataset using a “Longitudinal Employer-Household Dynamics” (LEHD) method. Countywide heavy-duty VMT that occurs within the county’s limits is assigned to the county regardless of where a trip begins or ends (this is typically referred to as the geographic boundary or in-boundary method for estimating VMT). Countywide heavy-duty VMT is allocated to individual jurisdictions in the county based on the number of jobs in a specific economic sector that generates heavy-duty vehicle trips such as agriculture, forestry, mining, utilities, construction, manufacturing, wholesale trade, retail trade and transportation/ warehousing. Jobs numbers by sectors were obtained from the US Census.

⁴ Association of Environmental Professionals. 2013. The California Supplement to the United States CommunityWide Greenhouse Gas (GHG) Protocol. Available < https://califaep.org/docs/California_Supplement_to_the_National_Protocol.pdf>. Accessed May 20, 2022

⁵ Regional Targets Advisory Committee (RTAC). 2009. Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375: A Report to California Air Resources Board. Available < <https://www.fresnocog.org/wp-content/uploads/files/SB375/finalreport.pdf>>. Accessed June 22, 2022

The method that MTC uses to model VMT omits motorcycles from light-duty VMT totals, as well as motor homes and all types of buses from heavy-duty VMT totals. To provide a more complete inventory, past Hayward inventories would estimate VMT from these vehicle types using CARB's most recent EMFAC model. The EMFAC-reported VMT for all light-duty vehicles and all heavy-duty vehicles for the county is summed and divided by the VMT from all over vehicle types to determine the ratio of motorcycle VMT and bus VMT to VMT from other vehicle types. The light-duty VMT for Hayward as reported by MTC is divided by the countywide percent of VMT from motorcycles to "add back in" the amount of light-duty VMT not captured in the MTC model. Similarly, the heavy-duty VMT for Hayward is divided by the countywide percent of VMT from motorhomes and buses to "add back in" the amount of heavy-duty VMT not captured in the MTC estimations.⁶

Evaluation

The MTC travel demand model relies on previous years of data including surveys of transportation patterns, land uses, and several other factors that may be dated given current conditions and recent situations that have altered traffic patterns (e.g., COVID-19). Future road networks and land use changes are based on the Plan Bay Area 2040. As such future travel demand is based on existing or modeled patterns and not able to capture year over year changes that could occur due to local changes. Additionally, because the model is developed using regional data and for regional traffic planning, it is limited in terms of the accuracy it can provide for a specific jurisdiction. The complete VMT data set includes the use of multiple data sources to estimate VMT for the community, including use of a travel demand model following origin-destination methodology for passenger vehicles and a regional data set for commercial vehicles based on a geographic boundary methodology for heavy-duty vehicles. Additionally, the MTC method for modeling omits certain vehicle types from VMT totals requiring off model calculations to estimate VMT from those omitted vehicle types occurring in Hayward. The use of differing methodologies with different base assumptions limits the accuracy of the final data set to be used in the inventory. Finally, the MTC model horizon year is 2040 and MTC has indicated that the model is not planned to be updated for future horizon years, limiting its usefulness in the future once the horizon year has been surpassed and may inadvertently introduce future emission changes that don't represent the actual conditions found in the city.

ACTC Countywide Transportation Demand Model

Background Review

As part of the Hayward Housing Element and General Plan Amendments being prepared in parallel with the Hayward CAP Update, transportation engineers Kittelson & Associates modeled VMT in Hayward using the latest version (July 2018) of the ACTC Countywide Transportation Demand Model, an activity-based travel demand model that is a variant of the MTC model that was developed for jurisdiction-level usage. The current version of the ACTC model includes land use assumptions and transportation investments associated with the Sustainability Communities Strategy from the Plan Bay Area 2040 and is consistent with the assumptions of the MTC's regional travel demand model. The ACTC model includes output spanning the years 2010 through 2040. The model includes the nine Bay Area counties, same as the MTC model, as well as San Joaquin County. Compared to the MTC model, the ACTC model has a refined Transportation Analysis Zone (TAZ) system in Alameda County and the adjacent TAZ sections in Santa Clara and Contra Costa Counties and uses local development information and census block level

⁶ East Bay Energy Watch. 2020. Regional Greenhouse Gas Inventory Phase III Methodological Summary.

information for these TAZ sections.⁷ No differences exist at the census tract level outside of Alameda County for the other MTC counties. In addition to the trip purposes modeled by MTC, the ACTC model also includes additional purposes in the travel demand model like light, medium, and heavy-duty internal and interregional truck trips to capture commercial trips as part of the travel demand model and has added additional mode choice options to include transit buses. The ACTC model also uses an origin-destination method to assign VMT to individual communities (i.e., 100 percent of daily trips completely within the jurisdiction, 50 percent of Partially In trips, and 0 percent of outside trips were allocated to Hayward).

The ACTC model VMT data is generally consistent with the MTC model, however, it differs in a few ways. The ACTC model captures interregional travel between San Joaquin County and Hayward which are not captured with the MTC model while commercial vehicle VMT are modeled with the ACTC model rather than using a regional data set like the MTC model. Therefore, while the ACTC model produced travel demand forecasts that are generally consistent with the travel demand forecasts that the MTC model produces, VMT reported from the ACTC model are 7 percent higher than VMT values reported from the MTC model due to the inclusion of the San Joaquin County in the ACTC, there is more refined demographic data for Alameda County compared with the MTC regional model, and ACTC includes of commercial VMT in the model.

Evaluation

Similar to the MTC model limitations, the ACTC model relies on previous years of data including surveys of transportation patterns, land uses, and several other factors that may be dated given current conditions and recent situations that have altered traffic patterns (e.g., COVID-19). Future road networks and land use changes are based on the Plan Bay Area 2040. As such future travel demand is based on existing or modeled patterns and not able to capture year over year changes that could occur due to local changes. Additionally, like the MTC model, the horizon year for the model is 2040. This limits the accuracy and utility of this model for years beyond the horizon year. The ACTC model is advantageous for GHG modeling to the MTC model as VMT data generated by the ACTC model includes light-duty and heavy-duty vehicle trips (i.e., passenger and commercial trips) using the same travel demand model and origin-destination boundary approach, improving consistency of the data set compared with the MTC model that uses two different data sets to obtain passenger and commercial VMT data. Additionally, the ACTC model has more refined demographic data for Alameda County in which Hayward is located, making this model potentially a more accurate representation of VMT in Hayward than the MTC model.

EMFAC 2021 Model

Background Review

EMFAC 2021 is the latest emission inventory model that CARB developed to assess emissions from on-road motor vehicles including cars, trucks, and buses in California. It's based on the statewide and regional vehicle activities and includes recently adopted regulations like the Advanced Clean Trucks, Innovative Clean Transit, and Heavy-Duty Omnibus regulations. The model utilizes Department of Motor Vehicle (DMV) registration data, International Registration Plan data, National Transit Database data, and vehicle data from the California Highway Patrol and major ports for vehicle characterizations in a

⁷ ACTC. 2018. Alameda Countywide Travel Demand Model Plan Day Area 2040 Update. Available < https://www.alamedactc.org/wp-content/uploads/2018/12/Key_Features_of_the_Model_Jul2018-1.pdf > Accessed June 2022.

county or region. Activity data are incorporated into the model from several sources including National Household Travel Surveys, 2018 California Vehicle Inventory and Use Survey and Geotab Telematics Data, and Portable Activity Measurement Systems from 200-Vehicle Project. The model estimates future light-duty VMT and new vehicle sales based on the latest available socio-economic data from UCLA Anderson Forecast, California Department of Finance, California Board of Equalization, California Energy Commission, and Federal Reserve Bank of St. Louis. VMT of light-duty vehicles at the statewide level is forecasted using multivariate regression analysis based on previous time-series data from 2003-2019. Heavy-duty VMT future trends are based on the forecasted VMT per county from the California Statewide Freight Forecasting Model. EMFAC 2021 also forecasts the penetration of zero-emission vehicles (ZEV) based on the projected ZEV market share under the most likely compliance scenario with California's ZEV mandate. Default VMT data is estimated based on previous fuel sales and is tied to a specific county, sub-county or region where vehicles are registered rather than assigned to a community using an origin-destination method.

Evaluation

The EMFAC model generates data only as granular as the county level limiting accuracy for a city within Alameda County and does not utilize the origin-destination methodology recommended by the ICLEI U.S. Community Protocol.⁸ Similar to the ACTC and MTC model limitations, the EMFAC model relies on previous years of data and other factors that may be dated given current conditions and recent situations that have altered VMT. As such future VMT is based on existing or modeled patterns and not able to capture year over year changes that could occur due to local changes. Additionally, the EMFAC model was developed for emission inventorying, so the VMT activity data is an estimate based on fuel sales, vehicle sales, and vehicle registration records and does not incorporate or account for impacts on VMT due to land use development changes. As such, VMT activity data from EMFAC 2021 is limited in its accuracy for municipal and for projecting VMT changes over time. However, EMFAC 2021 is particularly useful for developing an emission factor by vehicle category given the emissions inventory data and incorporated regulations impacting emissions, as well as provides useful information surrounding the anticipated future penetration of ZEVs into the vehicle mix of a region or County.

Google EIE Model

Background Review

Google EIE uses Google GIS data sources included in cell phones and modeling capabilities to produce estimates of activity data and emissions for various sectors to aid agencies in climate action planning. The modeled estimates are based on actual measurements of activity and current infrastructure paired with machine learning techniques and scaling factors. Collected activity and infrastructure data is the same as the underlying information used for Google Maps where the data is anonymous, aggregated and combined with other data sources to create useful VMT estimates in Google EIE. For the transportation sector, Google EIE accounts for all trips by all vehicle types that start or ends within the City boundary using anonymized and aggregated Location History data. The data accounts for movement on all major road classifications ranging from interstates to local roads. Annual vehicle trips by mode and vehicle distances are estimated using population and occupancy factors scaling techniques similar to transportation demand models. Region-specific assumptions obtained from Climate Action for Urban Sustainability tool are used to determine vehicle fleet mix and average fuel efficiency of vehicles

⁸ ICLEI. 2019. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Available: <<https://icleiusa.org/us-community-protocol/>>. Accessed May 20, 2022.

in the region.⁹ Provided Google EIE VMT data for Hayward includes light-duty and heavy-duty automobiles VMT and buses (excluding public transit) VMT. Additionally, Google EIE provides data regarding on-foot miles traveled and miles traveled by subways. Hayward utilized ridership data obtained from Bay Area Rapid Transit (BART) to calculate emissions associated with Hayward community use of BART. Hayward does not have another rail or subway system beyond BART and therefore, subway mileage data from Google EIE was not used in the Hayward inventory or forecast. Data for VMT follows the origin-destination method where 100 percent of in-boundary trips and 50 percent of outbound and inbound trips are attributed to the community of Hayward, while pass through trips are excluded from the VMT data set.

Evaluation

Google EIE data captures VMT data in real-time and is advantageous to transportation demand modeled data as it is able to accurately portray changes in VMT year over year that may be related to circumstances like COVID-19 or implementation of local policies and land use developments. Google EIE data is limited in previous data only dating as far back as 2018. As such, for to update GHG inventories older than 2018, a conversion or scaling factor would be applied to previous MTC inventory data to provide estimates comparable to Google EIE. Additionally, Google EIE does not distinguish between light-duty and heavy-duty vehicles in the automobile class of VMT and does not include public transit buses as part of the bus class of VMT. As such, the automobile class VMT would need to be allocated to passenger or commercial vehicles based on another data source, such as EMFAC, and public transit bus VMT would need to be evaluated separately for the inventory.

Comparison of VMT Data

This section includes a comparison of the VMT data sources for Hayward from the four different models. VMT data from each of the four data sources was compared during 2018 and 2019, which are years that data was available and considered “typical”¹⁰. VMT data was compared against MTC data, as MTC data is the data source originally used for the Hayward GHG emissions inventories (i.e., 2005, 2010, 2015, 2017, 2018, and 2019) and the Hayward 2009 CAP. Table 1 provides a summary of the comparison.

⁹Google. (n.d). *Methodology*. Google Insights Explorer. Available: <<https://insights.sustainability.google/methodology>>. Accessed May 20, 2022.

¹⁰ Due to impacts on VMT and traffic patterns caused by COVID-19 in 2020, the 2020-year data was not evaluated as it is not reflective of “typical “ conditions.

Table 1 Comparison of VMT Data Sources for Hayward for 2018 and 2019

	MTC ¹	ACTC ²	EMFAC 2021 ^{3,4}	Google EIE ⁵
2018				
Total VMT	1,088,220,072	1,164,159,045	1,349,979,145	973,250,000
Passenger Vehicles	915,174,796	1,003,996,271	1,234,860,955	890,131,191
Commercial Vehicles	165,116,268	152,338,752	109,413,100	78,868,809
Buses Vehicles	7,929,007	7,824,021	5,705,090	4,250,000
Average % deviation from MTC total VMT ⁶	N/A	7%	24%	-11%
2019				
Total VMT	1,095,372,659	1,169,822,223	1,356,385,315	942,650,000
Passenger Vehicles	921,045,495	1,008,627,852	1,240,475,294	860,511,102
Commercial Vehicles	166,473,724	153,450,839	110,263,061	76,488,898
Buses Vehicles	7,853,439	7,743,533	5,646,959	5,650,000
Average % deviation from MTC total VMT ⁶	N/A	7%	24%	-14%

Notes: Values in this table may not add up to totals due to rounding.

VMT = vehicle miles traveled; MTC = Metropolitan Transportation Commission; ACTC = Alameda County Transportation Commission; EMFAC = Emission FACTor (EMFAC) 2021; Google EIE = Google Environmental Insights Explorer

1. MTC data includes passenger and commercial vehicles with any omitted vehicle types added back in using EMFAC data proportions. Bus VMT is estimated as a percent proportion of commercial MTC data using EMFAC countywide percent proportion for Alameda County.

2. ACTC data includes passenger and commercial data where bus vehicle types are included in the commercial vehicle total. Bus VMT is estimated as a percent proportion of commercial MTC data using EMFAC countywide percent proportion for Alameda County.

3. Vehicle types from EMFAC 2021 are categories as passenger, commercial or buses as follows: Passenger (LDA, LDT1, LDT2, MCY, MDV, MH); Commercial (LHDT1, LHDT2, MHDT, HHDT); Buses (OBUS, SBUS, UBUS).

4. EMFAC 2021 data is countywide therefore to estimate VMT for Hayward, passenger vehicle VMT were scaled to Hayward based on the percent proportion of Hayward's population compared with the countywide population; commercial vehicle and bus VMT were scaled to Hayward based on the percent proportion of Hayward's service population compared with the countywide service population

5. Google EIE data reports VMT for two categories: 1) "automobiles" which include passenger and commercial vehicles and 2) "buses" which encompass all buses (e.g., school buses, private charter buses) except public transit like AC Transit. Automobile VMT is allocated to passenger or commercial vehicle VMT using the EMFAC Countywide proportion of passenger and commercial vehicle VMT for Alameda County.

6. Total VMT from each of the four data sources was compared back to MTC total VMT as MTC data is the data source originally used for Hayward inventories and the Hayward 2009 Climate Action Plan.

As shown in Table 1, VMT data sourced from the ACTC model is most similar to the MTC VMT data. This is anticipated given that both models use the same base assumptions and encompass the nine Bay area counties. ACTC VMT is approximately 7% greater than MTC likely due to the inclusion of interregional trips between Hayward and San Joaquin County, a county not included in the MTC model. EMFAC2021 VMT data deviates the furthest from the MTC model at approximately 24% greater VMT. This is likely a by-product of EMFAC2021 VMT data being an estimate based on fuel consumption at a Countywide level leading to overestimation of VMT when scaled to jurisdiction level for Hayward. Google EIE VMT data is approximately 11% and 14 % less than MTC modeled data for 2018 and 2019 respectively. However, Google EIE data is considered to be more reflective of annual jurisdiction VMT as data is based on data collected annually rather than MTC VMT data that is modeled based on a 2005 and 2015 baseline conditions forecasted forward where local condition changes or policies occurring in a year would not be captured.

VMT Data Determination

This section includes a final determination of the data source to be utilized for Hayward GHG emissions inventories and forecast. Due to the base assumptions used in a travel demand model like MTC or ACTC that are based on land use developments, trip purposes, and human behavior under typical conditions, the VMT data from such models likely overestimate VMT traveled by the Hayward community, and accuracy diminishes the further the modeled year is from the baseline year. This would be especially true for years following the COVID-19 pandemic where base assumptions surrounding trip purposes and human behavior are no longer reflective of current conditions. As EMFAC 2021 uses fuel use data and vehicle registration data to estimate VMT at the county level, EMFAC 2021 VMT data does not accurately reflect local conditions of a jurisdiction. As such, while EMFAC 2021 is useful for providing emission factors or information on future market trends for vehicle types (i.e., EV, ZEV penetration), EMFAC 2021 overestimates the VMT associated with a community such as Hayward and is limited in accuracy.

Google EIE VMT data, though not available for years earlier than 2018 or for future years, is reflective of local conditions in a community, provides the greatest level of accuracy of VMT data, and is able to capture change year over year, as it captures actual travel data within the subject year¹¹ rather than relying on the application of base assumptions. This method of VMT capture provides value to Hayward in that policies or actions taken locally (such as expanded transit or pedestrian infrastructure) or other conditions (like COVID-19) that impact VMT would be reflected in the annual community VMT data. This increased sensitivity to local changes will allow Hayward to better monitor the efficacy of its VMT reduction measures as well as limit the risk of over or underestimating changes in VMT that are an artifact of modeling assumptions.

Therefore, based on the review of the four data sources available for VMT for Hayward, the limitations of each data source, and the ease of access for annual data, Hayward has opted to use Google EIE VMT data to update previous and existing GHG inventories as well as for future GHG inventories.

Resulting On-road Transportation Sector GHG Inventory Updates

This section describes the methodology and results of the updated GHG inventories resulting from the use of Google EIE VMT data. It is important that the methodology and data sources utilized for the GHG inventories and forecasts are consistent, as this limits the risk of GHG emission changes observed to be an artifact of methodology or model changes. In order to address the risk associated with transitioning to a different VMT data source that uses a different estimation methodology, the City of Hayward updated all previous GHG emissions inventories (2005, 2010, 2015, 2017, 2018, and 2019) to be based on Google EIE VMT data.

Google EIE began collecting VMT data in 2018 and does not have VMT values earlier than 2018. As such, the City updated the 2018 and 2019 inventories using available Google EIE data. Google EIE provides data for on-road transportation in two categories: 1) “automobiles” which include passenger and commercial vehicles and 2) “buses” which encompass all buses (e.g., school buses, private charter buses) except public transit like AC Transit. Emissions associated with AC Transit is calculated separately for the inventory using data obtained from the National Transit Database and is further detailed in the

¹¹ Location History data is gathered locally and continuously measured via people’s phones. The data used for transportation behavior is the same underlying information as made available in Google Maps where information such as traffic are updated continuously.

Hayward Future GHG Emissions Forecast and Gap Analysis Memorandum dated April 5, 2022. VMT from the bus category of Google EIE data make up approximately 0.5 percent of total (i.e., automobile + bus category) Google EIE VMT data for Hayward. This is comparable to EMFAC 2021 Countywide VMT data for corresponding years (2018 and 2019) where vehicle types categorized as buses made up 0.4 percent of total VMT. Because Google EIE VMT data for automobiles is not broken out by passenger and commercial vehicles, it was assumed that the distribution between passenger and commercial vehicles in Alameda County, as determined by EMFAC 2021, are representative of Hayward. Therefore, Google EIE automobile VMT was allocated to Hayward passenger and commercial vehicle categories based on the EMFAC 2021 data for the County, where in both 2018 and 2019 approximately 92 percent of all “automobiles”, excluding bus vehicle types, were passenger vehicles and 8 percent were commercial vehicles.

For GHG inventories earlier than 2018 where Google EIE data is not available, the previous GHG inventories on-road transportation sector needed to be adjusted to remain comparable to future years where Google EIE would be the data source for VMT. As shown in Table 1, total annual VMT data obtained from Google EIE for Hayward for 2018 and 2019 was found to be approximately 11 percent and 14 percent lower than the modeled 2018 and 2019 MTC data, respectively, utilized in the previous GHG inventories. As such, Google EIE VMT data from the two comparable inventory years (2018 and 2019)¹² was on average approximately 12 percent lower than modeled MTC data for the same years. To make the previous GHG inventories (i.e., 2005, 2010, 2015, and 2017) comparable to the revised 2018 and 2019 GHG inventories, the previous annual MTC total VMT data from 2005, 2010, 2015, and 2017 was scaled down by 12 percent. The adjusted total VMT data by year was then attributed to passenger, commercial, and bus vehicle categories based on the percent distribution between passenger vehicles, commercial vehicles, and buses determined for Alameda County using EMFAC 2021.¹³ On-road transportation emissions were calculated using the adjusted VMT data and emissions factors by vehicle category (i.e., passenger, commercial, and bus) derived from EMFAC 2021 on-road model. A summary of the Hayward previous and updated on-road VMT and associated emissions for each inventory year is provided in Table 2. On-road transportation emissions were forecasted based on 2019 data year. Reference the *Hayward Future GHG Emissions Forecast and Gap Analysis Memorandum* dated April 5, 2022 for details regarding methodology for forecasting Hayward activity data and associated GHG emissions.

Table 2 Hayward Previous and Updated On-Road VMT and Associated GHG Emissions

On-Road Total Annual VMT	2005	2010	2015	2017	2018	2019
Previous On-Road Total Annual VMT ¹	1,126,343,501	1,023,970,690	1,075,958,492	1,091,342,210	1,088,176,092	1,095,363,045
Previous On-Road Total CO ₂ e Emissions (MT)	630,735	576,052	577,103	568,684	550,025	547,339
Google EIE data ²	n.d.	n.d.	n.d.	n.d.	973,250,000	942,650,000
Updated On-Road Total Annual VMT ^{2,3}	988,348,823	898,518,280	944,136,765	957,635,737	973,250,000	942,650,000
% Passenger Vehicles ^{4,5}	90.3%	90.9%	91.7%	91.2%	91.4%	91.2%

¹²

¹³ Vehicle types from EMFAC 2021 are categories as passenger, commercial or buses as follows: Passenger (LDA, LDT1, LDT2, MCY, MDV, MH); Commercial (LHDT1, LHDT2, MHDT, HHDT); Buses (OBUS, SBUS, UBUS). See EMFAC 2021 technical documentation for vehicle classification definitions.

% Commercial Vehicles ^{4,5}	9.3%	8.7%	7.9%	8.4%	8.2%	8.2%
% Buses Vehicles ^{3,4,5}	0.4%	0.4%	0.4%	0.4%	0.4%	0.6%
Passenger EF (MT CO ₂ e/VMT) ⁶	0.00042	0.00041	0.00038	0.00036	0.00035	0.00035
Commercial EF (MT CO ₂ e/VMT) ⁶	0.00148	0.00146	0.00147	0.00144	0.00144	0.00144
Bus EF (MT CO ₂ e/VMT) ⁶	0.00171	0.00175	0.00155	0.00150	0.00149	0.00147
Updated On-Road Total CO ₂ e Emissions(MT) ⁷	520,768	458,988	441,751	437,514	436,005	417,862

Notes: Values in this table may not add up to totals due to rounding.

VMT = vehicle miles traveled; CO₂e = carbon dioxide equivalent; n.d. = no data available

1. VMT data in previous inventories obtained from MTC. The method that MTC uses to model VMT omits certain types of vehicles, including motorcycles, motor homes and all types of buses. Previous inventories estimated VMT from these vehicle types to ensure a more complete inventory, using data from the California Air Resources Board's EMFAC model. VMT from these omitted vehicle types were added back into the MTC VMT total.

2. VMT data for 2018 and 2019 were obtained from Google EIE where total VMT includes the Google EIE vehicle category "automobile", that encompasses passenger and commercial vehicles, and "buses" that includes all buses except AC Transit.

3. Because Google EIE data is only available for 2018 and 2019, MTC data for earlier inventory years (2005, 2010, 2015, and 2017) was calculated by scaling down original MTC modeled data for those inventory years by the average difference between Google EIE 2018 and 2019 data and 2018 and 2019 MTC data (i.e., Google EIE VMT data was ~12% lower than annual MTC VMT data for the corresponding year).

4. Percent distribution between passenger, commercial, and bus VMT was obtained from EMFAC 2021 for Alameda County for inventory years 2005, 2010, 2015, and 2017. For 2018 and 2019, the percent distribution of total VMT that was buses was obtained directly from Google EIE, whereas the remaining VMT was allocated to either passenger or commercial VMT based on the percent distribution between passenger and commercial vehicles obtained from EMFA C2021 for Alameda County.

5. Vehicle types from EMFAC 2021 are categories as passenger, commercial or buses as follows: Passenger (LDA, LDT1, LDT2, MCY, MDV, MH); Commercial (LHDT1, LHDT2, MHDT, HHDT); Buses (OBUS, SBUS, UBUS)

6. City-level data is not available from EMFA C2021 however it is assumed that county-level emission factors and vehicle class distribution is representative of the City.

7. VMT by vehicle class was determined by multiplying total adjusted VMT by % distribution by vehicle class. Emission factors by vehicle class were applied to the VMT by vehicle class and summed to calculate the updated on-road emissions total for all inventories.

Table 2 provides the updated VMT for each historic inventory year (i.e., 2005, 2010, 2015, 2017, 2018, and 2019) using Google EIE data for 2018 and 2019, and by applying the scaling factor to the original MTC VMT data for years that Google EIE data was not available (i.e., 2005, 2010, 2015, and 2017). Additionally, the table presents the updated GHG emissions for the on-road transportation sector. The original 2019 inventory VMT data resulted in GHG emission from on-road transportation comprising of 67% of Hayward's community GHG emissions, whereas with the updated VMT data for 2019 using Google EIE, on-road emissions comprised of 61% of Haywards community GHG emissions. This change is associated with the previous VMT data sourced from the MTC model likely overestimating VMT activity data for Hayward. The document *Hayward Future GHG Emissions Forecast and Gap Analysis Memorandum* dated April 5, 2022, includes additional details regarding the updated inventories for Hayward including activity data and associated GHG emissions as well as details the methodology for forecasting emissions from all sectors including the on-road transportation sector using Google EIE VMT data.

Appendix C

GHG Forecasts and Gap Analysis



Rincon Consultants, Inc.

Environmental Scientists

Planners

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M E M O R A N D U M

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Project: **Hayward Climate Action Plan Update**

Re: Future GHG Emissions Forecasts and Gap Analysis Memorandum

Rincon Consultants, Inc. (Rincon) has calculated the 2025, 2030, 2035, 2040, and 2045 greenhouse gas (GHG) emissions forecasts based on the Hayward 2019 GHG emission inventory as well as population and economic growth projections for Hayward. The 2019 GHG emissions inventory identifies the major sources and quantities of GHG emissions produced by communitywide activities within Haywards's city limits (i.e., the Hayward General Plan Update planning area). The inventory was developed by the City and provides the City with the data necessary to establish a GHG emissions baseline for the Climate Action Plan (CAP) Update, track GHG emissions trends, and identify the greatest sources of GHG emissions within their jurisdiction.

The GHG emissions forecast discussed in this memorandum provides an estimate of how Hayward's GHG emissions are expected to change in the years 2025 (interim year), 2030 (initial Senate Bill 32 compliance year), 2035 (interim year), 2040 (Hayward General Plan Update horizon year), and 2045 (initial Executive Order B-55-18 compliance year) as a result of anticipated Hayward economic and population growth, as well as the impacts that California climate-related legislation would have on these

future GHG emissions. This memorandum also discusses the 2025, 2030, and 2045 GHG emission reduction targets adopted by Hayward that are aligned with California goals as well as the total quantity of GHG emissions reduction that Hayward needs to achieve in order to contribute their fair share reduction of California's GHG emission reduction goal.¹ The gap between the 2030 adjusted forecast and Hayward's 2030 targets would be addressed through local actions to be included in the CAP Update.

This memorandum also describes updates to previous (2005, 2010, 2015, 2017, 2018, and 2019) GHG inventories that were recalculated due to changes and/or updated methodologies. These changes were made to align the factors and methodologies across all the inventories so that the inventory information and results can be compared across years. The following sections provide a summary of the results for the GHG emission inventories, GHG emission forecast, and GHG reduction targets to be included in the Hayward CAP Update.

GHG Emissions Sectors and Sources

The GHG emissions forecasts presented herein are based on the 2019 GHG emissions inventory calculated for Hayward by the City as well as population and economic growth projections for Hayward. Based on the findings in the *GHG Inventory Data Consistency and Analysis Approach Review Memorandum*, prepared for the City on November 5, 2021, the City updated the analysis and/or emission factors of several sectors within the previous 2005, 2010, 2015, 2017, 2018, and 2019 inventories to be consistent with the Community Protocol, ensure methodology consistency across inventories, and ensure the most updated emission factors and modeled data were utilized that are best representative of communitywide emissions.

Specifically, in the water and wastewater sectors, the inventories were updated to include the addition of emissions associated with indirect electricity use from the water and wastewater sectors as well as process emissions from wastewater generation attributed to the community. In the electricity sector, eGRID electricity emission factors were updated to align with the EPA's most current eGRID2019 emission factors. Also, three updates were made related to the transportation sector emissions:

1. Addition of the Hayward AC Transit bus system into the public transit calculations;
2. Update to on-road transportation data to use Google Environmental Insights Explorer (EIE) vehicle miles traveled (VMT) data² and the California Air Resources Board's (CARB) EMission FAcTtor (EMFAC) Model Version 2021 v1.01; and
3. Update to off-road transportation data to use the CARB EMFAC OFFROAD2021 Model v1.02.

No updates were made to the natural gas sector nor the solid waste sector. Updates to the 2019 GHG inventory are described in further detail in the *Hayward GHG Emissions Inventory Update Summary* section below. The GHG emissions sources included in the 2025, 2030, 2035, 2040, and 2045 forecasts analysis align with those in the GHG inventory, which includes GHG emissions sources related to land use and transportation in the Hayward General Plan Update planning area. The GHG emissions sectors and associated sources included in the inventories and forecasts are provided in Table 1.

¹ California's long-term GHG emission reduction goals were established by the landmark Assembly Bill 32, Senate Bill 32, and Executive Order B-55-18. Collectively, these legislative actions provide a GHG reduction trajectory of reducing Statewide GHG emissions to 1990 GHG emission levels by 2020, 40% below 1990 GHG emissions levels 2030, and carbon neutrality by 2045.

² EIE uses unique Google data sources and modeling capabilities to produce estimates of activity, emissions, and makes them freely available. Google EIE account for all VMT by all vehicle types that start or ends within the City boundary for a calendar year using anonymized and aggregated Location History data (i.e., the underlying information made available in Google Maps). More information can be found here: <https://insights.sustainability.google/methodology>

Table 1 Hayward GHG Emissions Sectors and Sources

GHG Emissions Sector	GHG Emissions Source
Transportation	Passenger On-Road Transportation
	Commercial On-Road Transportation
	Bus On-Road Transportation (excluding Public Transit)
	Off Road - Diesel
	Off Road - Gasoline
	Off Road - Natural Gas (LPG)
	Public Transit - BART
	Public Transit – AC Transit
Electricity ¹	Residential Electricity Consumption
	Non-Residential Electricity Consumption
Natural Gas	Residential Natural Gas Consumption
	Non-Residential Natural Gas Consumption
Water	Indirect Electricity Consumption from Water Delivery
Wastewater	Indirect Electricity Consumption from Wastewater Collection and Treatment
	Direct Wastewater Treatment Emissions
Solid Waste	Methane Commitment of Solid Waste Generated by Community

1. Electricity Consumption includes electricity provided by Pacific Gas and Electric (PG&E) and Other Providers including local Community Choice Aggregation (CCAs).

2. Direct wastewater treatment emissions are from the following sources: digester gas from anaerobic digesters at wastewater treatment plants, nitrification of wastewater, and effluent from treatment and discharge of wastewater

Hayward GHG Emissions Inventory Update Summary

The GHG emissions forecast analysis presented here is based upon the calculated GHG emissions from each source included in the 2019 GHG emissions inventory developed by the City. The City updated the emissions calculations for the 2019 GHG inventory for on-road transportation, off-road transportation, public transit, and for electricity. The updates made by the City are summarized below and are detailed in a City-prepared *Hayward GHG Emissions Inventory Technical Memorandum*.

Transportation Sector Updates

On-Road Transportation Updates

Hayward's previous inventories included VMT data from Metropolitan Transportation Commission (MTC) which included passenger vehicles and commercial vehicles. To ensure a complete representation of all on-road vehicles, the data set was adjusted in the previous GHG inventories to include motorcycles, motor homes, and buses using EMFAC data sets as those vehicle classes are not included in the MTC data set. However, the City plans to use Google EIE VMT data for all future inventories, starting with 2020. Google EIE account for all trips by all vehicle types that start or ends within the City boundary using anonymized and aggregated Location History data. Use of Google EIE VMT data is advantageous to trip based traffic models as the data is collected real time throughout the year and is reflective of changes occurring in City VMT year over year, unlike transportation models which estimate VMT based on population and land use changes.

It is important that the methodology and data sources utilized for the inventories and forecast developed from the most current inventory are consistent as this limits the risk of any emission changes observed to be an artifact of methodology or model changes. Therefore, to address the risk associated with transitioning to a different VMT data source that uses a different estimation methodology, the City updated all previous GHG emissions inventories (2005, 2010, 2015, 2017, 2018, and 2019) to be based on Google EIE VMT data. Google EIE began collecting VMT data in 2018 and does not have previous VMT values earlier than 2018. As such, the City updated the 2018 and 2019 inventories using available Google EIE data. Total annual VMT data obtained from Google EIE for Hayward for 2018 and 2019 was found to be on average 13 percent lower than the modeled 2018 and 2019 MTC data utilized in the previous inventories. To make the previous inventories 2005, 2010, 2015, and 2017 comparable to the revised 2018 and 2019 inventories, the previous MTC annual VMT data from 2005, 2010, 2015, and 2017 was scaled down by 12 percent. Reference the *VMT Memorandum* (forthcoming) for the detailed VMT methodology and comparative analysis between VMT data from the different sources and models. A summary of the Hayward previous and updated on-road VMT emissions for each inventory year is provided in Table 2. Total annual VMT was attributed to either passenger or commercial vehicles based on the percent distribution determined for Alameda County using the recently updated California Air Resources Board (CARB) Emission FACTor (EMFAC) 2021 on-road model.³ On-road transportation emissions were calculated using the updated VMT data and updated emissions factors were derived from EMFAC2021 on-road model.

³ Passenger vehicles included the vehicle classes: LDA, LDT1, LDT2, MCY, MDV, MH, commercial vehicles included vehicle classes: LHDT1, LHDT2, HHDT, MHDT; bus vehicles included vehicle classes: OBUS, SUBUS, UBUS. See EMFAC2021 technical documentation for vehicle classification definitions.

Table 2 Hayward Previous and Updated On-Road Annual VMT and GHG Emissions

On-Road Total Annual VMT	2005	2010	2015	2017	2018	2019
Previous On-Road Total Annual VMT ¹	1,126,343,501	1,023,970,690	1,075,958,492	1,091,342,210	1,088,176,092	1,095,363,045
Previous On-Road Total CO ₂ e Emissions (MT)	630,735	576,052	577,103	568,684	550,025	547,339
Updated On-Road Total Annual VMT ^{2,3}	988,348,823	898,518,280	944,136,765	957,635,737	973,250,000	942,650,000
% Passenger Vehicles ^{4,5}	90.3%	90.9%	91.7%	91.2%	91.4%	91.2%
% Commercial Vehicles ^{4,5}	9.3%	8.7%	7.9%	8.4%	8.2%	8.2%
% Buses Vehicles ^{3,4,5}	0.4%	0.4%	0.4%	0.4%	0.4%	0.6%
Passenger EF (MT CO ₂ e/VMT) ⁶	0.00042	0.00041	0.00038	0.00036	0.00035	0.00035
Commercial EF (MT CO ₂ e/VMT) ⁶	0.00148	0.00146	0.00147	0.00144	0.00144	0.00144
Bus EF (MT CO ₂ e/VMT) ⁶	0.00171	0.00175	0.00155	0.00150	0.00149	0.00147
Updated On-Road Total CO ₂ e Emissions(MT) ⁷	520,768	458,988	441,751	437,514	436,005	417,862

Notes: Values in this table may not add up to totals due to rounding.

VMT = vehicle miles traveled; CO₂e = carbon dioxide equivalent

1. VMT data in previous inventories obtained from MTC. The method that MTC uses to model VMT omits certain types of vehicles, including motorcycles, motor homes and all types of buses. Previous inventories estimated VMT from these vehicle types to ensure a more complete inventory, using data from the California Air Resources Board's EMFAC model. VMT from these omitted vehicle types were added back into the MTC VMT total.

2. Google EIE data includes all trips from all vehicle classes (excluding transit buses). Because Google EIE data is only available for 2018 and 2019, MTC data for earlier inventory years (2005, 2010, 2015, and 2017) was scaled down by the average difference between Google EIE 2018 and 2019 data and 2018 and 2019 MTC data (i.e., Google EIE VMT data was ~12% lower than annual MTC VMT data for the corresponding year).

3. Updated VMT data for 2018 and 2019 were obtained from Google EIE where total VMT includes the Google EIE vehicle category "automobile", that encompasses passenger and commercial vehicles, and "buses" that includes all buses except AC Transit.

4. Percent distribution between passenger, commercial, and bus VMT was obtained from EMFAC2021 for Alameda County for inventory years 2005, 2010, 2015, and 2017. For 2018 and 2019, the percent distribution of total VMT that was buses was obtained directly from Google EIE, whereas the remaining VMT was allocated to either passenger or commercial VMT based on the percent distribution between passenger and commercial vehicles obtained from EMFAC2021 for Alameda County.

5. Vehicle types from EMFAC2021 are categories as passenger, commercial or buses as follows: Passenger (LDA, LDT1, LDT2, MCY, MDV, MH); Commercial (LHDT1, LHDT2, MHDT, HHDT); Buses (OBUS, SBUS, UBUS)

6. City-level data is not available from EMFAC2021 however it is assumed that county-level emission factors and vehicle class distribution is representative of the City.

7. VMT by vehicle class was determined by multiplying total adjusted VMT by % distribution by vehicle class. Emission factors by vehicle class were applied to the VMT by vehicle class and summed to calculate the updated on-road emissions total for all inventories.

Off-Road Transportation Updates

The City updated all GHG emissions inventories (2005, 2010, 2015, 2017, 2018, 2019) using the recently released OFFROAD2021 off-road emissions database. Off-road activity data, measured in U.S. gallons of fuel consumed by fuel type, was estimated using a combination of outputs from the CARB OFFROAD2021 Model (V1.0.2), per CARB recommendations. The updated inventories aggregate off-road activity by fuel type and allocate these emissions to the transportation sector using the same allocation factors previously used.

Public Transit Updates

The City updated all GHG emissions inventories (2005, 2010, 2015, 2017, 2018, 2019) to include emissions associated with Alameda-Contra Costa Transit (AC Transit) attributed to Hayward following the U.S. Community Protocol methodology for public transit attribution to a community. Transit emissions were first calculated for AC Transit using the U.S. Community Protocol methods TR.4.A and TR.4.B, where National Transit Database (NTD) reported fuel consumption data was multiplied by the fuels emission factor for buses. U.S. Community Protocol method TR.4.D was used to determine attribution of emissions to the community based on the amount of total vehicle revenue miles for the agency that were traveled within Hayward's city boundaries.

Electricity Sector Updates

The City updated all GHG emissions inventories (2005, 2010, 2015, 2017, 2018, 2019) to use updated regional electricity emissions factors for CH₄ and N₂O to supplement PG&E supplied CO₂ emission factors. Because PG&E does not provide CH₄ and N₂O emission factors for electricity, the City updated the eGRID CH₄ and N₂O emission factor to be regionally specific to the California grid by pulling the emission factor from the eGRID Summary Tables on the EPA's website⁴.

Water and Wastewater Sectors Updates

The City previously had not included emissions associated with indirect electricity use for water and wastewater or process emissions associated with wastewater treatment attributed to the City in the historical inventories. Following the same *Methodological Summary* used to prepare the historical inventories, the City updated all GHG emissions inventories (2005, 2010, 2015, 2017, 2018, 2019) to include indirect electricity emissions and direct emissions associated with water and wastewater generation in the community. See the *East Bay Energy Watch Regional Greenhouse Gas Inventory Phase III Methodological Summary* (June 2020) for details on the activity data used and the analysis methodology consistent with the Community Protocol.

Natural Gas and Solid Waste Sectors Updates

No updates to Hayward's GHG emissions inventories were necessary related to the natural gas and solid waste sectors.

Overall Updated 2019 GHG Emissions Inventory

A detailed summary of the updated 2019 GHG emissions inventory, incorporating the aforementioned individual sector updates, is provided in Table 3. The updated 2019 GHG emissions inventory was utilized for forecasting future emissions.

⁴ eGrid Summary Tables 2019. 2019. https://www.epa.gov/sites/default/files/2021-02/documents/egrid2019_summary_tables.pdf. Accessed March, 18 2022.

Table 3 Hayward Updated 2019 GHG Emissions Inventory Summary

GHG Emissions Sector/Source	Emissions (MT CO ₂ e)	Activity Data	Activity Data Units
Transportation			
Passenger On-Road Transportation ¹	298,256	859,527,091	VMT
Commercial On-Road Transportation ¹	111,329	77,472,909	VMT
Bus On-Road Transportation ²	8,277	5,650,000	VMT
Off Road - Diesel	14,661	1,421,471	Gallons
Off Road - Gasoline	4,940	542,985	Gallons
Off Road - Natural Gas (LPG)	4,687	807,908	Gallons
Public Transit - BART	547	41,311,182	Passenger Miles
Public Transit- AC Transit ³	4,308	1,666,441	Passenger Miles
Electricity^{4,5}			
Residential Electricity - PG&E	1,144	12,136,210	kWh
Non-Residential Electricity – PG&E	3,032	32,163,187	kWh
Tier 1 Residential Electricity – Other Providers	5,182	84,954,304	kWh
Tier 1 Non-Residential Electricity – Other Providers	3,108	50,952,251	kWh
Tier 2&3 Residential Electricity – Other Providers	0	141,916,183	kWh
Tier 2&3 Non-Residential Electricity – Other Providers	0	428,524,234	kWh
Natural Gas⁵			
Residential Natural Gas	95,291	17,943,901	Therms
Non-Residential Natural Gas	81,358	15,320,155	Therms
Water			
Indirect Electricity from Water Delivery ⁶	6	66,143	kWh
Wastewater			
Indirect Electricity from Wastewater Treatment ⁵	380	4,029,050	kWh
Direct Emissions from Wastewater Treatment	1,702	160,197	Population
Solid Waste			
Solid Waste Generated/Disposal	43,171	150,924	Tons Landfilled
Alternative Daily Cover (ADC) Generated	3,015	12,272	Tons Landfilled

Notes: MT CO₂e = metric tons carbon dioxide equivalents; kWh = kilowatt hours; N/A = not applicable

1. As described in the above sections, the on-transportation sector was updated as moving forward the City will be using Google EIE data. EMFAC2021 percent allocation of VMT to passenger and commercial vehicles classes for the County of Alameda in 2019 was applied to the total annual automobile VMT data category obtained from Google EIE for Hayward.

2. Google EIE reports VMT from all bus types except public transit including AC Transit.

3. Emissions associated with public transit are those attributed to Hayward based on passenger miles occurring within City boundaries.

4. The City receives electricity from PG&E as well as the Community Choice Aggregation East Bay Community Energy (EBCE). Tier 2 and Tier 3 of EBCE provided electricity are both carbon-free. Tier 2 reaches a carbon-free emission factor through use of large hydro-electric power which is not considered a eligible renewable source per RPS definitions. Tier 3 reaches a carbon-free emission factor through power supplied 100% by eligible renewable sources per RPS definitions.

5. PG&E published data presented herein meets the aggregation and anonymization rules to meet privacy regulations. Details of privacy regulations can be found here: https://pge-energydatarequest.com/sites/default/files/PGE_Aggregation_and_Anonymization_Rules.pdf

6. City rounds indirect electricity emissions from water and wastewater to the tenths place in their inventory. These values have not been rounded here for the purpose of forecasting.

Hayward GHG Emissions Forecasts

Hayward's 2019 inventory establishes a reference point for communitywide emissions in a specific year. However, annual GHG emissions change over time and GHG emissions forecasts provide a way to estimate future emission levels based on both the continuation of current activities and external factors such as population and job growth. Forecasts also account for California legislative actions that are anticipated to reduce GHG emissions. Thus, the emissions forecast provides detail on the level of GHG reductions needed to achieve the GHG emissions reduction targets in a future year. Calculating the difference between the forecasted GHG emissions and the reduction target determines the gap to be closed through local actions and policies. This section includes an estimate of the future emissions for Hayward in the years 2025, 2030, 2035, 2040, and 2045 in a *business-as-usual scenario* (BAU) forecast and an *adjusted scenario* (adjusted) forecast, which are defined as follows:

- *Business-as-usual scenario*- Provides a forecast of how future GHG emissions would change if current activities continued as they did in 2019 and growth trends were to occur absent of any policies or legislation that would reduce local emissions. The BAU forecast is based on growth trends projected in population, housing, employment, and transportation activity over time, consistent with regional projections.
- *Adjusted scenario*- Provides a forecast of how currently adopted legislation would reduce GHG emissions from the *business-as-usual scenario*. The *adjusted scenario* represents the State's contribution to reducing local GHG emissions to meet State goals without any additional contribution from local policies or actions.

Business-as-usual (BAU) GHG Emissions Forecast

The BAU forecast provides an estimate of how GHG emissions would change in the forecast years if existing action continued as in 2019, absent any new regulations or actions which would reduce local GHG emissions. The BAU forecast is based on growth projected trends in population, and employment over time, consistent with local and regional projections. The BAU GHG emissions projections were calculated based on the guidance of the Association of Environmental Professionals 2012 whitepaper Forecasting Communitywide GHG Emissions and Setting Reduction Targets. The result is a BAU forecast in which GHG emissions change with time in relation to demographics, with the assumption that GHG emissions rates and activity data will continue in the future as they did in the year of the 2019 GHG emissions inventory. This methodology is used for all GHG emissions sectors and sources included in the 2019 GHG emissions inventory except for off-road transportation. Off-road equipment GHG emissions were alternatively projected using modeled activity data and emissions as detailed below. A description of the demographic metrics used to project activity data and associated growth factors for each forecasted GHG emission source are provided in Table 4 for each for the GHG emission sources in the 2019 community GHG emissions inventory. Detailed calculations for the BAU forecast are included in Attachment A.

Table 4 Growth Metrics and Associated GHG Emissions Sectors

GHG Emissions Sector	GHG Emission Source	Associated Growth Metric	Growth Metric Data Source
Transportation	Passenger On-Road	Households	Plan Bay Area 2040
	Commercial On-Road	Service Population	Plan Bay Area 2040
	Bus On-Road (excluding Public Transit)	Service Population	Plan Bay Area 2040
	Public Transit -BART	Service Population	Plan Bay Area 2040
	Public Transit – AC Transit	Service Population	Plan Bay Area 2040
Electricity	Residential GHG Emissions Sources	Households	Plan Bay Area 2040
	Non-Residential GHG Emissions Sources	Employment	
Natural Gas	Residential GHG Emissions Sources	Households	Plan Bay Area 2040
	Non-Residential GHG Emissions Sources	Employment	
Water	All GHG Emissions Sources	Service Population	Plan Bay Area 2040
Wastewater	All GHG Emissions Sources	Population	Plan Bay Area 2040
Solid Waste	All GHG Emissions Sources	Service Population	Plan Bay Area 2040

The BAU forecast for the Hayward planning area relies on the growth and demographic projections used in the Hayward Housing Element currently being drafted and was obtained from the Plan Bay Area 2040 for the Alameda CTC Zone.⁵ Demographic projections were approved by the City for use in forecasting. Table 5 provides an overview of the growth metrics used to project GHG emissions for the BAU forecast calculations.

Table 5 Growth Metrics for Hayward BAU GHG Emissions Forecast

Growth Metric ^{1,2}	2019 ¹	2025	2030	2035	2040	2045 ³
Population	160,197	161,781	167,425	173,069	178,713	184,358
Employment	70,739	70,326	72,073	73,821	75,568	77,315
Service Population	230,936	232,107	239,498	246,890	254,281	261,673
Housing	47,987	51,788	53,108	54,427	55,747	57,066

Notes: Service Population = Population + Employment

1. Previous inventories demographic data was obtained from MTC, including years 2005,

2. Forecasted demographic data for Hayward is based on the Alameda CTC Zone from plan Bay Area 2040 and is consistent with the projections used for the Housing Element and traffic analysis conducted by Kittleson & Associates, Inc. Data was provided for year 2020 and 2040, therefore interim years were linearly interpolated.

3. To estimate demographic growth past 2040, the annual compound growth rate between 2020 and 2040 was applied to the demographic data to estimate demographic projections in 2045.

The growth indicators for Hayward are provided in Table 6 for each GHG emissions source, excluding off-road fuel consumption which was modeled separately, described in more detail below.

⁵ Although the Plan Bay Area 2050 was adopted in October 2021, at the time of drafting this forecast and Housing Element the demographic projections obtained and approved by the City from the Plan Bay Area 2040 are considered the best available data.

Table 6 Growth Indicators for BAU GHG Emissions Forecast

GHG Emissions Source	Activity Data	Units
Transportation		
Passenger On-Road	17,911.67	Passenger VMT/Household
Commercial On-Road	335.47	Commercial VMT/Service Population
Bus On-Road (excluding Public Transit)	24.47	Bus VMT/ Service Population
Off Road - Diesel	NA	OFFROAD Model
Off Road - Gasoline	NA	OFFROAD Model
Off Road - Natural Gas (LPG)	NA	OFFROAD Model
Public Transit - BART	178.89	Passenger Miles/Service Population
Public Transit – AC Transit	7.22	Passenger Miles/Service Population
Electricity		
Residential Electricity	4,980.66	kWh/Household
Non-Residential Electricity	7,232.81	kWh/Employment
Natural Gas		
Residential Natural Gas	373.93	Therms/Household
Non-Residential Natural Gas	216.57	Therms/Employment
Water		
Indirect Electricity from Water Delivery	0.00022	MG/Service Population
Wastewater		
Indirect Electricity from Wastewater Treatment	0.026	MG/Population
Direct Emissions from Wastewater Treatment	0.011	MT CO ₂ e/Population
Solid Waste		
Solid Waste Generation	0.65	Tons Landfilled/Service Population
ADC Generation	0.05	Tons Landfilled/Service Population
Notes: NA = not applicable; MT CO ₂ e = metric ton carbon dioxide equivalent; kWh = kilowatt-hour; MG = million gallons		

Off-Road Activity Data

Activity data for off-road GHG emissions forecast was modeled separately from the above growth metrics and growth indicators, using the outputs from the CARB web-based OFFROAD2021 model. The OFFROAD2021 database was queried for Alameda County for the forecast years to obtain fuel consumption for gasoline, diesel, and natural gas. The inclusion of specific equipment sectors from the database query was determined based on their relevance to activities occurring within Hayward and remained consistent with previous Hayward inventories. The following equipment sectors are included in the 2019 baseline year inventory and the GHG emissions forecast:

- Construction and Mining
- Light Commercial
- Industrial
- Pleasure Craft
- Portable Equipment

- Recreational Vehicles
- Lawn and Garden
- Transportation Refrigeration Units

The results of the database query were summarized for all equipment sectors in Alameda County. Hayward was allocated a percentage of county fuel consumption for each sector relative to Hayward's proportion of jobs or population in the county. The results are summarized in Table 7.

Table 7 Hayward BAU GHG Emissions Forecast Off-Road Fuel Consumption

Off-road Fuel Category	2019	2025	2030	2035	2040	2045
Diesel	1,421,471	1,591,090	1,741,895	1,882,487	2,034,506	1,500,899
Gasoline	542,985	585,183	624,078	665,017	710,483	712,605
Natural Gas	807,908	876,474	937,988	1,001,263	1,071,304	1,071,304
Notes: All values are of the unit gallons of fuel Data Source: California Air Resources Board. 2021. OFFROAD2021 v1.0.2 Emissions Inventory . Available: https://arb.ca.gov/emfac/emissions-inventory/b3e3139ff7a2304c48acb2a0684ab41b38c5c26e . Accessed March 25, 2022.						

Emissions Factors

The BAU GHG emissions forecast is representative of a scenario where community activities are generally similar to that of the most recent 2019 GHG emissions inventory. As such, BAU activity data growth is multiplied by the emissions factors used to calculate GHG emissions from the 2019 GHG emissions inventory to generate an estimate of future GHG emissions without influence from GHG reduction policies at the State or local level. The BAU GHG emissions factors for the relevant GHG emissions sources and sectors are provided in Table 8, reported in MT CO₂e.

Table 8 BAU GHG Emissions Factors

GHG Emissions Source	GHG Emissions Factor	Units
Transportation		
Passenger On-Road ¹	0.000347	MT CO ₂ e/VMT
Commercial On-Road ¹	0.00144	MT CO ₂ e/VMT
Bus On-Road (excluding Public Transit) ¹	0.00147	MT CO ₂ e/VMT
Off Road - Diesel	0.0103	MT CO ₂ e/Gallons
Off Road - Gasoline	0.0091	MT CO ₂ e/Gallons
Off Road - Natural Gas (LPG)	0.0058	MT CO ₂ e/Gallons
Public Transit - BART	0.0000133	MT CO ₂ e/Passenger Miles
Public Transit – AC Transit	0.00259	MT CO ₂ e/Passenger Miles
Electricity²		
Weighted Residential Electricity	0.0000265	MT CO ₂ e/kWh
Weighted Non-Residential Electricity	0.0000120	MT CO ₂ e/kWh
Natural Gas		
Residential Natural Gas	0.00531	MT CO ₂ e/Therm
Non-Residential Natural Gas	0.00531	MT CO ₂ e/Therm
Water		
Indirect Electricity from Water Delivery ³	0.000094	MT CO ₂ e/kWh
Wastewater		
Indirect Electricity from Wastewater Treatment ³	0.000094	MT CO ₂ e/kWh
Direct Emissions from Wastewater Treatment ⁴	0.0106	MT CO ₂ e/person
Solid Waste		
Solid Waste Generation	0.29	MT CO ₂ e/Tons Landfilled
ADC Generation	0.25	MT CO ₂ e/Tons Landfilled
Notes: NA = not applicable; VMT = vehicle miles traveled; MT CO₂e = metric ton carbon dioxide equivalent; kWh = kilowatt-hour; ADC = alternative daily cover 1. On-road passenger, commercial, and bus VMT in the 2019 inventory does not differentiate EV vs ICE vehicles, as such its assumed that electricity associated with EV charging is captured in the building energy sector. The BAU forecast follows suit and electricity associated with EV charging is captured under the building energy sector. 2. Electricity emission factors for residential and non-residential are weighted based on the quantity of electricity consumed by each category by provider and the associated emission factor. It is assumed for the BAU forecast that the emission factors for all providers will not change from the 2019 year 3. Electricity emission factor for indirect electricity emissions from water and wastewater assumed to be PG&E default emission factor to remain consistent with previously prepared inventories. 4. Starting in 2018, Hayward began managing all the City's wastewater. Because wastewater treatment methods and the associated calculation parameters (i.e. default values and constants) remain the same year over year and change only with the change in population served, all direct emissions associated with wastewater treatment were aggregated and divided by the population served in 2019 to develop a single emission factor.		

BAU GHG Emissions Forecast Results

The following provides a summary of the results of the BAU GHG emissions forecast for each source in Hayward. The results have been reported in MT CO₂e. The BAU forecast projects a gradual increase in GHG emissions above the baseline 2019 GHG emissions inventory from the energy sector, water and wastewater sector, and from solid waste due to projected population growth. Emissions associated with

transportation show a slight decline over time attributed to an increasing contribution of VMT traveled by EVs as projected by EMFAC2021 which offsets the increased VMT projected. Table 9 and Figure 1 provide a summary of the Hayward BAU GHG emissions forecast.

Table 9 Hayward BAU GHG Emissions Forecast Summary

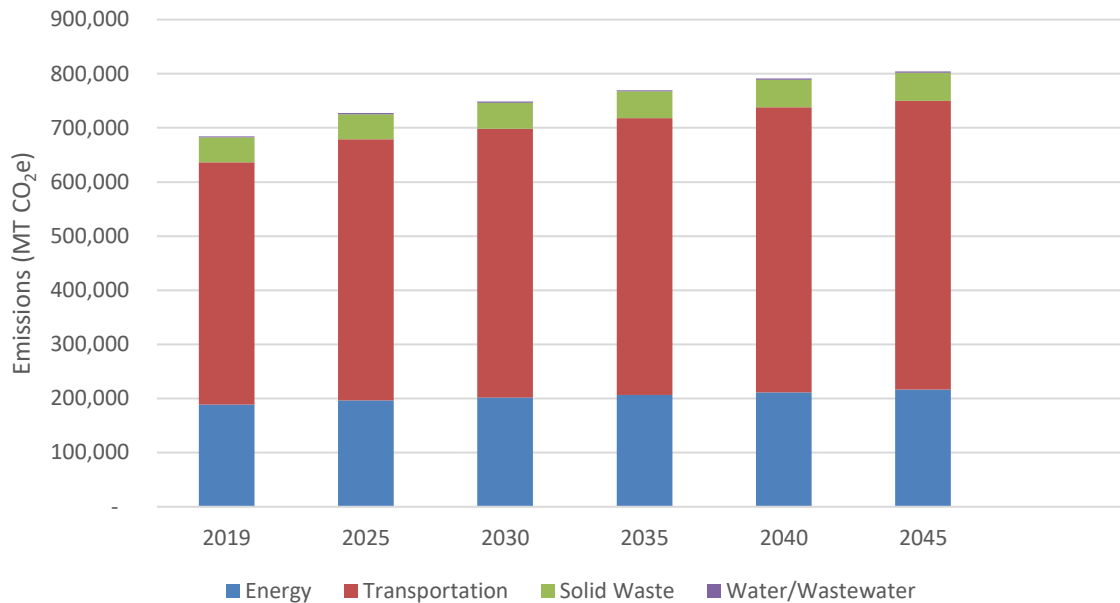
GHG Emissions Source	2019	2025	2030	2035	2040	2045
Transportation						
Passenger On-Road Transportation	298,256	321,882	330,084	338,285	346,486	354,687
Commercial On-Road Transportation	111,329	120,212	124,041	127,869	131,697	135,525
Bus On-Road Transportation ¹	8,277	8,319	8,584	8,849	9,114	9,379
Off Road – Transportation and Equipment	24,287	26,818	29,084	31,274	33,662	28,177
Public Transit - BART	547	550	568	585	603	620
Public Transit - AC Transit	4,308	4,330	4,468	4,605	4,743	4,881
Electricity²						
Residential Electricity	6,326	6,828	7,001	7,175	7,349	7,523
Non-Residential Electricity	6,140	6,104	6,256	6,408	6,560	6,711
Natural Gas						
Residential Natural Gas	95,291	102,840	105,460	108,080	110,701	113,321
Non-Residential Natural Gas	81,358	80,883	82,893	84,903	86,912	88,922
Water						
Indirect Electricity from Water Delivery	6	6	6	7	7	7
Wastewater						
Indirect Electricity from Wastewater Treatment	380	384	397	410	424	437
Direct Emissions from Wastewater Treatment	1,702	1,719	1,779	1,839	1,899	1,959
Solid Waste						
Solid Waste Generation	43,171	43,390	44,772	46,154	47,536	48,917
ADC Generation	3,015	3,030	3,127	3,223	3,320	3,416
TOTAL	684,395	727,297	748,520	769,667	791,012	804,484

Notes: Values in this table may not add up to totals due to rounding. All values are of the unit metric tons of carbon dioxide equivalent (MT CO₂e)

1. Bus on-road transportation does not include public transit. Public transit is calculated separately.

2. Electricity associated with EV charging is captured in the building energy sector in the BAU forecast.

Figure 1 Hayward BAU GHG Emissions Forecast (MT CO₂e) through 2045



Adjusted GHG Emissions Forecast

Several federal and State regulations have been enacted that would reduce Hayward's GHG emissions in 2025, 2030, 2035, 2040, and 2045. The impact of these regulations was quantified and incorporated into the adjusted forecast to project future emissions growth and the responsibility of the City and community once established State regulations have been implemented. The State legislation included in the adjusted forecast result in GHG emission reductions related to transportation, building efficiency and renewable electricity. A brief description of each regulation and the methodology used to calculate associated reductions is provided in the following, as well as a description of why specific legislation was excluded from the analysis. The following State legislation were applied to the Adjusted Forecasts based on the unique sectors within Hayward:

- 2019 Title 24 Building Energy Efficiency Standards:** The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated triennially to allow consideration and possible incorporation of new energy-efficient technologies and methods. The 2019 Title 24 Energy Efficiency Standards have come into effect, creating significantly more efficient new building stock. Starting in 2020, new residential developments must include on-site solar generation and near-zero net energy use.
- Renewable Portfolio Standard and Senate Bill 100:** Established in 2002 under Senate Bill 1078, enhanced in 2015 by Senate Bill 350, and accelerated in 2018 under Senate Bill 100, California's Renewables Portfolio Standard (RPS) is one of the most ambitious renewable energy standards in the country. The RPS program requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026 and 60 percent of total procurement by 2030. The RPS program further requires these entities to increase procurement from GHG-free sources to 100 percent of total procurement by 2045.

- **Transportation Legislation:** Major regulations incorporated into CARB’s 2021 transportation model (EMFAC2021) include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards. Additional reductions were calculated for the newly promulgated Innovative Clean Transit (ICT) regulations from CARB. Signed into law in 2002, AB 1493 (Pavley Standards) required vehicle manufacturers to reduce GHG emissions from new passenger vehicles and light trucks from 2009 through 2016. Regulations were adopted by CARB in 2004 and took effect in 2009 when the United States Environmental Protection Agency (USEPA) issued a waiver confirming California’s right to implement the bill. The CARB anticipates that the Pavley I standard will reduce GHG emissions from new California passenger vehicles by about 30 percent in 2016, while simultaneously improving fuel efficiency and reducing motorists’ costs.⁶ Prior to 2012, mobile emissions regulations were implemented on a case-by-case basis for GHG and criteria pollutant emissions separately. In January 2012, CARB approved a new emissions-control program combining the control of smog, soot-causing pollutants, and GHG emissions into a single coordinated package of requirements for passenger cars and light trucks for model years 2017 through 2025. The Advanced Clean Cars program coordinates the goals of the Low Emissions Vehicles, Zero Emissions Vehicles, and Clean Fuels Outlet programs into a single coordinated package of requirements for model years 2017 to 2025. The new standards are anticipated to reduce GHG emissions by 34 percent in 2025.⁷ Public transit GHG emissions will also be reduced in the future through the Innovative Clean Transit (ICT) regulation, which was adopted in December 2018. It requires all public transit agencies to gradually transition to a 100-percent zero-emission bus fleet by 2040. Under ICT, large transit agencies are expected to adopt Zero-Emission Bus Rollout Plans to establish a roadmap towards zero emission public transit buses.⁸

Table 10 summarizes the legislation that was applied to each sector in the adjusted forecast.

⁶ CARB. Clean Car Standards – Pavley, Assembly Bill 1493. May 2013. <http://www.arb.ca.gov/cc/ccms/ccms.htm>

⁷ CARB. Facts About the Advanced Clean Cars Program. December 2011. http://www.arb.ca.gov/msprog/zevprog/factsheets/advanced_clean_cars_eng.pdf

⁸ Innovative Clean Transit. Approved August 13, 2019. https://ww2.arb.ca.gov/sites/default/files/2019-10/ictfro-Clean-Final_0.pdf?utm_medium=email&utm_source=govdelivery

Table 10 Hayward Adjusted GHG Emissions Forecast Sectors and Applicable Legislation

GHG Emissions Sector	GHG Emissions Source	
Transportation	Passenger On-Road Transportation	Transportation Legislation (Advanced Clean Cars Standards, Pavley Standards, Phase 2 Federal GHG Standards)
	Commercial On-Road Transportation	Transportation Legislation (Advanced Clean Cars Standards, Pavley Standards, Phase 2 Federal GHG Standards)
	Bus On-Road Transportation	Transportation Legislation (Advanced Clean Cars Standards, Pavley Standards, Phase 2 Federal GHG Standards)
	Off Road - Diesel	None
	Off Road - Gasoline	None
	Off Road - Natural Gas (LPG)	None
	Public Transit - BART	None
	Public Transit – AC Transit	Innovative Clean Transit
Electricity ¹	Residential Electricity Consumption	Title 24 – applied to new buildings SB 100 – all electricity use
	Non-Residential Electricity Consumption	Title 24 – applied to new buildings SB 100 – all electricity use
Natural Gas	Residential Natural Gas Consumption	Title 24 – applied to new buildings
	Non-Residential Natural Gas Consumption	Title 24 – applied to new buildings ¹
Water	Indirect Electricity Consumption from Water Delivery	SB 100
Wastewater	Indirect Electricity Consumption from Wastewater Collection and Treatment	SB 100
	Direct Wastewater Treatment Emissions	None
Solid Waste	Methane Commitment of Solid Waste Generated by Community	None

1. As detailed below, though Title 24 impacts new building it is not anticipated to have a natural gas reduction impact on non-residential buildings under the 2019 Energy Efficiency Standards.

The following State legislation was not included in the emissions forecast calculations:

- **Assembly Bill 939 and 341:** In 2011, AB 341 set the target of 75 percent recycling, composting, or source reduction of solid waste by 2020 calling for the California Department of Resources Recycling and Recovery (CalRecycle) to take a Statewide approach to decreasing California’s reliance on landfills. This target was an update to the former target of 50 percent waste diversion set by AB 939. As actions under AB 341 are not assigned to specific local jurisdictions, AB 939 has not been included as part of the adjusted forecast and instead measures addressing compliance with AB 939 will be included in the CAP Update.
- **Senate Bill 1383:** In 2016, SB 1383 established a methane emission reduction target for short-lived climate pollutants (SLCP) in various sectors of the economy. Specifically, SB 1383 establishes targets to achieve a 50 percent reduction in the level of the Statewide disposal of organic waste from the 2014 level by 2020 and a 75 percent reduction by 2025 (CalRecycle 2019). Additionally, SB 1383 requires a 20 percent reduction in “current” edible food disposal by 2025. Although SB 1383 has been signed into law, compliance at the jurisdiction-level is un-proven. For example, Santa Clara

County, in their SB 1383 Rulemaking Overview presentation (June 20, 2018),⁹ suggest that the 75 percent reduction in organics is not likely achievable under the current structure; standardized bin colors are impractical; and the general requirement is too prescriptive. As such, SB 1383 has not been included as part of the adjusted forecast. Instead measures addressing compliance with SB 1383 will be included and quantified through GHG reduction measures included in the CAP Update.

GHG Reduction Legislation Calculations

The following methodology was used to calculate energy-related GHG emissions reduction related to Title 24 and SB 100.

- **Title 24:** It is assumed that all growth in building energy consumption is from new construction. Accordingly, Title 24 GHG emissions reduction for natural gas and electricity are calculated as a percentage of the projected increase in energy consumption beyond the baseline 2019 GHG emissions inventory, under the BAU forecast. For projects implemented after January 1, 2020, the California Energy Commission (CEC) estimates that the 2019 standards will have the following energy consumption reduction impact:
 - 53 percent reduction beyond the 2019 baseline for residential electricity;
 - 30 percent reduction beyond the 2019 baseline for commercial electricity; and
 - 7 percent reduction beyond the 2019 baseline for residential natural gas.¹⁰
- **SB 100:** PG&E and other providers such as the Community Choice Aggregation East Bay Community Energy (EBCE) that currently provide electricity in Hayward are subject to SB 100 requirements. GHG emissions from electricity consumption are largely determined by the emissions factor associated with the supplied electricity. Legislative GHG emissions reductions from SB 100 are calculated as the difference between GHG emissions under the BAU forecast electricity and GHG emissions calculated using a SB 100-adjusted GHG emissions factor for a given forecast year. An adjusted GHG emission factors is calculated by scaling the current electricity GHG emissions factor with the RPS percentage for eligible renewable electricity required for compliance with SB 100. Each of the electricity providers for Hayward has different electricity emissions factors due to different RPS percentages in their electricity delivery mix. The RPS percentages and associated GHG emissions factors used to determine the adjusted forecast electricity emissions are provided in Table 11. In 2019, the RPS percentage for all EBCE tiers of service already exceeded SB 100 requirements of a 60% RPS percentage by 2030. As such, EBCE emission factors in the forecasted years were linearly interpolated between the 2019 emission factor and an emission factor of 0 in 2045 which would correspond with the SB 100 requirement of 100% RPS by 2045. Note that while both Title 24 and SB 100 influence GHG emissions reductions in the electricity sector, double counting of these reductions is avoided by accounting for Title 24 reductions first and then accounting for reductions from SB 100.

⁹ Santa Clara County. June 20, 2018. SB 1383 Rulemaking Overview.

<https://www.sccgov.org/sites/rwr/rwrc/Documents/SB%201383%20PowerPoint.pdf>

¹⁰ California Energy Commission. 2018. 2019 Building Energy Efficiency Standards Frequently Asked Questions. Available: <https://www.energy.ca.gov/sites/default/files/2020-03/Title_24_2019_Building_Standards_FAQ_ada.pdf>. Accessed June 21, 2021.

Table 11 Electricity Provider Forecasted RPS and Electricity GHG Emissions Factors

Energy Provider	2019	2025	2030	2035	2040	2045
PG&E						
Renewable Portfolio Standard Percentage	32%	47%	60%	73%	87%	100%
Adjusted Electricity Emission Factor (MT CO ₂ e/kWh)	0.000094	0.000073	0.000055	0.000037	0.000018	0.0
Tier 1 – Other Providers (EBCE -Bright Choice)						
Adjusted Electricity Emission Factor (MT CO ₂ e/kWh)	0.000061	0.000047	0.000035	0.000023	0.000012	0.0
Tier 2&3 – Other Providers (EBCE – Brilliant 100 and Renewable 100)						
Adjusted Electricity Emission Factor (MT CO ₂ e/kWh)	0.0	0.0	0.0	0.0	0.0	0.0
Weighted Community Electricity Emissions Factor^{1,2}						
Residential Adjusted Electricity Emission Factor (MT CO ₂ e/kWh) ¹	0.000026	0.000020	0.000015	0.000010	0.000005	0.0
Non-residential Adjusted Electricity Emission Factor (MT CO ₂ e/kWh) ²	0.000012	0.000009	0.000007	0.000005	0.000002	0.0
Notes: MT CO ₂ e = metric tons of carbon dioxide equivalent; kWh = kilowatt hour 1.The Residential Weighted Electricity Emission Factor is developed based on the percent of residential electricity provided by each provider in 2019. It is assumed that the percent of residential electricity provided by each provider remains consistent over time. Based on the 2019 inventory, residential electricity was provided by the providers as follows: ~ 5% by PG&E, ~35% by EBCE- Bright Choice (Tier 1), ~ 59% by EBCE – Brilliant 100 (Tier 2), ~<0.1% by EBCE – Renewable 100 (Tier 3). 2.The Non-residential Weighted Electricity Emission Factor is developed based on the percent of non-residential electricity provided by each provider in 2019. It is assumed that the percent of residential electricity provided by each provider remains consistent over time. Based on the 2019 inventory, non-residential electricity was provided by the providers as follows: ~ 6% by PG&E, ~10% by EBCE- Bright Choice (Tier 1), ~ 84% by EBCE – Brilliant 100 (Tier 2), ~<0.1% by EBCE – Renewable 100 (Tier 3).						

The following methodology was used to calculate transportation-related GHG emissions reduction related to various State legislation.

- **Transportation Legislation:** Activity data for the adjusted forecasted on-road transportation VMT was similarly forecasted as the BAU forecast where the growth metrics were applied to the BAU growth indicators for passenger and commercial VMT to forecast passenger and commercial VMT. Reductions in GHG emissions from the above referenced transportation standards were calculated using CARB’s EMFAC2021 model for Alameda County. The EMFAC2021 model integrates the estimated reductions into the mobile source emissions portion of the model.¹¹ The degree to which GHG emissions from on-road transportation will be reduced can be quantified as the difference between transportation emissions calculated using the 2019 provided emission factors and calculated using the reduced emission factors for the target years. In addition, passenger and commercial electric vehicle (EV) electricity consumption was calculated per forecast year based on EV penetration rates obtained from EMFAC 2021.

¹¹ Additional details are provided in CARB’s EMFAC2017 Technical Documentation, July 2018. (<https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf>). Note that the Low Carbon Fuel Standard (LCFS) regulation is excluded from EMFAC2017 because most of the emissions benefits due to the LCFS come from the production cycle (upstream emissions) of the fuel rather than the combustion cycle (tailpipe). As a result, LCFS is assumed to not have a significant impact on CO₂ emissions from EMFAC’s tailpipe emission estimates.

Passenger and commercial EV emissions from electricity consumption are subtracted from residential and commercial energy emissions respectively in the adjusted forecast as emissions from EV charging in the forecast years are captured under the transportation sector. This emissions reallocation is labeled as an “EV adjustment” in the forecasts. The forecasted annual VMT and associated GHG emissions factors used to determine the adjusted forecast on-road emissions are provided in Table 12.

Table 12 Hayward Passenger On-Road Transportation Forecast

Growth Metric	2019	2025	2030	2035	2040	2045
Total VMT ¹	942,650,000	1,011,159,621	1,037,454,669	1,063,749,716	1,090,044,764	1,116,339,812
Passenger VMT ¹	859,527,091	927,615,232	951,249,744	974,884,257	998,518,769	1,022,153,281
Commercial VMT ¹	77,472,909	77,865,740	80,345,435	82,825,129	85,304,824	87,784,519
Bus VMT ¹	5,650,000	5,678,649	5,859,490	6,040,331	6,221,172	6,402,012
Passenger EV Share ²	0.0%	6.9%	8.6%	9.6%	10.0%	10.2%
Commercial EV Share ²	0.0%	0.7%	6.9%	17.6%	25.9%	27.5%
Bus EV Share ²	0.0%	0.2%	14.1%	32.3%	47.3%	59.9%
Passenger ICE Emission Factor (MT CO ₂ e/mile)	0.00035	0.00033	0.00030	0.00029	0.00028	0.00028
Commercial ICE Emission Factor (MT CO ₂ e/mile)	0.00144	0.00134	0.00126	0.00122	0.00121	0.00121
Bus ICE Emission Factor (MT CO ₂ e/mile)	0.00147	0.00136	0.00127	0.00121	0.00121	0.00114
Notes: VMT = vehicle miles traveled, EV = electric vehicle; ICE = internal combustion engine 1. Data for forecast years estimated by multiplying the growth indicator for VMT from the 2019 inventory multiplied by growth metric (i.e., households for passenger vehicles and service population for commercial and bus vehicles). Vehicle categories include the following vehicle types: Passenger (LDA, LDT1, LDT2, MCY, MDV, MH); Commercial (LHDT1, LHDT2, MHDT, HHDT); Buses (OBUS, SBUS, UBUS). Bus VMT presented here does not include Public Transit -AC Transit which is calculated separately as described in this memorandum. 2. Previous inventories did not separately account for electricity used for EV charging. In forecast years EV share by vehicle category was obtained from EMFAC2021 and applied to the respective vehicle category to estimate electricity used for EVs. The calculated electricity is subsequently removed from the electricity sector in the adjusted forecast to avoid double counting.						

Adjusted GHG Emissions Forecast Results

Compliance with State legislation is expected to result in GHG emissions reduction from the BAU GHG Emissions Forecast in the transportation and energy sectors for residential and non-residential activities. Compliance with both the Pavley regulation, which requires automakers to control GHG emission from new passenger vehicles for the 2009 through 2016 model years, and the Advanced Clean Car Program, which combines the control of smog-causing (criteria) pollutants and GHG emissions into a single package of regulations, are expected to reduce GHG emissions from transportation. Emissions associated with heavy-duty trucks and transit buses are also anticipated to be reduced through the Advanced Clean Trucks Regulation and Innovative Clean Transit, respectively. Compliance with Title 24 requirements are expected to reduce GHG emissions from reduced electricity and natural gas consumption in new buildings. Compliance with SB 100 requirements are expected to further reduce

GHG emissions in the residential sector through reduced GHG emissions associated with electricity generation, as well as similar reductions in the commercial sector. SB 100 is also anticipated to reduced indirect electricity emissions associated with water and wastewater conveyance and treatment. A detailed summary of the projected GHG emissions under the adjusted forecast by sector and year through 2045 can be found in Table 13 .

Table 13 Hayward Adjusted GHG Emissions Forecast Detail

GHG Emissions Source	2019	2025	2030	2035	2040	2045
Transportation						
Passenger On-Road Transportation	298,256	281,963	264,018	256,013	254,427	256,924
Commercial On-Road Transportation	111,329	103,620	94,404	83,586	77,090	74,698
Bus On-Road Transportation ¹	8,277	7,703	6,398	4,975	3,964	2,922
Off Road – Transportation and Equipment	24,287	26,818	29,084	31,274	33,662	28,177
Public Transit - BART	547	550	568	585	603	620
Public Transit - AC Transit	4,308	4,010	3,324	2,581	2,056	1,519
Electricity²						
Residential Electricity – EV Adjusted	6,326	4,771	3,586	2,401	1,210	-
Non-Residential Electricity -EV Adjusted	6,140	4,670	3,548	2,370	1,190	-
Natural Gas						
Residential Natural Gas	95,291	102,311	104,748	107,185	109,622	112,059
Non-Residential Natural Gas	81,358	80,883	82,893	84,903	86,912	88,922
Water						
Indirect Electricity from Water Delivery	6	5	4	3	1	-
Wastewater						
Indirect Electricity from Wastewater Treatment	380	297	232	160	83	-
Direct Emissions from Wastewater Treatment	1,702	1,719	1,779	1,839	1,899	1,959
Solid Waste						
Solid Waste Generation	43,171	43,390	44,772	46,154	47,536	48,917
ADC Generation	3,015	3,030	3,127	3,223	3,320	3,416
TOTAL	684,395	665,743	642,486	627,251	623,574	620,134

Notes: Values in this table may not add up to totals due to rounding. All values are of the unit metric tons of carbon dioxide equivalent (MT CO₂e)

1. Bus on-road transportation does not include public transit. Public transit is calculated separately.

2. Electricity associated with EV charging is captured in the transportation sector by vehicles class and has been removed from the electricity sector to avoid double counting of emissions.

Figure 2 presents the GHG emissions trends in terms of MT CO₂e for the Adjusted forecast. Adjusted forecast emissions trend downward over time through 2045 with the decrease becoming more gradual between 2035 and 2045.

Figure 2 Hayward Adjusted GHG Emissions Forecast (MT CO₂e) through 2045

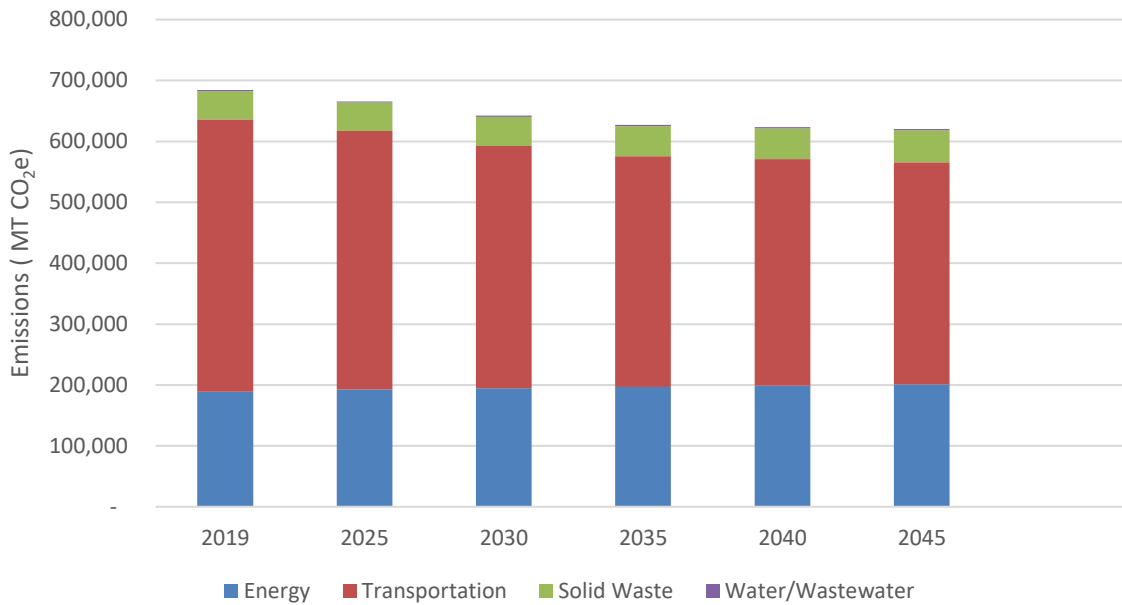


Table 14 provides the results summary of the GHG emissions forecast for Hayward, including the BAU GHG Emissions Forecast, the Adjusted GHG Forecast, and the expected percentage GHG emissions reduction based on compliance with State GHG legislation.

Table 14 Hayward GHG Emissions Forecast Results Summary

	2019	2025	2030	2035	2040	2045
Business-as-Usual Forecast	684,395	727,297	748,520	769,667	791,012	804,484
<i>Transportation Reductions</i>	0	-57,446	-99,031	-132,454	-154,504	-168,410
<i>Title 24 Reductions</i>	0	-1,212	-1,666	-2,136	-2,566	-2,962
<i>SB 100 Reductions</i>	0	-2,895	-5,337	-7,826	-10,367	-12,979
Legislative Adjusted Forecast	684,395	665,743	642,486	627,251	623,574	620,134
Percent Reduction in GHG Emissions from Legislation	0.0%	8.5%	14.2%	18.5%	21.2%	22.9%
SB = Senate Bill; GHG = greenhouse gas						

Hayward GHG Emissions Targets

GHG reduction targets are used in CAPs to establish measurable metrics intended to guide the community's commitment to achieve GHG emissions reduction and help gauge progress with reducing emissions over time. GHG targets are developed relative to a baseline emissions level. California has established Statewide GHG reduction goals for 2030 and 2045. The CARB 2017 Scoping Plan recommends that local agencies provide their fair share GHG reduction to achieve the States goals. Thus, local agencies are recommended to establish at a minimum, equivalent reduction targets at the local level by establishing communitywide GHG reduction goals for climate action that will help California achieve its 2030 and 2045 GHG emissions goals.

GHG reduction targets can be set as either an efficiency target (MT CO₂e per capita) or as a communitywide mass emissions target (total MT CO₂e). With CARB's 2017 Scoping Plan Update, California recommended using efficiency metrics for local targets to incentivize growth in a coordinated manner and not penalize cities which are growing at significant rates.¹² Throughout this section, targets are discussed in terms of mass emissions reduction, as Hayward developed the targets initially as mass emissions targets and has primarily tracked emissions as mass emissions.

Hayward GHG Emissions Targets for 2025, 2030, and 2045

State climate legislation compares emissions reduction targets to a 1990 baseline. However, Hayward does not have a 1990 GHG inventory, and the targets developed by the City are instead compared to their 2005 baseline. In the 2006 AB 32 Scoping Plan, the recommended target for local governments to meet 1990 levels was 15 percent below "current" levels by 2020, where "current" levels were construed as baseline years between 2005-2008.¹³

The City has adopted the following targets using the 2005 GHG inventory as the baseline:

- Reduce GHG emissions to 30 percent below 2005 levels by 2025;
- Reduce GHG emissions to 55 percent below 2005 baseline levels by 2030; and
- Work with the community to develop a plan that may result in the reduction of community-based GHG emissions to achieve carbon neutrality by 2045.

Hayward's target of 55 percent below 2005 levels by 2030 is consistent with the California 2030 target of 40 percent below 1990 levels.

With GHG emission reduction targets in place, the reduction gap that Hayward will be responsible for through local action can be calculated. The CAP Update will assess the GHG emissions reduction gap based on the difference between the *legislative* adjusted GHG emissions forecast and the adopted Hayward GHG reduction targets. Table 15 provides a summary of the Hayward GHG emission reduction targets and gap in both mass emissions and per capita emissions metrics. The per capita targets aligned with Hayward's targets are similarly calculated as the mass emission targets using the 2005 baseline mass emissions and City population in 2005 to establish a per capita baseline.

¹² California Air Resources Board. 2017. California's Climate Change Scoping Plan, p. 99-102.

¹³ Governor's Office of Planning and Research (OPR). 2017. General Plan Guidelines. Ch 8 Climate Change. p. 228.
https://opr.ca.gov/docs/OPR_C8_final.pdf.

Table 15 Summary of Hayward GHG Emission Reduction Targets and Gap Analysis

Metric	2005	2019	2020 ¹	2025	2030 ²	2035	2040	2045 ²
Mass Emissions Target and Gap								
Mass Emissions Adjusted Forecast (MT CO ₂ e)	973,244	684,395	693,697	665,743	642,486	627,251	623,574	620,134
City and SB 32 Mass Emissions Target (Pathway) (MT CO ₂ e) ^{1,2}	N/A	N/A	778,595	681,271	437,960	291,973	145,987	-
Remaining Emissions Gap from State targets (MT CO ₂ e) ²	N/A	N/A	-84,898	-15,528	204,526	335,278	477,588	620,134
Per Capita Emissions City set Target and Gap								
Population ³	140,530	160,197	156,136	161,781	167,425	173,069	178,713	184,358
Per Capita Adjusted Forecast (MT CO ₂ e per capita)	6.9	4.3	4.4	4.1	3.8	3.6	3.5	3.4
Per Capita City Targets (MT CO ₂ e per capita)	N/A	N/A	5.5	4.8	3.1	2.1	1.0	0.0
Remaining Per Capita Emissions Gap (MT CO ₂ e per capita)	N/A	N/A	-1.1	-0.7	0.7	1.5	2.5	3.4

Notes: MT CO₂e = Metric tons of carbon dioxide equivalent

Emissions have been rounded to the nearest whole number and therefore sums may not match.

1. Hayward has set GHG reduction targets originally adopted with the 2009 CAP and 2014 General Plan that were slightly more aggressive than the State's target set by AB 32.

2. As of 2019, the City has exceeded the City's 2020 GHG reduction target of 20% reduction below 2005 GHG emissions levels, thereby exceeding the State's 2020 target of 15% below 2005 levels (AB 32).

3. Population projections for the GHG inventories (2005, 2010, 2015, 2017, 2018, 2019) were obtained from MTC. Forecasted population projections obtained from Plan Bay Area 2040 and differ slightly.

Figure 3 provides a visual representation of past and future GHG emissions, with the impacts of State legislation. Figure 4 presents the remaining gap Hayward will be responsible for to meet the GHG emission reduction targets. City targets as mass emissions and as efficiency targets converted to mass emissions are shown.

Figure 3 Past and Future GHG Emissions and Reduction Targets

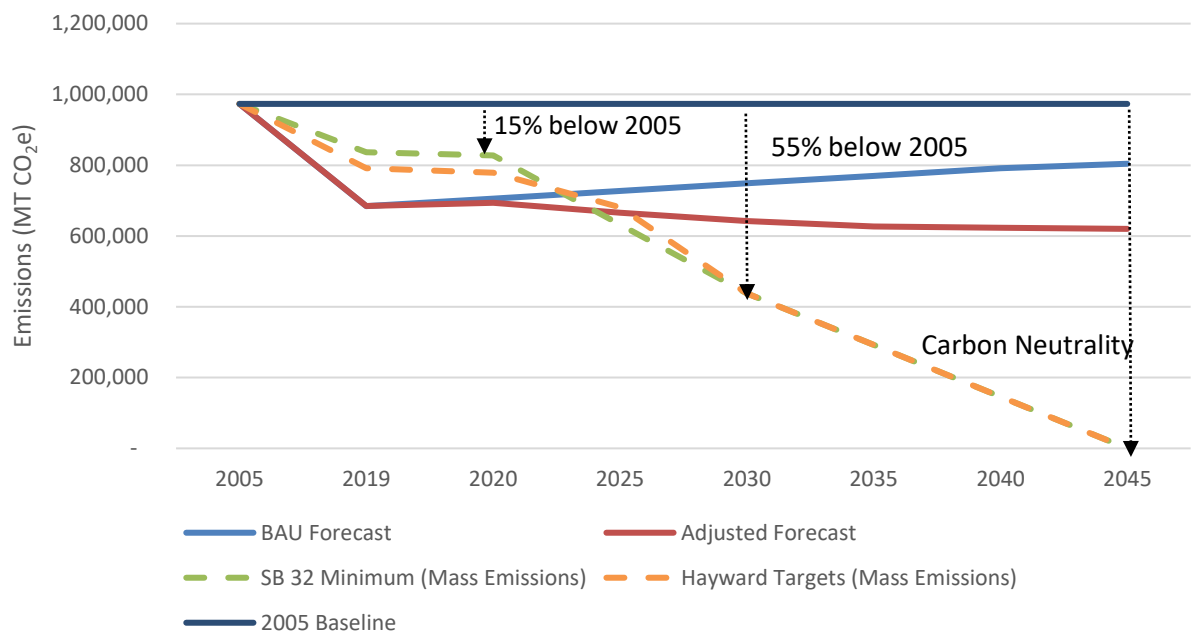
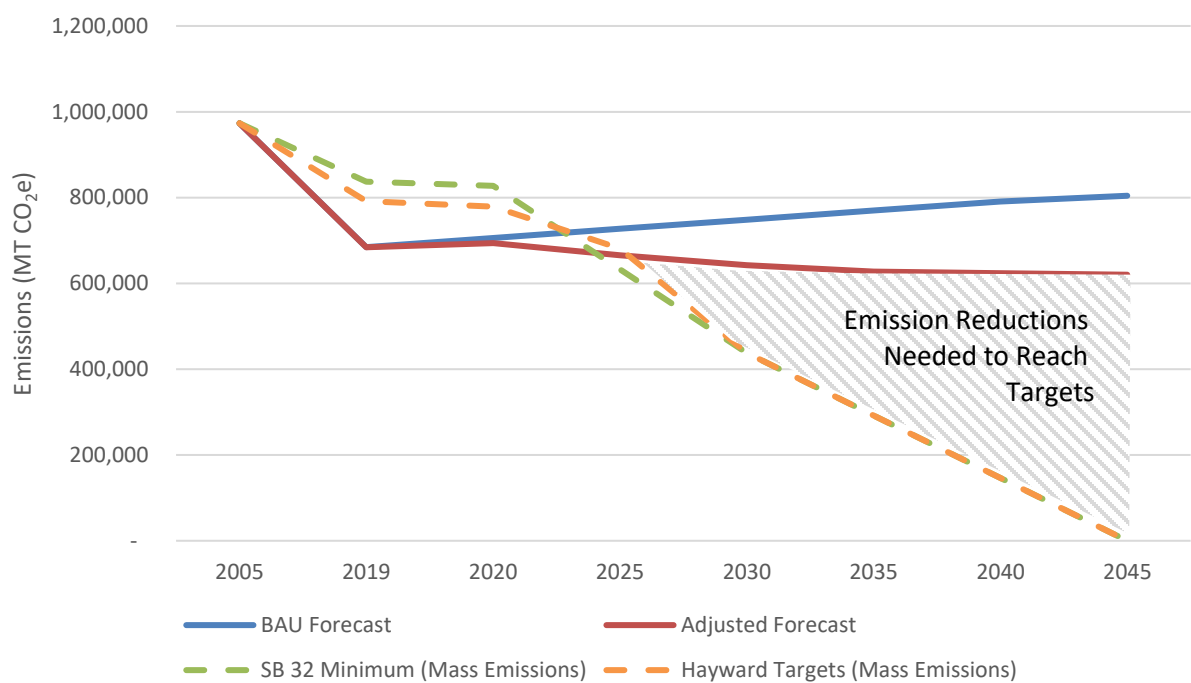


Figure 4 GHG Emissions Gap Analysis



Plan to Meet the Targets

The 2025, 2030, and 2045 targets identified above would be achieved through a combination of existing California measures and implementation of local measures identified in the Hayward CAP Update. Local measures will be identified through a comprehensive assessment of existing local and regional policies,

programs, and actions and by assessing any gaps and identifying additional opportunities. Additional measures will be developed from best practices of other similar and neighboring jurisdictions, as well as those recommended by organizations and agencies, such as the California Air Pollution Control Officers Association (CAPCOA), the Office of Planning and Research, CARB's 2017 Scoping Plan, and Association of Environmental Professionals (AEP). Measures will be vetted by City staff, stakeholders, and the community and will be quantified to identify their overall contribution to meeting the City's 2025, 2030, and 2045 GHG reduction targets in the Hayward CAP Update.

Appendix D

GHG Reduction Measures Quantification and Evidence



Hayward Climate Action Plan

Greenhouse Gas Reduction Measures Quantification and Evidence Appendix

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1 GHG Measures Quantification Approach and Timeframe

The California Environmental Quality Act (CEQA) Guidelines Section 15183.5(b) establishes criteria to guide the preparation of a “plan for the reduction of greenhouse gas emissions.” Subsection (D) notes that a CEQA Guideline-consistent greenhouse gas (GHG) Climate Action Plan (CAP) must include, “measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level.” This appendix includes the CAP GHG reduction measures quantification approach, quantification, and substantial evidence.

1.1 GHG Measures Quantification Approach

GHG measures and actions can be either quantitative or supportive, defined as follows:

- **Quantitative:** When implemented, quantitative measures and actions result in quantifiable GHG emissions reductions. GHG emissions reduction were calculated using published evidence provided through adequately controlled investigations, studies, and articles carried out by qualified experts that establish the effectiveness for the reduction measures and actions. In this appendix, GHG emissions are quantified at the measure level rather than at the specific level of each action.
- **Supportive:** Supportive measures and actions may also be quantifiable and have substantial evidence to support their overall contribution to GHG reduction. However, due to one of several factors – including a low GHG reduction benefit, indirect GHG reduction benefit, or potential for double-counting– they have not been quantified and do not contribute directly to the total GHG reduction quantification. Despite not being quantified, supportive measures/actions are nevertheless critical to the overall success of the CAP and provide support so that the quantitative measures and actions will be successfully implemented.

1.2 GHG Measures Quantification Timeframe

This appendix provides estimates for GHG emissions reduction associated with the implementation of CAP measures and actions. These estimates are based on projected activity data for each source and relative emission factors. The GHG emissions reduction associated with the CAP measures and actions were calculated and compared to the adjusted 2030 and 2045 forecast to determine whether the City is anticipated to meet the established 2030 and 2045 targets. Table 1 shows Hayward’s existing (2019) and projected (2030 and 2045) population.¹

¹ Forecasted demographic data for Hayward is based on the Alameda CTC Zone from plan Bay Area 2040 and is consistent with the projections used for the Housing Element and traffic analysis conducted by Kittleson & Associates, Inc.

Table 1 Hayward Existing and Projected Population²

Year	2019	2030	2045
Population	160,197	167,425	184,358

Table 2 provides a summary of emissions reduction achieved by CAP measure as well as presents the total emissions reduction achieved on a mass emissions basis and a per capita basis using the population projections included in Table 1.

Table 2 GHG Measures Reduction Quantification in 2030 and 2045

Measure ID	Measure	Anticipated GHG Emissions Reduction/Sequestration (MT CO ₂ e) in 2030	Anticipated GHG Emissions Reduction/Sequestration (MT CO ₂ e) in 2045
BE-1	Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.	5,393 MT CO ₂ e	18,764 MT CO ₂ e
BE-2	Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.	13,874 MT CO ₂ e	68,032 MT CO ₂ e
BE-3	Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.	20,670 MT CO ₂ e	114,220 MT CO ₂ e
BE-4	Support Ava Community Energy in providing 100% carbon-free electricity by 2030.	4,802 MT CO ₂ e	0 MT CO ₂ e
BE-5	Continue to promote energy efficiency improvement, in alignment with the existing 2014 Climate Action Plan (2014).	Supportive	Supportive
BE-6	Generate on City facilities carbon-neutral electricity meeting 80% of the City's electricity needs by 2030.	Supportive	Supportive
T-1	Increase active transportation mode share to 15% by 2030 and to 20% by 2045.	6,485 MT CO ₂ e	8,755 MT CO ₂ e
T-2	Implement public and shared transit programs to reduce communitywide VMT 15% by 2030 and 30% by 2045.	7,585 MT CO ₂ e	25,092 MT CO ₂ e

² Association of Bay Area Governments & Metropolitan Transportation Commission. 2017. Plan Bay Area 2040: Final Regional Forecast of Jobs, Population and Housing. http://2040.planbayarea.org/files/2020-02/Regional%20Forecast%20Supplemental%20%20Report_Final_7-2017_0.pdf. Accessed June 27, 2023

Measure ID	Measure	Anticipated GHG Emissions Reduction/Sequestration (MT CO ₂ e) in 2030	Anticipated GHG Emissions Reduction/Sequestration (MT CO ₂ e) in 2045
T-3	Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-2 and T-3.	Supportive	Supportive
T-4	Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045.	16,014 MT CO ₂ e	88,718 MT CO ₂ e
T-5	Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.	3,161 MT CO ₂ e	37,461 MT CO ₂ e
T-6	Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045.	4,312 T CO ₂ e	22,542 MT CO ₂ e
T-7	Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.	Supportive	Supportive
SW-1	Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics by 75% by 2025 and 90% by 2045.	35,925 MT CO ₂ e	47,101 MT CO ₂ e
SW-2	Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.	Supportive	Supportive
WW-1	Reduce water consumption by 15% by 2030 and maintain it through 2045.	35 MT CO ₂ e	0 MT CO ₂ e
CS-1	Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.	212 MT CO ₂ e	743 MT CO ₂ e
CS-2	Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030 and 2045.	3,081 MT CO ₂ e	3,392 MT CO ₂ e
Total GHG Emissions Reduction		121,543 MT CO₂e	434,784 MT CO₂e
Total GHG Emissions Reductions – per capita		0.73 MT CO₂e/person	2.36 MT CO₂e/person
Percent Reductions from Adjusted Forecasted Emissions		19%	70%

2 GHG Measures Quantification and Evidence

The CAP measures and actions are summarized by the overarching GHG reduction sector categories, which include:

- Building Energy
- Transportation
- Waste
- Water
- Carbon Sequestration

The following discussion is organized similarly and the substantial evidence for each quantifiable measure and action is detailed below.

2.1 Building Energy

Measure BE-1 Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.

Background

To reach carbon neutrality by 2045, most of the buildings in the City, including those that have not yet been constructed, will need to be carbon neutral. Electrification of new construction will eliminate the use of natural gas for space heating, water heating, clothes drying, and cooking. Natural gas combustion for heating and cooking in commercial and residential buildings is projected to account for 29 percent and 32 percent of the City's total GHG emissions, for 2030 and 2045, respectively.³ By transitioning buildings from the consumption of natural gas to electricity, emissions from this source can be reduced through Senate Bill (SB) 100 requirements for increased renewable electricity and the associated GHG emissions. A variety of studies have found that electrification of buildings, combined with renewable power generation is a potential path towards reaching carbon neutrality.⁴ Additionally, the benefits in annual utility bill savings and decreased cost associated with piping of natural gas into new construction makes all-electric buildings more cost effective in some California Building Climate Zones; including, Zone 3 and Zone 12, where

³ 2019 Community GHG Inventory. See Appendix B of the CAP.

⁴ Williams, James et al., Pathways to Deep Decarbonization in the United States (San Francisco: Energy and Environmental Economics, 2014); Northeastern Regional Assessment of Strategic Electrification (Northeast Energy Efficiency Partnerships, 2017); Steinberg, Daniel et al., Electrification and Decarbonization: Exploring US Energy Use and Greenhouse Gas Emissions in Scenarios with Widespread Electrification and Power Sector Decarbonization (National Renewable Energy Laboratory, 2017). Accessed June 27, 2023

Hayward is located.^{5,6} As of June 2023, over 65 California cities have adopted all-electric only ordinances.⁷

Quantifiable GHG emissions reduction is associated with the implementation of Action BE-1.1, enforcing the Hayward Electrification Ordinance for new residential buildings banning natural gas and Action BE-1.2, establishing mandatory requirements to eliminate natural gas in all newly constructed building, by transitioning energy consumption from natural gas consumption to electricity. All other actions under Measure BE-1 would incrementally support the overall goal of the measure by sharing informational resources with the community to enhance awareness around the cost savings, environmental benefits, and health and safety benefits of all-electric construction (Actions BE-1.3, BE-1.4, BE-1.5, BE-1.6, BE-1.5, BE-1.8, and BE-1.9).

Methodology and Assumptions

Adoption of mandatory requirements to eliminate natural gas in all newly constructed buildings by 2026 would align with the California Building Code three-year cycle, stopping growth of natural gas consumption from new construction after 2026. The City's existing all electric ordinance requires that, as of 2023, all newly constructed residential buildings eliminate natural gas for detached accessory dwelling units, single-family homes, condominium buildings, apartments, and mixed-use buildings. It also requires that all new non-residential buildings for which natural gas infrastructure is installed must be "electric ready," meaning the wiring, electrical capacity, and physical space needed is provided to allow the building to be converted to an all-electric building in the future.⁸ These new mandatory requirements will require that all new non-residential buildings eliminate natural gas by 2026. The amount of future new development that will occur in the City is evaluated based on increases in employment and population provided for the Alameda CTC Zone from plan Bay Area 2040 and is consistent with the projections used for the Housing Element and traffic analysis conducted by Kittleson & Associates, Inc. Data was provided for year 2020 and 2040, therefore interim years were linearly interpolated. To estimate demographic growth past 2040, the annual compound growth rate between 2020 and 2040 was applied to the demographic data to estimate demographic projections in 2045. This growth is assumed to be constant year-over-year in the GHG emissions forecast, with each additional resident's or employee's contribution towards natural gas consumption being equivalent to the per capita or per employment natural gas consumption in the 2019 Community GHG Inventory year, while also accounting for efficiency increases from future Title 24 requirements. The resulting calculated increase in natural gas consumption is conservative as it is assumed to be purely from new construction, and any increases beyond the time the ordinance is adopted would be shifted to electricity consumption.

Emissions reduction calculations assume mandatory requirements to eliminate natural gas in all newly constructed residential and non-residential buildings will be adopted by 2023 and 2026, respectively; therefore, increased natural gas consumption from population and employment growth beyond 2023 and 2026 would be replaced by electricity consumption. Since electric appliances are approximately three times more efficient over similar natural gas burning equipment and appliances, the use of electric equipment instead of natural gas would result in improved

⁵ California Energy Codes and Standards. 2022. Cost Effectiveness Study New Residential Building. <https://explorer.localenergycodes.com/jurisdiction/hayward-city/summary>. Accessed June 27, 2023

⁶ California Energy Codes and Standards. 2022. Cost Effectiveness Study New Nonresidential Building. <https://explorer.localenergycodes.com/jurisdiction/hayward-city/summary>. Accessed June 27, 2023

⁷ California Energy Codes and Standards. 2023. 2022 Code Cycle Locally Adopted Energy Ordinances. <https://localenergycodes.com/content/adopted-ordinances>. Accessed June 27, 2023

⁸ City of Hayward. Reach Code. 2023. <https://www.hayward-ca.gov/reach-code#:~:text=The%20new%20Reach%20Code%20requires,apartments%20and%20mixed%2Duse%20buildings>. Accessed July 2023

energy efficiency and a reduction in overall energy consumption for replaced natural gas equipment.^{9,10,11} The electricity consumption would generate GHG emissions that would partially offset the reduction in natural gas emissions from electrification. The calculations and assumptions used to estimate emissions reduction from Measure BE-1 are provided in Table 3.

Table 3 Measure BE-1 GHG Emissions Reduction Calculations

Year	2030	2045
Residential Reductions		
Adjusted Forecast Residential NG usage (therms) ¹	19,724,708	21,101,309
NG usage in implementation year (therms)	19,082,294	19,082,294
NG usage avoided (therms)	642,414	2,019,015
Emissions from NG usage avoided (MT CO ₂ e) ²	3,412	10,722
Electricity usage from converting to electric (kWh) ³	6,274,478	19,719,788
Residential weighted electricity Emissions Factor (MT CO ₂ e/kWh) ⁴	0.0000028	0
Emissions from converted electricity usage (MT CO ₂ e)	17	0
Residential emission reductions (MT CO ₂ e)	3,394	10,722
Commercial Reductions		
Adjusted Commercial NG usage (therms) ¹	15,609,224	16,744,501
NG usage in implementation year (therms)	15,230,798	15,230,798
NG usage avoided (therms)	378,426	1,513,703
Emissions from NG usage avoided (MT CO ₂ e) ²	2,010	8,039
Electricity usage from converting to electric (kWh) ³	3,696,098	14,784,390
Commercial weighted electricity EF (MT CO ₂ e/kWh) ⁴	0.0000031	0
Emissions from converted electricity usage (MT CO ₂ e)	12	0
Commercial emission reductions (MT CO ₂ e)	1,997	8,039
Total Reductions (MT CO₂e)	5,392	18,761

Notes: MT CO₂e = metric tons of carbon dioxide; kWh =kilowatt-hour

¹ Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP.

² Based on an emission factor of 0.00531051 MT CO₂e/therms, per EPA's Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf

³ Based on a conversion factor of 29.3001 kWh/therms and the assumption that electric appliances are generally three times more efficient than gas appliances. <https://help.leonardo-energy.org/hc/en-us/articles/203047881-How-efficient-is-a-heat-pump->

⁴ Weighted electricity emission factors were developed for residential and non-residential uses and incorporate the differing current opt-out rates for residential (5% opt-out) and non-residential (6% opt-out) sectors. Additionally, the emission factor used assumes implementation of Measure BE-4 to avoid double counting of GHG emission reductions.

*Values may not add up due to rounding

⁹ According to the EIA 2020 Annual Energy Outlook, electric heat pumps for commercial space heating and cooling are two to five times more efficient than natural gas fueled equipment. EIA. 2020. Annual Energy Outlook. Table 22. Commercial Sector Energy Consumption, Floorspace, Equipment Efficiency, and Distributed Generation. <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=32-AEO2020&cases=ref2020&sourcekey=0>. Accessed June 27, 2023.

¹⁰ Residential electric heat pumps for space heating and cooling are six to 20 times more efficient than natural gas equipment. EIA. 2020. Annual Energy Outlook. Table 21. Residential Sector Equipment Stock and Efficiency, and Distributed Generation. <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=30-AEO2020&cases=ref2020&sourcekey=0>. Accessed June 27, 2023.

¹¹ Dennis, Keith. 2015. Environmentally Beneficial Electrification: Electricity as the End-Use Option. The Electricity Journal. 28(9). pp. 100-112. <https://doi.org/10.1016/j.tej.2015.09.019>. Accessed June 27, 2023.

Table 4 GHG Emissions Reduction Associated with Measure BE-1

Action ID	Pillar	Action	Emissions Reduction (MT CO ₂ e)	
			2030	2045
BE-1.1	Structural Change	Continue to enforce the adopted Hayward Electrification Ordinance for new residential buildings banning natural gas.	5,392	18,761
BE-1.2	Structural Change	Adopt an ordinance, reach code, or zero NOx threshold, effective January 1, 2026, that establishes mandatory requirements that all newly constructed buildings avoid natural gas use by 2026.	Supportive	Supportive
BE-1.3	Education/Funding	Compile case studies conducted by BayREN, the Building Decarbonization Coalition and other relevant sources that show cost effective strategies for electric buildings by prototype and detail the cost savings associated with all-electric construction. Share the information on the City's website.	Supportive	Supportive
BE-1.4	Education/Partnership	Partner with BayREN to provide/share technical resources, including hosting workforce development training for installers, local contractors, and building owners/operators, to discuss benefits and technical requirements of electrification within Hayward. Promote the cost savings, environmental benefits, and versatility of electrification to builders, property owners, and contractors on the City website and at the City permit counters.	Supportive	Supportive
BE-1.5	Partnerships/Equity	Engage with stakeholders, both internal stakeholders, such as City staff and officials, and external stakeholders, such as local developers and community groups regarding the purpose and impact of the Hayward Electrification Reach Code and to identify equity concerns.	Supportive	Supportive
BE-1.6	Partnership	Engage with an organization such as Building Decarbonization Coalition to work with local building industry stakeholders in educating developers and other stakeholders on new appliances and approaches to building electrification.	Supportive	Supportive
BE-1.7	Feasibility Studies	Partner with Ava Community Energy to conduct an electrification infrastructure and capacity feasibility study to identify expected increases in electricity demand due to building and vehicle electrification, ensure capacity to meet that demand, and identify any infrastructure improvements.	Supportive	Supportive
BE-1.8	Feasibility Studies	Utilize the Low Carbon Concrete Code Amendment Toolkit and review current best practices to develop implementation strategies, compliance forms, and specifications for compliant mixes.	Supportive	Supportive
BE-1.9	Education	Promote the use of low carbon concrete in construction projects (residential and commercial). Coordinate with the California Air Resources Board as they develop rules and guidance pursuant to AB2446.	Supportive	Supportive

Measure BE-2 Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.

Background

In the 2019 Community Inventory, residential (single-family and multi-family) natural gas usage is about 112 therms/person/year and accounts for 14 percent of the City's total GHG emissions. Through Measure BE-2, the City commits to electrifying existing single-family residential buildings.

Action BE-2.1 and BE-2.2 commit the City to adopting an existing single-family residential building decarbonization ordinance by 2026 to eliminate expansion of natural gas infrastructure and require decarbonization of appliances, upon replacement. These actions also commit the City to adopting an ordinance requiring existing single-family homes to be 100 percent electric by 2045. The 2026 decarbonization ordinance will establish mandatory requirements eliminating expansion of natural gas in existing single-family residential buildings. HVAC system and hot water heaters should be targeted in the ordinance due to their large contribution to residential natural gas end-uses and the cost-effectiveness associated with their replacement on burnout.¹² To support this, Action BE-2.3 commits the City to adopting a time of retrofit ordinance that requires all buildings with retrofit work that meet a certain threshold, to complete energy efficiency/electrification actions, to be part of the 2026 ordinance. Additionally, before adopting an existing single-family residential building decarbonization ordinance, the City will develop a single-family residential building electrification feasibility study (Action BE-2.5), to better understand cost implications, equity concerns, and potential strategies to address those concerns whilst implementing an ordinance.

While there is substantial momentum and resources behind electrification of existing buildings, some approaches are still being clarified through the legal process. On April 17, 2023, the Ninth Circuit Court of Appeals determined an ordinance enacted by the City of Berkeley that prohibited gas piping in new construction was preempted by the federal Energy Policy and Conservation Act ("EPCA"). Preemption generally means that a law or rule of an inferior government entity is of no effect if it is in conflict with a law or rule of a superior government entity. Among other things, the EPCA preempts state and local regulations concerning the energy use of covered appliances. The term covered appliances includes appliances such as water heaters, furnaces, clothes dryers, and kitchen ranges. As of July 2023, Berkeley has the opportunity request further review by the Ninth Circuit Court of Appeals or the United States Supreme Court. However, neither the Ninth Circuit Court of Appeals nor the United States Supreme Court is obligated to entertain any additional review. An existing single-family residential building decarbonization ordinance is a foundational measure in the City's CAP. However, as the City of Berkeley is anticipated to appeal the Ninth Circuit's ruling, the legal support for some ordinance types remains uncertain. Based on the findings of this or other rulings, the City should continue to adapt its approach to decarbonization.

In addition to efforts regarding structural changes and feasibility studies, the City will work to identify further electrification measures that can be implemented to reach the long-term target of electrifying 100 percent of the buildings in the City, through continued partnerships with the Bay Area Air Quality Management District (BAAQMD), local realtors and contractors, Bay Area Regional Energy Network (BayREN), Ava Community Energy (ACE), Pacific Gas & Electric (PG&E), BlocPower, and StopWaste (Actions BE-2.6, BE-2.4, BE-2.7, BE-2.11, BE-2.12, and BE-2.14). Partnerships and engagement efforts will range from developing a comprehensive building code and compliance training program to discuss benefits and technical requirements of electrification (Action BE-2.6) to

conducting engagement efforts targeting low-income communities of color to better understand the community's concerns around electrification and provide guidance (Action BE-2.8 and Action BE-2.10). Action BE-2.13 seeks to provide funding options to disadvantaged community members while Action BE-2.9 commits the City to partnering with the Hayward Below Market Rate (BMR) housing stock owners to develop a plan to electrify all BMR housing by 2045. The impacts associated with promotional and educational outreach for electrification have not been well documented due to the cutting-edge nature of the strategy. Electrification as a GHG reduction strategy has only begun to gain traction in California mostly due to the implementation of SB 100 and the expansion of community choice aggregations. While it is not clear how the community will respond to electrification, energy efficiency outreach has been conducted since as early as the 1970's and some research has been conducted on the effects of outreach and education on energy. One study in New York showed that out of the 8,991 people who participated in informational programs, 69 percent implemented the recommended practices.¹³ Another research meta-analysis reviewed dozens of papers covering various energy efficiency, water efficiency, and waste outreach and found that education-only campaigns could produce between 10-12 percent energy savings.¹⁴ Due to the City's recent leadership in adopting and implementing reach codes, including the new residential building natural gas ban (Action BE-1.1), it is anticipated that community members will comply with electrification efforts.

Methodology and Assumptions

Natural gas usage from existing residential buildings accounted for 14 percent of emissions in the City in 2019. Based on 2021 U.S. Census Bureau American Community Survey estimates for Hayward, approximately 67 percent of housing units in the City are considered single-family. Therefore, it was assumed for this calculation that 67 percent of natural gas usage and associated emissions from existing residential buildings was attributed to single-family buildings specifically.¹⁵ GHG emission reduction calculations were developed assuming the implementation of BE-1.1, starting in 2023, for residential buildings. GHG emissions reductions were calculated based on the percentage of natural gas attributed to water heaters, HVAC systems, and stoves, the average lifespan of each natural gas consuming devices, as seen in Table 5. Based on information from the United State Energy Information Administration (EIA), the average gas-fire water heater, HVAC, and stovetop were assumed to be 13, 21.5, and 12 years, respectively. Although studies indicate that permit compliance for appliances ranges from 10-25 percent, regardless of permit status, there is generally a high compliance rate with mandatory requirements related to energy efficiency. The ordinances developed through this measure, the efforts by BAAQMD to require zero-NOx appliances, incentive programs available and the increasing affordability and efficiency of electric appliances over natural gas appliances all will contribute to a high replacement rate of natural gas appliances with electric at time of burnout. Therefore, it is assumed that approximately 94 percent of the time, natural gas equipment would be replaced with an electric alternative. Calculations for Measure BE-2 also assumed that 38 percent, 39 percent, and 9 percent of residential natural gas usage comes from water heaters, space heating/cooling, and cooking, respectively. Natural gas saved after ordinance implementation was converted to electricity usage (i.e., therms converted to

¹³ https://www.joe.org/joe/2009december/pdf/JOE_v47_6a6.pdf

¹⁴ Skumatiz Economic Research Associated Inc. N.d. Evaluating the Impacts of Education/Outreach Programs Lessons On Impacts, Methods, and Optimal Education https://aceee.org/files/proceedings/2000/data/papers/SS00_Panel8_Paper10.pdf. Accessed June 27, 2023

¹⁵ Single-family residential share of the residential units in Hayward was calculated to be 33 percent, based on the 1-unit detached and 1-unit attached totals presented in the DP04 Selected Housing Characteristics Census 2021 American Community Survey Table. https://data.census.gov/table?g=040XX00US06_160XX00US0633000&d=ACS+5-Year+Estimates+Data+Profiles&tid=ACSDP5Y2021.DP04 . Accessed June 27, 2023

kWh). Since electric appliances are approximately three times more efficient over similar natural gas burning equipment and appliances,¹⁶ the use of electric equipment instead of natural gas would result in improved energy efficiency and a reduction in overall energy consumption for replaced natural gas equipment. A weighted electricity emissions factor assuming implementation of Measure BE-4 was used to calculate GHG emission associated with electricity usage. The calculations and assumptions used to estimate emissions reduction from Measure BE-2 are provided in Table 5.

Table 5 Measure BE-2 GHG Emissions Reduction Calculations

Calculation Factor	2030	2045
Residential NG usage after new building electrification ordinance is implemented (therms) ¹	19,082,294	19,082,294
Percentage of homes with replaced water heaters, assuming some non-compliance ²	29%	94%
NG reduction from water heater replacement (%) ³	11%	35%
Percentage of homes with replaced HVAC, assuming some non-compliance ⁴	17%	83%
NG reduction from HVAC replacement (%) ⁵	7%	32%
Percentage of homes with replaced stoves, assuming some non-compliance ⁶	31%	94%
NG reduction from stove replacement (%) ⁷	3%	8%
Total percent reduction of NG/% of existing buildings electrified (%)	20%	100%
Total NG saved (therms)	3,911,403	19,082,294
Emissions from total NG saved (MT CO ₂ e) ⁸	20,775	101,355
Electricity usage from converting to electric (kWh) ⁹	38,201,496	186,371,042
Weighted residential electricity Emission Factor (MT CO ₂ e/kWh) ¹⁰	0.0000028	0
Emissions from converted electricity usage (MT CO ₂ e)	105	0
Total Residential Reductions (MT CO ₂ e)	20,670	101,355
Percentage of housing units that are single-family residential ¹¹	67%	67%
Total GHG Emissions Reductions (MT CO₂e)	13,872	68,020

Notes: MT CO₂e = metric tons of carbon dioxide; kWh =-kilowatt-hour

¹ Assumes implementation of Measure BE-1.

² Assumes electrification ordinance implementation year of 2026 and average gas-fire water heat lifespan of 13 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf>. Access June 27, 2023

³ Assumes 38 percent of natural gas usage comes from water heaters, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf>. Access June 27, 2023.

⁴ Assumes electrification ordinance implementation year of 2026 and average HVAC lifespan of 21.5 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf>. Access June 27, 2023

⁵ Assumes 39 percent of natural gas usage comes from HVAC, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf>. Access June 27, 2023.

⁶ Assumes electrification ordinance implementation year of 2026 and average stovetop lifespan of 12 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf>. Access June 27, 2023

⁷ Assumes 6 percent of natural gas usage comes from cooking, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. <https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf>. Access June 27, 2023.

¹⁶ Dennis, Keith. 2015. Environmentally Beneficial Electrification: Electricity as the End-Use Option. The Electricity Journal. 28(9). pp. 100-112. <https://doi.org/10.1016/j.tej.2015.09.019>. Accessed June 27, 2023

Calculation Factor	2030	2045
⁸ Assumes a NG emission factor of 0.005311 (MT CO ₂ e/therm), per EPA's Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf .		
⁹ Assumes a conversion factor of 29.3 (kwh/therm) and that electric equipment is three times as efficient as natural gas, per European Copper Institute. 2018. Heat Pumps Integrating technologies to decarbonize heating and cooling. https://help.leonardo-energy.org/hc/en-us/article_attachments/360010981780/ehpa-white-paper-111018.pdf . Accessed June 27, 2023		
¹⁰ Electricity Emission Factor is weighted to account for opt-out rates of residential customers and assumes implementation of BE-4.		
¹¹ Single-family residential share of the residential units in Hayward was calculated to be 67 percent, based on the 1-unit detached and 1-unit attached totals presented in the DP04 Selected Housing Characteristics Census 2021 American Community Survey Table. https://data.census.gov/table?g=040XX00US06_160XX00US0633000&d=ACS+5-Year+Estimates+Data+Profiles&tid=ACSDP5Y2021.DP04 . Accessed June 27, 2023		
*Values may not add up due to rounding () denotes negative		

Table 6 GHG Emissions Reductions Associated with Measure BE-2

Action ID	Pillars	Action	Emissions Reduction (MT CO ₂ e)	
			2030	2045
BE-2.1	Structural Change	Once costs and funding/financing options are identified (BE-2.5), adopt a decarbonization ordinance for existing single-family residential buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure, and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective.	13,872	68,020
BE-2.2	Structural Change	Adopt an ordinance requiring existing single-family homes to be 100% all-electric by 2045.	Supportive	Supportive
BE-2.3	Structural Charge	Adopt a time of retrofit ordinance that requires all buildings with retrofit work who meet a certain threshold, to complete energy efficiency/electrification actions. To be part of reach code to take effect January 2026.	Supportive	Supportive
BE-2.4	Structural Change/Partnership	Work with community stakeholders including realtors and contractors to develop electrification readiness requirements to be completed within 120 days of completion of a home sale. Include a potential waiver process for distressed sales.	Supportive	Supportive
BE-2.5	Feasibility Studies	Develop a single-family residential building electrification feasibility study with a detailed existing building analysis and electrification costs analysis to understand cost implications, identify potential equity concerns/impacts, and develop strategies to electrify existing buildings such that natural gas usage in single-family residential buildings is reduced by 10% by 2030.	Supportive	Supportive
BE-2.6	Partnership	Support BAAQMD's efforts to require zero-NOx furnaces and water heaters at time of replacement with compliant technologies such as electric heat pumps. Advocate that BAAQMD ensure discounted electric appliances are offered to lower income households and upfront rebates are available.	Supportive	Supportive

Action ID	Pillars	Action	Emissions Reduction (MT CO ₂ e)	
			2030	2045
BE-2.7	Partnership/ Education	Partner with BayREN, Ava Community Energy and StopWaste to work with the local contractors, realtors, homeowner associations, and labor unions to develop a comprehensive building code and compliance training program, including hosting workforce development trainings discussing the benefits and technical requirements of electrification.	Supportive	Supportive
BE-2.8	Education	Conduct engagement efforts for the general public and targeted to low-income communities of color during development of the electrification strategy to understand the community's concerns around electrification.	Supportive	Supportive
BE-2.9	Equity	Partner with Hayward Below Market Rate (BMR) housing stock owners (such as Eden Housing) to commit to electrifying all BMR housing by 2045. Establish a plan, financing strategies, and schedule for implementing this action by 2026 ¹⁷	Supportive	Supportive
BE-2.10	Equity	Identify and partner with local community-based organizations with connections to low-income communities of color to assist in development of the electrification strategy	Supportive	Supportive
BE-2.11	Partnership/Funding	Devote staff time to collaborate with PG&E, Ava Community Energy, and other cities in the region to advocate for regulatory changes at the State level (e.g., CARB) to allow neighborhood level electrification and pruning of natural gas to reduce the change of stranded asset, provide potential funding, and establish an efficient transition to carbon neutral buildings.	Supportive	Supportive
BE-2.12	Partnership/Funding	Work with Pacific Gas & Electric (PG&E), and Ava Community Energy (ACE) to conduct a feasibility study assessing the cost and funding strategy for incentivizing all-electric retrofits through on-bill financing.	Supportive	Supportive
BE-2.13	Equity	Review incentives, rebates, and financing options for procedural equity and ensure that existing and updated incentive programs are being equitably distributed to the community. Hurdles to equitable implementation could include credit checks, excessive procedural hurdles and lack of targeted outreach.	Supportive	Supportive
BE-2.14	Partnerships	Partner with a financing/management company such as BlocPower to provide electrification services and financing to the community with prioritization of historically under-invested communities.	Supportive	Supportive

¹⁷ <https://www.hayward-ca.gov/services/city-services/finding-affordable-housing>

Measure BE-3 Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.

Background

In line with Measure BE-2, the City is committed to decarbonizing existing commercial and multi-family buildings through the adoption of building decarbonization requirements requiring electrification building retrofits and electric appliances.

Through Action BE-3.4, the City commits to developing a commercial and multi-family residential building electrification feasibility study, outlining costs, equity concern/impacts, and strategies to reduce natural gas usage and support future adoption of a commercial and multi-family building decarbonization ordinance. Actions BE-3.1 and BE-3.2 commit the City to adopting a decarbonization ordinance by 2026 for commercial and multi-family buildings separately to eliminate expansion of natural gas infrastructure and require decarbonization of appliances, upon replacement for multi-family and commercial building. The 2026 decarbonization ordinances establish mandatory requirements eliminating expansion of natural gas in existing commercial and multi-family buildings. Information regarding systems and appliances targeted in the ordinances and the Ninth Circuit Court of Appeals is described above in the Measure BE-2 background section. Through Action BE-3.3, the City will adopt a commercial energy performance assessment and disclosure ordinance for commercial and multi-family buildings, requiring energy disclosure consistent with State law and the use of ENERGY STAR Portfolio Manager benchmarking tool. The City will work to identify further electrification measures that can be implemented to reach the long-term target of electrifying 100 percent of the buildings in the City, through partnering with electrification experts to provide guidance to commercial building owners (Action BE-3.5) and developing education campaigns to promote commercial electrification, targeting builders, developers, local contractors, and property managers and advertising electric appliance rebates and incentives (Action BE-3.6). The City will also conduct targeted outreach to small business and minority-owned business to understand equity challenges associated with building decarbonization and will partner with BayRen, ACE, and StopWaste to continue to provide rebates and other financing option (Action BE-3.7 and Action BE-3.9). Through Action BE-3.8, the City will conduct a feasibility study to evaluate the current effectiveness of Property Assessed Clean Energy (PACE) financing for installation of renewable energy systems in commercial and industrial properties. If found effective through the study the City should continue to provide this financing option. As outlined above for Measure BE-2, studies show that education and engagement around energy efficiency has historically led to increased implementation of recommended practices and ultimately resulted in energy savings.

Methodology and Assumptions

Calculations used for Measure BE-2 were similarly used to quantify the GHG emission reductions associated with implementation of Measure BE-3. Based on 2021 U.S. Census American Community Survey estimates for Hayward, approximately 33 percent of housing units in the City are considered to be multi-family units. Emissions reduction calculations were developed for multi-family

residential buildings in alignment with this percentage.¹⁸ The calculations and assumptions used to estimate emissions reduction from Measure BE-3 are provided in Table 7.

¹⁸ Multi-family residential share of the residential units in Hayward was calculated to be 33 percent, based on the 2-unit or greater totals presented in the DP04 Selected Housing Characteristics Census 2021 American Community Survey Table.
https://data.census.gov/table?g=040XX00US06_160XX00US0633000&d=ACS+5-Year+Estimates+Data+Profiles&tid=ACSDP5Y2021.DP04 .
Accessed June 27, 2023

Table 7 Measure BE-3 GHG Emissions Reduction Calculations

Calculation Factor	2030	2045
Multi-Family Residential		
Residential NG usage after new building electrification ordinance is implemented (therms) ¹	19,082,294	19,082,294
Percentage of homes with replaced water heaters, assuming some non-compliance ²	29%	94%
NG reduction from water heater replacement (%) ³	11%	35%
Percentage of homes with replaced HVAC, assuming some non-compliance ⁴	17%	83%
NG reduction from HVAC replacement (%) ⁵	7%	32%
Percentage of homes with replaced stoves, assuming some non-compliance ⁶	31%	94%
NG reduction from stove replacement (%) ⁷	3%	8%
Total percent reduction of NG/% of existing buildings electrified (%)	20%	100%
Total NG saved (therms)	3,911,403	19,082,294
Emissions from total NG saved (MT CO ₂ e) ⁸	20,775	101,355
Electricity usage from converting to electric (kWh) ⁹	38,201,496	186,371,042
Weighted residential electricity Emission Factor (MT CO ₂ e/kWh) ¹⁰	0.0000028	0
Emissions from converted electricity usage (MT CO ₂ e)	105	0
Total Residential Reductions (MT CO ₂ e)	20,666	101,337
Percentage of housing units that are multi-family residential ¹¹	33%	33%
Total Multi-Family Residential Reductions (MT CO₂e)	6,794	33,317
Commercial		
Commercial NG usage after new building electrification ordinance is implemented (therms) ¹	15,230,798	15,230,798
Percentage of buildings with replaced water heaters, assuming some non-compliance ¹²	38%	94%
NG reduction from water heater replacement (%) ¹³	10%	26%
Percentage of commercial buildings with replaced HVAC, assuming some non-compliance ¹⁴	16%	78%
NG reduction from HVAC replacement (%) ¹⁵	7%	32%
Total percent reduction of NG (%)	17%	100%
Total NG saved (therms)	2,628,232	15,230,798
Emissions from total NG saved (MT CO ₂ e) ⁸	13,960	80,898
Electricity usage from converting to electric (kWh) ⁹	25,669,157	148,754,636
Weighted commercial electricity EF (MT CO ₂ e/kWh) ¹⁰	0.0000033	0
Emissions from converted electricity usage (MT CO ₂ e)	85	0
Total Commercial Reductions (MT CO ₂ e)	13,872	80,883
Total GHG Emissions Reductions (MT CO₂e)	20,667	114,200

Notes: MT CO₂e = metric tons of carbon dioxide; kWh = kilowatt-hour

¹ Assumes implementation of Measure BE-1.

² Assumes electrification ordinance implementation year of 2026 and average gas-fire water heat lifespan of 13 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. <https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf>. Access June 27, 2023

Calculation Factor	2030	2045
3. Assumes 38 percent of natural gas usage comes from water heaters, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf . Access June 27, 2023.		
4. Assumes electrification ordinance implementation year of 2026 and average HVAC lifespan of 21.5 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf . Access June 27, 2023		
5. Assumes 39 percent of natural gas usage comes from HVAC, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf . Access June 27, 2023.		
6. Assumes electrification ordinance implementation year of 2026 and average stovetop lifespan of 12 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf . Access June 27, 2023		
7. Assumes 6 percent of natural gas usage comes from cooking, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf . Access June 27, 2023.		
8. Assumes a NG emission factor of 0.005311 (MT CO ₂ e/therm), per EPA's Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/default/files/2015-07/documents/emission-factors_2014.pdf .		
9. Assumes a conversion factor of 29.3 (kwh/therm) and that electric equipment is three times as efficient as natural gas, per European Copper Institute. 2018. Heat Pumps Integrating technologies to decarbonize heating and cooling. https://help.leonardo-energy.org/hc/en-us/article_attachments/360010981780/ehpa-white-paper-111018.pdf . Accessed June 27, 2023		
10. Electricity Emission Factor is weighted to account for the specific opt-out rates of residential and non-residential customers and assumes implementation of BE-4.		
11. Single-family residential share of the residential units in Hayward was calculated to be 67 percent, based on the 1-unit detached and 1-unit attached totals presented in the DP04 Selected Housing Characteristics Census 2021 American Community Survey Table. https://data.census.gov/table?g=040XX00US06_160XX00US0633000&d=ACS+5-Year+Estimates+Data+Profiles&tid=ACSDP5Y2021.DP04 . Accessed June 27, 2023		
12. Assumes electrification ordinance implementation year of 2026 and average gas-fire water heat lifespan of 10 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf . Access June 27, 2023		
13. Assumes 28 percent of natural gas usage comes from water heaters, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf . Access June 27, 2023.		
14. Assumes electrification ordinance implementation year of 2026 and average HVAC lifespan of 23 years, per EIA. Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. https://www.eia.gov/analysis/studies/buildings/equipcosts/pdf/full.pdf . Access June 27, 2023		
15. Assumes 42 percent of natural gas usage comes from HVAC, per Synapse. 2018. Decarbonization of Heating Energy Use in California Buildings. https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf . Access June 27, 2023.		
*Values may not add up due to rounding () denotes negative		

Table 8 GHG Emissions Reduction Associated with Measure BE-3

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
BE-3.1	Structural Change	Based on the results of the feasibility studies (BE- 3.4) adopt a decarbonization ordinance for existing commercial buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. As part of this ordinance, implement the following steps: 1. Develop requirements that satisfy the federal Energy Policy and Conservation Act (EPCA) seven criteria for an exemption from preemption; 2. Establish specific metrics for standard benchmarking; 3. Identify a regulatory mechanism for eliminating natural gas use in existing commercial buildings that addresses legal and feasibility considerations; and 4. Enforce requirement compliance through the same permitting compliance program as for residential building electrification.	20,667	114,200
BE-3.2	Structural Change	Based on the results of the feasibility studies (BE- 3.4) adopt a decarbonization ordinance for existing multi-family buildings by 2026 that, based on legislative feasibility, establishes mandatory requirements that eliminates expansion of natural gas infrastructure and requires appliances, upon replacement, to be decarbonized where technologically feasible and cost effective. As part of this ordinance, implement the following steps: 1. Develop requirements that satisfy the federal Energy Policy and Conservation Act (EPCA) seven criteria for an exemption from preemption; 2. Establish specific metrics for standard benchmarking; 3. Identify a regulatory mechanism for eliminating natural gas use in existing multi-family buildings that addresses legal and feasibility considerations; and 4. Enforce requirement compliance through the same permitting compliance program as for residential building electrification.	Supportive	Supportive
BE-3.3	Structural Change	Adopt a Commercial Energy Performance Assessment and Disclosure Ordinance for commercial and multi-family buildings, which requires energy use disclosure consistent with State law (AB 1103) and the use of the ENERGY STAR Portfolio Manager benchmarking tool.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
BE-3.4	Feasibility Studies	Conduct feasibility studies to identify commercial and multi-family building decarbonization barriers and develop a commercial and multi-family building decarbonization strategy with analysis supporting future adoption of a commercial and multi-family building decarbonization ordinance.	Supportive	Supportive
BE-3.5	Education/ Partnership	Partner with an electrification/efficiency expert to provide guidance to commercial buildings covered by the building performance standard.	Supportive	Supportive
BE-3.6	Education	Develop an education campaign to promote commercial electrification and include items in the program such as: - Continue to engage with local business and business organizations (e.g., Chamber of Commerce, the Alameda County Green Business Program) to inform and facilitate electrification for commercial business owners. - Continue to promote the use of the Energy Star Portfolio Manager program and energy benchmarking training programs for nonresidential building owners. - Advertise via utility bill inserts the incentive programs or grants available and the cost benefits of electric appliances. - Targeted outreach to builders, developers, local contractors, and property managers with an informational brochure describing the financial benefits of replacing natural gas appliances with all electric appliances when they apply for permits. - Provide informational webinars and an updated website to advertise and promote All-Electric Building Initiative rebates and incentives.	Supportive	Supportive
BE-3.7	Equity	Conduct outreach to small businesses and minority-owned businesses to understand potential equity impacts of a decarbonization policy as part of the existing building decarbonization study.	Supportive	Supportive
BE-3.8	Funding	Conduct feasibility study to evaluate the current uptake and effectiveness of Property Assessed Clean Energy (PACE) financing for installation of renewable energy systems in commercial and industrial properties. If feasibility study indicates effectiveness, continue to offer PACE financing for commercial and industrial properties to install renewable energy systems.	Supportive	Supportive
BE-3.9	Partnerships	Continue to work with Bay Area Regional Energy Network (BayREN), ACE, and StopWaste to continue to improve and implement commercial electrification rebates and financing opportunities and other offered incentives.	Supportive	Supportive

Measure BE-4: Support Ava Community Energy in providing 100% carbon-free electricity by 2030

Background

Electricity in the City is currently supplied by Ava Community Energy (ACE) and Pacific Gas & Electric (PG&E). PG&E provides a power mix with 39 percent renewable resources, and 89 percent GHG free overall (including nuclear and large hydro).¹⁹ While the portion of renewables in PG&E's grid mix is relatively high compared to other utility providers in the state, the emission factor associated with its electricity is not expected to decrease to zero until the state-mandated year of 2045, due to SB 100. In order to reduce GHG emissions in the short-term, the City will provide 100 percent carbon free electricity to the community through ACE, City's Community Choice Aggregation (CCA) energy provider by 2030. In general, CCAs use the purchasing power of the community to procure electricity directly from electricity generators. This allows the community to choose its own grid mix, with an option to procure electricity from 100 percent carbon free renewable generation sources. PG&E will continue to deliver power, maintain lines and infrastructure, and coordinate billing. ACE currently provides two power mix options²⁰ for residents to choose from:

- **Bright Choice:** Base option with 42.3% eligible renewable energy, with prices five percent below PG&E rates
- **Renewable 100:** 100% eligible renewable option. Price is 1/4 cent per kilowatt hour above PG&E rates.

To maximize the GHG reduction opportunity this presents, the City will continue to automatically enroll all community accounts in Renewable 100 (Action BE-4.1), as many cities in California have already done today.²¹ The Hayward City Council voted to set the default electricity option for City residents, except low-income residents, and businesses to ACE's Renewable 100 service, starting in January 2022.²² Although, ACE is planning on Bright Choice being 100 percent carbon free by 2030. Customers have the option to opt-out of the CCA back to PG&E or opt-down to another grid mix option. Currently, about 5 percent of Hayward residential customers and 6 percent of commercial customers currently choose to opt-out of the ACE programs.²³ Action BE-4.2 will focus on conducting outreach and educating citizens about the benefits of opting in to ACE electricity. Purchasing 100 percent carbon free electricity through ACE is one of the most cost-effective actions the City can take to meaningfully reduce GHG emissions within the City. The cost of opting up into carbon free electricity with ACE is five percent below the PG&E rate and 100 percent renewable rates with both PG&E and ACE are only a few dollars a month extra for most residential rate schedules.²⁴ However, even a small increase on monthly bills can make a big difference for the most vulnerable populations. Both PG&E and ACE provides a CARE rate schedule for low-income households. Action BE-4.3 commits the City to ensuring no cost increase to CARE/FERA customers, potentially through subsidization cost to CARE/FERA customers to be funded by a rate increase for non-discounted customers. Action BE-4.4 requires the City to work with ACE to conduct a feasibility study to

¹⁹ PG&E. 2021. Power Mix. https://www.pge.com/en_US/about-pge/environment/what-we-are-doing/clean-energy-solutions/clean-energy-solutions.page?WT.mc_id=Vanity_cleanenergy. Accessed June 27, 2023.

²⁰ EBCE. 2023. Compare Your Options. <https://ebce.org/compare-plans-residential/>. Accessed June 27, 2023.

²¹ UCLA Luskin Center for Innovation. 2019. <https://innovation.luskin.ucla.edu/2019/09/04/50-cities-are-quietly-leading-the-nations-100-clean-energy-wave/>. Accessed June 27, 2023

²² EBCE. Hayward is Going Green with 100% Renewable Energy. <https://ebce.org/hayward/>. Accessed July 19, 2023

²³ Opt-out rates were calculated based on electricity data included in the 2019 Hayward Community Inventory.

²⁴ PG&E – EBCE Join Rate Comparisons. 2023. https://www.pge.com/pge_global/common/pdfs/customer-service/other-services/alternative-energy-providers/community-choice-aggregation/ebce_rateclasscomparison.pdf. Accessed June 27, 2023

understand reason for opt outs and to track changes in rates, which can in-turn allow for more targeted efforts to reduce opt-out rates over time.

Methodology and Assumptions

The GHG reduction quantification below is based on the forecasted electricity consumption under the adjusted forecast as well as the forecasted electricity emission factor in each year. Additional electricity load expected from Measure BE-1, BE-2, and BE-3 is not included here due to reductions for Measure BE-4 being accounted for in each measure's respective quantification. It is assumed in all other electrification measures that the City completes this measure by 2030. GHG emissions reduction were calculated by multiplying all electricity obtained from ACE by an emission factor of zero compared with the current emission factor. As such, the emissions remaining from electricity use would be from the customers that opted out of ACE back to PG&E. The electricity purchased from PG&E was calculated by applying the current ACE opt-out rates for residential and commercial of 5 and 6 percent, respectively, to the total residential and commercial electricity forecasted in 2030 and 2045. In the quantification of this measure, these baseline opt-out rates were assumed to remain the same through 2045. The forecasted PG&E electricity quantity was then multiplied by the forecasted PG&E emission factor in the corresponding year. The measure residential and commercial weighted emission factors were calculated per the equation below:

$$\text{Measure Weighted EF} = \text{EBCE EF} * (1 - \text{EBCE Opt - Out Rate}) + \text{PG\&E EF} * \text{EBCE Opt - Out Rate}$$

The ACE Emission Factor in the equation above is assumed to be zero by 2030.

Table 9 Measure BE-4 GHG Emissions Reduction Calculations

Year	2030	2045
Residential		
Forecasted Electricity Purchased Residential (kWh) ¹	234,194,499	239,471,069
Forecasted Residential Emission Factor (MT CO ₂ e/kWh) ²	0.00002	0
Forecasted Emissions (MT CO ₂ e)	3,586	0
PG&E Opt out Electricity (kWh)	11,709,725	11,973,553
ACE Electricity (kWh)	222,484,774	227,497,516
Electricity Emissions with Measure Implementation (MT CO ₂ e)	646	0
Measure Weighted Residential Emission Factor (MT CO ₂ e/kWh) ³	0.0000028	0
Emissions Reduced with Measure Implementation (MT CO ₂ e)	2,940	0
Commercial		
Forecasted Electricity Purchased Commercial (kWh) ¹	508,611,741	516,310,524
Forecasted Commercial Emission Factor (MT CO ₂ e/kWh) ²	0.000007	0
Forecasted Emissions (MT CO ₂ e)	3,548	0
PG&E Opt out Electricity (kWh)	30,516,704	30,978,631
ACE Electricity (kWh)	478,095,036	485,331,892
Electricity Emissions with Measure Implementation (MT CO ₂ e)	1,685	0
Measure Weighted Residential Emission Factor (MT CO ₂ e/kWh) ⁴	0.0000033	0
Emissions Reduced with Measure Implementation (MT CO ₂ e)	1,863	0
Total Reductions (MT CO₂e)	4,802	0
Notes: MT CO ₂ e = metric tons of carbon dioxide; kWh =kilowatt-hour		

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- ¹ Legislative Adjusted Forecast. See Appendix B of the CAP. Additional electricity load expected from Measure BE-1, BE-2, and BE-3 is not included here due to CCA reductions for the added electricity being accounted for in each measure's respective quantification.
 - ² The Forecasted Residential and Commercial Emission Factors are based on the weighted average residential emission factors for PG&E and ACE residential accounts.
 - ³ The Measure Residential Emission Factor assumes a baseline residential ACE opt-out rate of 5%, that the ACE emission factor is zero by 2030, and applies the PG&E forecasted emission factor for the 5% opt-out.
 - ⁴ The Measure Commercial Emission Factor assumes use a baseline commercial ACE out-out rate of 6%, that the ACE emission factor is zero by 2030, and applies the PG&E forecasted emission for the 6% opt-out.
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Table 10 GHG Emissions Reduction Associated with Measure BE-4

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
BE-4.1	Structural Change	Adopt a resolution establishing a policy that if Ava Community Energy does not meet the 2030 goal of its entire portfolio being 100% carbon-free, all Hayward customers will be enrolled in Renewable 100 by 2030. Resolution should include identification of funding or subsidies to ensure no cost increase to CARE/FERA customers. This may include subsidization cost to CARE/FERA customers to be funded by a rate increase for non-discounted customers.	4,802	0
BE-4.2	Education	Engage with community (residential and non-residential) to advertise/highlight Ava Community Energy 's plan to provide 100% carbon-free electricity by 2030. Provide information on the importance of this goal and the impact of buying electricity from Ava Community Energy .	Supportive	Supportive
BE-4.3	Equity	In collaboration with Ava Community Energy , implement a pilot program to provide Hayward's affordable housing units Ava Community Energy 's Renewable 100 service. Identify funding options with Ava Community Energy such as subsidies funded by non-discounted customers or grant funding.	Supportive	Supportive
BE-4.4	Feasibility Studies	Work with Ava Community Energy to conduct an annual analysis of opt-out rates in the City of Hayward to understand why residents and businesses opt out of Ava Community Energy or opt-down to Bright Choice over Renewable 100.	Supportive	Supportive

Measure BE-5 Continue to promote energy efficiency improvement, in alignment with the 2014 Climate Action Plan

Background

Reducing both electricity and natural gas use is a fundamental strategy for the City to encourage and support as the electrical grid becomes increasingly cleaner and ultimately carbon-free. Measure BE-5 aims to reduce GHG emissions by increasing energy efficiency in homes and businesses by reducing electricity and natural gas use. Measure BE-5's energy efficiency actions build on successful actions included in the existing Hayward Climate Action Plan (2014), with a focus on promoting energy efficient design, construction, maintenance, and operation of facilities and infrastructure (Action BE-5.1), collaborating with utility providers and regional entities to promote incentive programs for energy efficient retrofits, appliances, and equipment (Action BE-5.2 and Action BE-5.3), and prioritizing funding for low-income homeowners, landlords, and renters (Action BE-5.5). The City will also continue to support non-residential building owners by promoting the use of the Energy Star Portfolio management program and energy benchmarking training programs (Action BE-5.4).

Measures BE-1, BE-2, and BE-3 promote energy efficiency through electrification. Furthermore, all-electric versions of equipment contribute to on-bill energy savings, since electric heat-pumps used for water and space heating have up to 400 percent efficiency improvement compared with natural

gas powered appliances.²⁵ This reduction in energy bill burden can help low-income households maintain equitable access energy when energy needs for space heating and cooling are high.

Methodology and Assumptions

GHG reductions for Measure BE-5 are not quantified for the years 2030 and 2045 in this analysis to minimize double counting associated with GHG emissions reductions from other the building energy measures in the CAP.

Table 11 GHG Emission Reductions Associated with Measure BE-5

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
BE-5.1	Structural Change	Continue to promote the efficient use of energy in the design, construction, maintenance, and operation of public and private facilities, infrastructure, and equipment.	Supportive	Supportive
BE-5.2	Partnership/Education	Continue to collaborate with partner agencies, utility providers, and the business community to support a range of energy efficiency, conservation, and waste reduction measures, including the development of green buildings and infrastructure, weatherization programs, installation of energy-efficient appliances and equipment in homes and offices, promotion of energy efficiency retrofit programs, use of green power options, and heightened awareness of the benefits of energy efficiency and conservation issues.	Supportive	Supportive
BE-5.3	Partnership/Funding	Continue to collaborate with regional entities and others to promote incentive programs for energy efficiency retrofits such as the Energy Upgrade California program for residential properties.	Supportive	Supportive
BE-5.4	Structural Change	Continue to promote the use of the Energy Star Portfolio Manager program and energy benchmarking training programs for nonresidential building owners.	Supportive	Supportive
BE-5.5	Equity/Funding	Obtain and prioritize funding for the weatherization program specifically for low, very low, and low-income homeowners, landlords, and renters, to make energy efficiency improvement and improve health and safety of residences.	Supportive	Supportive

²⁵ Dennis, Keith. 2015. Environmentally Beneficial Electrification: Electricity as the End-Use Option. *The Electricity Journal*. 28(9). pp. 100-112. <https://doi.org/10.1016/j.tej.2015.09.019>. Accessed June 27, 2023

Measure BE-6 Generate carbon-neutral electricity on City facilities meeting 80% of the municipal operational electricity needs by 2030.

Background

Measure BE-6 commits the City to generating carbon-neutral electricity meeting 80 percent of the City's electricity needs by 2030. The City has already made progress towards reaching this goal by completing a citywide study to estimate the total potential for renewable energy generation on City facilities including estimated cost and benefits. Actions BE-6.5 and BE-6.6 build upon these efforts to develop an Energy Assurance Plan, outlining locations for installation of local renewable energy generation, energy storage projects and locations for development of a micro-grid and scheduling the implementation of prioritized projects, considering potential funding sources and partnerships needed for successful implementation. The Energy Assurance Plan will also identify which City facilities can serve as cooling centers for disadvantaged communities (Action BE-6.4). Additionally, Actions BE-6.1, BE-6.3, BE-6.9, and BE-6.11 serve to increase battery storage and energy resilience of critical City facilities and operations. These actions will increase community resilience to power outages during extreme weather events, improving the City's ability to adapt to future impacts of climate change. Actions BE-6.2 and BE-6.7 outline partnership opportunities with the Urban Sustainability Directors Network, California Resilience Partnership (CRP), PG&E, ACE, and the Water Pollution Control facility to identify locations for resilience hubs, ensure smooth integration of renewable energy systems, and expand methane recovery, respectively. Action BE-6.8 seeks to provide incentives to community members and businesses to install solar and battery storage options. Through Action BE-6.12, the City will prepare a plan to facilitate the transition of natural gas appliances to electric in City facilities.

Methodology and Assumptions

GHG reductions for Measure BE-6 are not quantified for the years 2030 and 2045 in this analysis as this reduction is a subset of the community emissions (municipal electricity use is included in the overall community electricity use) and was not quantified to avoid double counting.

Table 12 GHG Emission Reductions Associated with Measure BE-6

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
BE-6.1	Structural Change	Obtain battery storage in City buildings and critical facilities, including community-based resilience hubs, identified to need power during emergencies or power outages.	Supportive	Supportive
BE-6.2	Partnership/ Feasibility Study	Develop partnerships with organizations, such as the Urban Sustainability Directors Network (USDN) or California Resilience Partnership (CRP), to conduct a feasibility study to identify locations for community resilience hubs within the City, identify grant opportunities, and to develop a plan to implement a resilience hub.	Supportive	Supportive
BE-6.3	Structural Change	Conduct analysis on risks and benefits associated with relying on battery storage to achieve carbon neutral electricity and grid resiliency goals in the City and set a MW capacity goal for installed battery storage by 2030 and 2045.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
BE-6.4	Equity	Formally include City facilities that serve as cooling centers to disadvantaged communities in the Energy Assurance Plan (Community Safety program 13) and develop and implement energy resiliency strategies like on-site renewable energy generation or energy storage to ensure center remains active even in power shortages.	Supportive	Supportive
BE-6.5	Feasibility Study	As part of Energy Assurance Plan (Community Safety program 13), include identifications of locations or complexes (i.e., City facilities, college campuses, critical facilities) in the City for installation of local renewable energy generation, energy storage projects, and/or ideal locations for development of a micro-grid as evaluated in Ava Community Energy feasibility study.	Supportive	Supportive
BE-6.6	Feasibility Study	Develop the study estimating renewable energy generation on City facilities and schedule for implementing the prioritized solar projects identified. The plan should include an identification of barriers and needs for implementation of the prioritized projects as well as identify funding sources and partnerships needed for successful implementation.	Supportive	Supportive
BE-6.7	Partnership	Partner with PG&E and/or Ava Community Energy to ensure smooth integration of renewable energy systems from the identified prioritized projects or other individual solar projects into the grid.	Supportive	Supportive
BE-6.8	Funding/Education	Identify and advertise incentives available for the community members for installing solar on homes such as Net Metering Programs through PG&E for bill credits, or the Disadvantaged Communities-single-family Solar Homes (DAC_SASH) program. Identify incentives available for businesses and homeowners to install energy storage systems, such as Self Generation Incentive Program (SGIP) and Equity Resiliency rebates that provides an upfront rebate for battery storage and/or the federal investment tax credit for solar batteries installed. Provide resource information to the community through websites, workshops, and partnerships.	Supportive	Supportive
BE-6.9	Funding /Equity	Partner with affordable housing providers to conduct a feasibility analysis of battery storage and solar projects at the affordable housing in Hayward that are eligible for Equity Resilience Incentives under the SGIP Program.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
BE-6.10	Funding/Partnership	Determine opportunities for the Water Pollution Control Facility to expand existing biogas (i.e., methane) capturing and utilization as part of the Biosolids Master Plan currently underway. The Master Plan document will plan for and phase in improvements for utilizing biogas for the next 20-years including potentially expanding the existing cogeneration facility to produce more energy, or possibly converting to renewable natural gas for pipeline injection off-setting the need to purchase non-renewable natural gas. This master plan is consistent with General Plan policy PFS-4.12 to develop, enhance and maintain clean, green and renewable energy systems at the Water Pollution Control Facility (WPCF).	Supportive	Supportive
BE-6.11	Education	Provide educational materials and workshops to large commercial developers and large business property owners of the benefits of microgrids and energy resiliency. Provide resources to identify opportunities for solar installations and/or battery storage on site.	Supportive	Supportive
BE-6.12	Feasibility Study	Prepare a plan to facilitate the transition of natural gas appliances to electric in City Facilities. Plan should include an inventory of appliances available for replacement, identify cost where possible, and establish a timeline for replacement.	Supportive	Supportive

2.2 Transportation

Measure T-1 Increase active transportation mode share to 15% by 2030 and to 20% by 2045.

Background

Reducing transportation emissions and becoming a carbon neutral City means reducing the number of miles driven by fossil fuel-powered vehicles, particularly passenger vehicles. According to Hayward's 2019 GHG Inventory, transportation emissions accounted for 61 percent of total emissions in the City. The City will prioritize reducing vehicles miles travelled (VMT) first, by improving active and public transportation mode share. Reducing VTM through an increase in active transportation mode share carries innumerable benefits outside of GHG emissions reductions, including reduced congestion, reduced space needed for roadways and parking, local economic revitalization, and lifestyle improvements.²⁶

As of 2019, bicycle and pedestrian mode share in the City is low – 0.4 percent and 1.5 percent, respectively.²⁷ Studies show that investments in active transportation infrastructure in other cities have demonstrated improvements in active transportation mode shifts and GHG emissions

²⁶ Richard Campbell and Margaret Wittgens. March 2004. The Business Case for Active Transportation. http://thirdwavecycling.com/pdfs/at_business_case.pdf. Accessed June 27, 2023

²⁷ U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023

reduction.²⁸ Recently, the City adopted the 2020 Bicycle and Pedestrian Master Plan, which details the City's plan to establish a network of accessible, safe and integrated bicycle and pedestrian facilities.²⁹ The new plan recommends 153 miles of new bicycles facilities, including 32 miles of multi-use paths for both pedestrians and cyclists. Action T-1.5 commits the City to continuing the implementation of the Bicycle and Pedestrian Master Plan. Several other actions under Measure T-1 commit the City to continuing structural changes to further investments in active transportation mode shifts, including Action T-1.3, which seeks to implement complete streets improvements such as retrofits, design standards, and green infrastructure that would accommodate walking, biking, transit use and carpooling. Other actions to promote mode shift include continuing to identify streets for permanent through traffic closure (Action T-1.8) and removing parking and/or additional traffic lanes to priority outdoor seating (Action T-1.9). In Action T-1.2, the City commits to update the General Plan to facilitate complete and walkable neighborhoods, maximize infill development, support the regional Sustainable Communities Strategy, and promote a job-housing match. Through Action T-1.6, the City will evaluate and update the relevant codes and plans to encourage active transportation. The City will also conduct an underused rights-of-way study to understand community perspectives on potential barriers to conversions and identify solutions (Action T-1.7). Action T-1.1 seeks to amend the Off-Street Parking Regulation of the Municipal Code to incorporate smart growth principles and to incentivize walking, biking, and public transit. Other actions focused on partnerships, education, equity, and engagement, including Actions T-1.10, T-1.11, T-1.13, T-1.12, and T-1.14, identify partners to collaborate with to obtain funding, expand rebates, and promote incentives to promote active transportation and disseminate information regarding the environmental and health benefits of walking and bicycling. Additionally, Action T-1.4 commits the City to adopting a micro-mobility policy in the City. Studies suggest that micro-mobility programs, like e-bike share, can reduce VMT and associated GHG emissions. For example, a 2019 report from the City of Santa Monica found that 49 percent of shared mobility trips replaced trips that would have otherwise been made by car, either driving alone or ride-hailing. Findings were based on answers to survey questions asking participants how shared electric scooters and bikes helped them get around the City.³⁰ Actions T-1.15 and Action T-1.16 commit the City to devoting staff time to identify solutions, tracking and apply for funding, and eliminate barriers.

Methodology and Assumptions

GHG reductions are determined by quantifying the effect the active transportation interventions have on shifting trips from single occupancy vehicles (SOV) to walking and biking. Reduction calculations are based on increasing bike mode shares by 13 percent and 18 percent for 2030 and 2045, respectively, and maintaining a walking mode share of 1.5 percent for both 2030 and 2045. Current bicycle mode share (0.4 percent) and walking mode share (1.5 percent) were estimated based on statistics in the U.S. Census Bureau American Community Survey (2019) for Hayward.³¹ The CARB EMFAC2021 model is used to determine the GHG emissions reduced as a result of reduced SOV VMT. Total passenger VMT was converted into average car trips using an average trip length for Alameda County obtained from EMFAC2021. This number of vehicle trips was then

²⁸ Andrew Glazener and Haneen Khreis. January 2019. Transforming our Cities: Best Practices Towards Clean Air and Active Transportation. <https://link.springer.com/article/10.1007/s40572-019-0228-1>. Accessed June 27, 2023

²⁹ City of Hayward. 2020. Bike and Pedestrian Master Plan Update. <https://www.hayward-ca.gov/content/bike-and-pedestrian-master-plan-update>. Accessed June 27, 2023.

³⁰ City of Santa Monica. November 2019. Shared Mobility Pilot Program Summary Report. https://www.smgov.net/uploadedFiles/Departments/PCD/Transportation/SantaMonicaSharedMobilityEvaluation_Final_110419.pdf. Accessed June 27, 2023

³¹ U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023

multiplied by the target percent increase in bike mode share to determine the number of vehicle trips that would be replaced by bike mode share with Measure implementation. The number of bike trips was converted to VMT replaced based on a study by CARB finding that on average bike trips are 1.5 miles.³² The replaced VMT was multiplied by the emission factors for passenger vehicles from CARB's EMFAC2021 model. The calculations and assumptions used to estimate GHG emission reductions from Measure T-1 are provided in Table 13.

³² CARB. 2019. Quantifying Reductions in Vehicle Miles Traveled from new Bike Paths, Lanes , and Cycle Tracks Summary Report. https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle%20facilities_summary_032519.pdf. Accessed July 20, 2023

Table 13 Measure T-1 GHG Emission Reduction Calculations

Calculation Factor	2030	2045
Bike mode share increase from baseline ¹	13%	18%
Walk mode share increase from baseline ²	0%	0%
Passenger VMT ³	951,249,744	1,022,153,281
Passenger trips ⁴	118,915,731	128,286,370
New bike trips substituted for vehicle trips	15,577,961	23,219,833
New walk trips substituted for vehicle trips	0	0
Passenger VMT reduced with bike trips (Miles) ⁵	23,366,941	34,829,749
Passenger VMT reduced with walk trips (Miles) ⁶	0	0
Total VMT reduced with bike and walk trips (miles)	23,366,941	34,829,749
Passenger Emissions Factor from EMFAC2021 (MT CO ₂ e/VMT) ⁷	0.000278	0.000251
Total GHG Emissions Reductions (MT CO₂e)	6,485	8,755

Notes: MT CO₂e = metric tons of carbon dioxide; VMT = vehicle miles traveled

- ¹. Assumes a bicycles mode share target of 14% by 2030 and 19% by 2045 as well as an existing bicycle mode share of 0.4%, per U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023
- ². Assumes a walk mode share target of 2% by 2030 and maintain through 2045 as well as an existing walk mode share of 1.5%, per U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023
- ³. Legislative Adjusted Emissions Forecast. See Appendix B of the CAP.
- ⁴. Passenger trips are calculated using trips per mile traveled in a combustion vehicle, as obtained from CARB's vehicle emission factor database, EMFAC2021 times forecasted passenger VMT.
- ⁵. Assumes an average bike trip length of 1.5 miles, per CARB. 2019. Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks. https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle_facilities_technical_041519.pdf. Accessed June 27, 2023
- ⁶. Assumes an average walk trip length of 0.3 miles, per CARB. 2019. Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks. https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/bicycle_facilities_technical_041519.pdf. Accessed June 27, 2023
- ⁷. Passenger Emissions Factor calculated from data from CARB's vehicle emission factor database, EMFAC2021.

*Values may not add up due to rounding

Table 14 GHG Emission Reductions Associated with Measure T-1

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-1.1	Structural Change	Amend the Off-Street Parking Regulation of Municipal Code to incorporate smart growth principles and to incentivize walking, biking, and public transit. 1. Creating a single “blended” parking requirement for commercial uses to facilitate future changes of use (i.e., changing a retail store to a restaurant). 2. Allowing on-street parking along the property’s frontage to count towards satisfying a portion of the property’s off-street parking requirements. 3. Creating parking preferences or incentives for residents who rideshare or use low- or zero-emissions vehicles. 4. Allowing property owners to develop and implement parking demand management plans that consider ways to reduce the need for off-street parking by using shared parking arrangements, valet parking services, paid parking, and other appropriate techniques. 5. Establish design standards or retrofit standards from the Complete Streets. 6. Assessment to promote multi-modal use.	6,485	8,755
T-1.2	Structural Change	In support of the General Plan and City land-use policies, maximize infill development, increase land-use and transit efficiencies to support the regional Sustainable Communities Strategy and promote a jobs-housing match. Wlin addition, work with developers to prioritize infill development projects and transit-oriented development zones.	Supportive	Supportive
T-1.3	Structural Change	Based on the completed Complete Streets Assessment, and the Complete Streets Inventory Baseline, and the 2020 Bicycle and Pedestrian Master Plan, develop a priority list of complete streets improvements such as retrofits, design standards, and green infrastructure that would accommodate walking, biking, transit use and carpooling. This effort should include a schedule for implementation, prioritization of improvements, identification of whether improvement will aid in walking, biking or transit access, and the plan should ensure equitable roll-out to low-income communities.	Supportive	Supportive
T-1.4	Structural Change	Adopt and implement a micro-mobility policy that promotes ownership of micro-mobility devices, especially among lower income community members. Promote equitable access to charging facilities for electric micro-mobility devices.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-1.5	Structural Change	Continue to implement 2020 Bicycle and Pedestrian Master Plan goals of developing 153 new bicycle facilities and 32 miles of multi-use paths for pedestrians and cyclists.	Supportive	Supportive
T-1.6	Structural Change	Evaluate and, if necessary, update the City's Zoning Code, Transportation Demand Management Plan (or Administrative Rule 2.26), and California Green Building Code to reflect current transportation demand management opportunities and ensure the City requires sufficient bicycle parking for new commercial development and retrofits.	Supportive	Supportive
T-1.7	Structural Change/ Feasibility Study	Update and conduct Underused Rights-of-Way Study such that a community/business survey and evaluation is completed to understand community perspective on potential barriers to conversions and identify barrier solutions. Based on findings, convert recommended amount miles of under used roadways thoroughfare to active transportation corridors to create a connected environment City (i.e., downtown areas). As part of the program, launch a public campaign to gain public and business support to ensure success of such efforts. Consider having pilot programs (i.e., shutting down street lanes for specific events/periods of time) to demonstrate the advantages of proposed improvements.	Supportive	Supportive
T-1.8	Structural Change	Identify streets for permanent through traffic closures to promote walking, biking, and other forms of active transportation.	Supportive	Supportive
T-1.9	Structural Change	Identify areas of the City to remove parking and/or additional traffic lanes to prioritize outdoor seating and make permanent outdoor dining established during Covid 19.	Supportive	Supportive
T-1.10	Equity	Prioritize active transportation and mobility projects in historically under-invested neighborhoods.	Supportive	Supportive
T-1.11	Partnership/ Education	Partner with schools, employers, transit agencies, Hayward Area Recreation and Park District (HARD), and community groups to teach bicycle and pedestrian safety in schools and workplaces and to educate residents and businesses about the health and environmental benefits of walking, bicycling, and using public transit.	Supportive	Supportive
T-1.12	Partnership	Partner with community organizations and local bike shops to provide rebates for low-income community members to purchase bicycles, helmets, pumps, e-bikes, e-scooters, and other related equipment. Work with community partners to provide incentives to promote bicycle, e-bike and e-scooter ownership.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-1.13	Equity/ Funding	Partner with community groups to obtain funding through the California Air Resources Board Car Sharing and mobility Options program for a pilot bike-share program in low-income communities and to connect low-income communities with the E-Bike Purchase Incentive Program through CalBike.	Supportive	Supportive
T-1.14	Equity	Ensure there is equitable access to safe bicycle and pedestrian infrastructure in all areas of the city. Prioritize the development of pedestrian and bicycle infrastructure in low-income communities where there is currently no or limited pedestrian and bicycle infrastructure	Supportive	Supportive
T-1.15	Feasibility Studies	Based on the identified barriers to completing the Complete Streets Evaluation including limited staff and fiscal resources, develop strategies to reduce or eliminate barriers, such as identifying staff to assign the Complete Streets Evaluation to.	Supportive	Supportive
T-1.16	Funding	Devote staff time to managing, tracking and applying for grant funding to complete projects that would improve active transportation or mobility in the community.	Supportive	Supportive

Measure T-2 Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.

Background

The City is served by the public transiting agencies Alameda-Contra Costa Transit (AC Transit) and Bay Area Rapid Transit (BART). Improving transit ridership is key to reducing SOV VMT in the City, as transportation GHG emissions are estimated to be the largest contributor to communitywide emissions in the 2019 GHG Inventory, accounting for 61 percent of total GHG emissions (excluding AC Transit and BART emissions which both account for less than one percent of emissions). Similar to Measure T-1, Measure T-2 focuses on reducing transportation related emissions by reducing VMT through programs and policies that shift VMT away from SOV to other modes including transit, e-mobility, and transportation demand management programs and policies. As outlined for Measure T-1, these mode shifts generate many co-benefits such as reduced congestion, safer conditions for walking and biking, and improved air quality. One of the best ways to improve a transit system and reduce driving is to expand its geographical reach and increase the frequency and reliability of transit service. Each new mile of transit usage replaces VMT on much more than a 1:1 basis. Approximately 1 percent increase in transit frequency saves 0.5 percent in VMT.³³ Furthermore, improving transit access has the potential to shift trips from cars to transit, which may reduce vehicle trips, VMT, and greenhouse gas emissions, with time spent getting to a transit stop being the key indicator of transit access.³⁴

³³ Todd Litman. Victoria Transport Policy Institute. August 2021. Evaluating Public Transit Benefits and Costs Best Practices Guidebook. Accessed at: <https://www.vtpi.org/tranben.pdf>. Accessed June 27, 2023

³⁴ California Air Resources Board (CARB). August 2017. Methods to Assess Co-Benefits of California Climate Investments: Vehicle Miles Travelled. Accessed at: http://ww2.arb.ca.gov/sites/default/files/auction-proceeds/carb_vehicle_miles_traveled.pdf

The City is committing to several structural change actions to implement public and share transit programs to increase communitywide transit mode share to 15 percent by 2030 and to 30 percent by 2045. Through Action T-2.2, the City is adopting a policy or code into the Municipal code to establish new development of public space to be transit accessible. In addition to improving transit connection in the City, Action T-2.9 strives to reduce the GHG emissions associated with the AC Transit bus fleet, by partnering with AC Transit to understand how they can address the Innovative Clean Transit Rule. The City is committing to promoting e-mobility through the development and adoption of an ordinance requiring new multi-family development projects to install a car share or provide e-bikes/e-scooters to each new tenant (Action T-2.4). Other actions commit the City to prioritizing and updating transit stops to include trees or shade structures (Action T-2.5), requiring employers to develop Transportation Demand Management Plans (TDM) and incentives (Action T-2.7), and expanding the Student Transit Pass Program (STPP) to provide free AC transit to college students and low-income community members (Action T-2.8). Other structural change actions commit the City to continuing to promote transit-oriented infill development and/or new development, adopting parking requirements into the Municipal code that are appropriate for a transit-oriented district, and allowing developers to build housing without off-street parking if near transit stops (Actions T-2.1, T-2.3, and T-2.6).

Other actions prioritize conducting surveys and studies to better understand the community's need and motivations for traveling by car versus other alternatives such as AC Transit or BART (Action 2.11). Action T-2.10 commits the City to dedicating staff time to implementing planned City transit/TDM projects and programs while through Action T-2.13 the City looks to partner with AC Transit to conduct a study to determine transit property corridors and prioritize infrastructure improvements in existing neighborhoods that enable people to better access and use public transit. Through Action T-2.12, the City will assess the feasibility and GHG reduction impacts of banning cars in high-traffic zone(s) or on individual roads in the City where other transit options are available by implementing a congestion charge.

Methodology and Assumptions

GHG reductions associated with Measure T-2 were calculated in a similar manner to those calculated for Measure T-1. Reduction calculations are based on the target transit mode shares of 15 percent and 30 percent for 2030 and 2045, respectively. Current transit mode share (8.8 percent) was estimated based on statistics in the U.S. Census Bureau American Community Survey (2019) for the City.³⁵ The CARB EMFAC2021 model is used to determine the GHG emissions reduced as a result of reduced SOV VMT. To avoid double counting the reduced VMT from implementation of Measure T-1 was subtracted from the total passenger VMT. The adjusted passenger VMT was converted to trips using the average trip length for Alameda County obtained from EMFAC2021. This number of vehicle trips was then multiplied by the target percent increase in transit mode share to determine the number of vehicle trips that would be replaced by transit mode share with Measure implementation. Transit trips were translated into VMT using an average transit trip length of 3.8 miles based on a study developed by the American Public Transportation Association.³⁶ Emissions associated with the reduced VMT were calculated using the passenger emission factors from CARB's EMFAC2021 model. The calculations and assumptions used to estimate emission reductions from Measure T-1 are provided in Table 15.

³⁵ U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex.

<https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023

³⁶ American Public Transportation Association. 2018. 2018 Public Transportation Fact Book. <https://www.apta.com/wp-content/uploads/Resources/resources/statistics/Documents/FactBook/2018-APTA-Fact-Book.pdf>. Accessed June 30th, 2023

Table 15 Measure T-2 GHG Emission Reduction Calculations

Calculation Factor	2030	2045
Transit mode share increase from baseline ¹	6%	21%
Passenger VMT ²	927,882,803	987,323,531
Passenger trips ³	115,994,629	123,915,027
New transit trips substituted for vehicle trips	7,191,667	26,269,986
Passenger VMT reduced with transit trips (Miles) ⁴	27,328,335	99,825,946
Passenger EF from EMFAC2021 (MT CO ₂ e/VMT) ⁵	0.000278	0.000251
Total GHG Emissions Reductions (MT CO₂e)	7,585	25,092

Notes: MT CO₂e = metric tons of carbon dioxide; VMT = vehicle miles traveled

¹ Assumes a transit mode share target of 15% by 2030 and 30% by 2045 as well as an existing transit mode share of 8.8%, per U.S. Census Bureau. 2019. S0801 Commuting Characteristics by Sex. <https://data.census.gov/table?t=Commuting&g=160XX00US0633000>. Accessed June 27, 2023

² Passenger VMT assumes implementation of Measure T-1, therefore reducing the forecasted passenger VMT with bike and walk trips.

³ Passenger trips are calculated using trips per mile traveled in a combustion vehicle, as obtained from CARB's vehicle emission factor database, EMFAC2021 times forecasted passenger VMT.

⁴ Assumes an average intercity bus trip length of 3.8 miles, per American Public Transportation Association. 2018. Public Transportation Fact Book. <https://www.apta.com/wp-content/uploads/Resources/resources/statistics/Documents/FactBook/2018-APTA-Fact-Book.pdf>. Accessed June 27, 2023

⁵ Passenger Emissions Factor calculated from data from CARB's vehicle emission factor database, EMFAC2021.

*Values may not add up due to rounding

Table 16 GHG Emission Reductions Associated with Measure T-2

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-2.1	Structural Change	Continue to promote infill development and/or new development that is compact, mixed use, pedestrian friendly, and transit oriented.	7,585	25,092
T-2.2	Structural Change	Adopt a policy or code into the Municipal code that establishes specific standards for new development of public space to be transit accessible and multi-functional by co-locating public facilities.	Supportive	Supportive
T-2.3	Structural Change	Consistent with the Downtown Parking Management Plan and Downtown Specific Plan, adopt parking requirements into the Municipal code that are appropriate for a mixed-use, walkable, and transit-oriented district. Evaluate opportunities in the Downtown area to designate streets for transit only.	Supportive	Supportive
T-2.4	Structural Change	Develop and adopt an ordinance requiring new multi-family development projects to install a car share or provide e-bikes/e-scooters to each new tenant.	Supportive	Supportive
T-2.5	Structural Change	Evaluate and prioritize transit stops needing renovations that do not meet the adopted Pedestrian Design Standard for Transit Stop. Upgrade transit stops such that they include bicycle parking and shade trees or structures and are designed to promote use.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-2.6	Structural Change	Consistent with the intention of Senate Bill 10, allow developers to build housing without off-street parking if they're close to frequent transit service	Supportive	Supportive
T-2.7	Funding/ Structural Change	Through the adoption of an ordinance or incorporation into large commercial building codes, require all employers to develop a Transportation Demand Management (TDM) Plan. TDM plans should include money-based incentives for employees to bike, walk, carpool, or take the bus to work. In alignment with BAAQMD requirement, require large employers (more than 50 employees) to subsidize biking, walking, or bus travel.	Supportive	Supportive
T-2.8	Partnership/Equity	Expand the Student Transit Pass Program (STPP), which provides free youth clipper cards with unlimited bus rides to middle and high schools students, to provide free AC transit to college students and low-income community members.	Supportive	Supportive
T-2.9	Partnership	Collaborate and engage with AC Transit to understand how they are addressing the Innovative Clean Transit Rule and their plan to electrify their bus fleet.	Supportive	Supportive
T-2.10	Funding	Dedicate staff time or create a staff position to pursue funding opportunities to implement planned City transit/TDM projects and programs and to support AC Transit in obtaining grant funding for regionwide service expansion.	Supportive	Supportive
T-2.11	Feasibility Study	Conduct local transportation surveys to better understand the community's needs and motivation for traveling by car versus other alternatives such as AC Transit or BART. Use survey results to inform policy development and education/outreach campaigns that are transit focused. Consistent with the previous CAP policy M-3 (Survey Transportation and Transit Gaps and Barriers)	Supportive	Supportive
T-2.12	Feasibility Study	Assess the feasibility and GHG reduction impact of banning cars in high-traffic zone(s) or on individual roads in the City where other transit options are available by implementing a congestion charge that applies to passenger cars and car-sharing services like Uber and Lyft with exceptions for handicap drivers and residents of those areas.	Supportive	Supportive
T-2.13	Feasibility Studies/ Partnerships	Partner with AC Transit to conduct a study to determine transit priority corridors and prioritize infrastructure improvements in existing neighborhoods that enable people to better access and use public transit	Supportive	Supportive

Measure T-3 Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-1 and T-2.

Background

While Measures T-1 and T-2 can be effective in changing community choices around transportation, the impacts of incentive-based policies increase when coupled with disincentives for less favorable choices, such as making it less convenient to drive a gasoline-fueled single passenger vehicle.³⁷ However, disincentive-based policies can be unpopular and place a burden on the community if not implemented carefully. Structural change actions reducing parking minimums and parking maximums citywide (Action T-3.3), developing disincentive options to achieve reductions in peak hour traffic as part of a Citywide Transportation Demand Management (TDM) Plan (Action T-3.1), updating development requirements, ordinances, and/or building codes requiring TDM as part of new developments (Action T-3.2), and increasing broadband internet access (Action T-3.11) should be supported by feasibility planning, funding opportunities, and engagement efforts, to minimize the burden placed on vulnerable community members. Action T-3.5 commits the City to conducting feasibility planning for implementing disincentives for driving gasoline-fueled single passenger vehicles, including analyzing and engaging the community on potential impacts and benefits of limiting parking options while Action T-3.6 requires that the City conduct engagement efforts targeting low-income communities of color to better understand the community's potential concerns. The City will also evaluate parking pricing structures that best work for the community, through Action T-3.4. Through Action T-3.7, the City will define equity metrics for implementation of disincentives based on feedback from low-income communities. Actions T-3.8, T-3.9, and T-3.10 seek to minimize financial burdens on community-members by providing funding options.

Methodology and Assumptions

Measure T-3 is intended to be supportive to Measures T-1 and T-2 in reducing communitywide VMT, and therefore GHG emissions reductions were not calculated.

³⁷ Gabriel Ayobami Ogunkunbi et al. August 2021. Evidence-Based Market Overview of Incentives and Disincentives in Electric Mobility as a Key to the Sustainable Future. <https://www.mdpi.com/2673-7590/1/2/17/pdf>. Accessed June, 27 2023

Table 17 GHG Emission Reductions Associated with Measure T-3

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-3.1	Structural Change	Develop and adopt a Citywide Transportation Demand Management (TDM) Plan including strategies to reduce peak-hour traffic, such as staggered work hours, flexible schedule options, and telecommuting from home offices. Include updated policy incentives or disincentive options to achieve reductions in peak-hour traffic, reduce traffic congestions and promotes alternative transportation (biking, walking, and use of transit)	Supportive	Supportive
T-3.2	Structural Change	Continue to require new development adopt transportation demand management strategies to reduce use of single occupancy vehicles and encourage the use of alternative modes of travel. Update development requirements, ordinances, and/or building codes requiring TDM as part of new developments as part of enforcement.	Supportive	Supportive
T-3.3	Structural Change	Develop consistent standards for parking minimums and maximums across the city. Reduce parking minimums and parking maximums citywide, as improved active and public transit infrastructure becomes more available. Additionally, price all public parking spaces for all areas of the city based on available transportation options, travel demand, and land use.	Supportive	Supportive
T-3.4	Feasibility Study/ Funding	Evaluate parking pricing structures that would best work with the City of Hayward. Based on evaluation, implement dynamic parking pricing in downtown parking areas and earmark parking revenues to implement other active transportation and transit projects.	Supportive	Supportive
T-3.5	Feasibility Study	Conduct an analysis of the potential community impacts and benefits of implementing disincentive-based policies for driving single passenger vehicles, including a congestion charge program, limiting parking options, increased local taxes (income tax, gasoline tax, or car registration tax), and Transportation Network Company (TNC) user taxes.	Supportive	Supportive
T-3.6	Equity	Conduct engagement efforts for the general public and targeted to low-income communities of color during analysis of the disincentive-based transportation policies to understand the community's potential concerns	Supportive	Supportive
T-3.7	Equity	Define equity metrics for implementation of disincentives based on feedback from local low-income communities of color and structure the disincentive programs to meet these metrics	Supportive	Supportive
T-3.8	Funding	Fund active and public transit programs through a local gasoline tax and/or through paid parking fees.	Supportive	Supportive
T-3.9	Funding	Implement a Transportation Network Company (TNC) user tax which would put a small fee on the use of Uber and Lyft and generate funds to pay for transit and mobility infrastructure.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-3.10	Funding/Equity	Implement a gasoline/diesel car registration tax starting in 2028 with exemption criteria established for low-income residents.	Supportive	Supportive
T-3.11	Structural Change	Increase Broadband Internet Access. Add a program to encourage more working from home and reducing the need to travel for work.	Supportive	Supportive

Measure T-4 Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045.

Background

The State of California has adopted ambitious goals for ZEV adoption, with the Advanced Clean Cars II regulation striving to achieve 100 percent ZEV vehicle sales by 2035. To align with these aggressive State goals, the City seeks to increase ZEV adoption to 15 percent by 2030, while striving to set in place the framework to reach a long-term goal of 50 percent ZEV adoption by 2045. This regulation puts the total number of ZEVs on the road by 2035 at approximately 15 million.³⁸ As of 2020, the City has 1,363 electric vehicles and 1,066 plug-in hybrid vehicles out of 155,531 vehicles currently registered, together accounting for 1.6 percent of the vehicles registered within the City.³⁹

Reaching these targets will require significant investment in electric vehicle charging infrastructure to facilitate the transition to electric vehicles. While the City cannot require residents to buy and use EVs rather than gas-powered vehicles, the City will take actions to incentivize this behavior change and support this level of EV adoption. Adding and supporting the addition of electric vehicle chargers within the City will be the main mechanism through which the City will encourage zero-emission vehicle (ZEV) adoption within the community.

As a part of this measure, the City's primary target will be to provide one public EV charger for every 20 EV's and ensure as many privately owned chargers are installed in new development as practicable, in line with the leading cities in California (San Francisco, Los Angeles, and San Jose) and recent charging infrastructure studies. Since the City of Hayward already has 152 existing public charging stations, there is currently one public EV charger for every 16 EVs, and the City will need to have 1,365 new public chargers installed to meet the forecasted demand from passenger vehicles by 2030.

A 2015 report by Idaho National Laboratory, *Plugged In: How Americans Charge Their Electric Vehicles*, found that nearly 98 percent of all EV charging events occurred at home or work.⁴⁰ In support of these findings, and to address the challenges faced by those who may not be able to install their own home chargers, as part of Action T-4.1, the City will continue to enforce the Hayward EV Charge Reach Code. EV-ready building codes are one of the most effective and low-cost

³⁸ Susan Carpenter. Spectrum News 1. October 2020. What it will take to get 100% EV sales in California. Accessed at: <https://spectrumnews1.com/ca/la-west/transportation/2020/10/05/what-it-will-take-to-sell-100-evs-in-california>. Accessed June, 27 2023

³⁹ DMV. 2020. Fuel Type by County. https://www.dmv.ca.gov/portal/uploads/2020/09/MotorVehicleFuelTypes_City_01012020.pdf Accessed June 27, 2023

⁴⁰ Osti.Gov. 2018. Plugged In: How American Change Their Electric Vehicles. <https://www.osti.gov/biblio/1369632-plugged-how-americans-charge-electric-vehicles>. Accessed June, 27 2023

strategies for states and local governments to encourage consumers to buy or lease electric vehicles and can save consumers thousands of dollars in installation costs.⁴¹

Through Action T-4.3, the City will continue to maintain a streamlined EV infrastructure permitting process and ordinance to minimize barriers and inefficiencies. Action T-4.4 promotes ZEVs by requiring new private parking lots grant ZEV access to preferred parking spaces. The City recognizes the barriers associated with the procurement of ZEVs, particularly to low-income community members. Actions T-4.5, T-4.6, T-4.7, T-4.8, and T-4.9 seek to provide funding opportunities to minimize costs associated with the purchase of ZEVs and associated charging equipment and develop and disseminate educational information on the costs/benefits of owning ZEVs. The City will also seek to partner with the Alameda County Transportation Commission, ACE, PG&E, and car share companies to expand infrastructure, provide incentives, and increase ZEV infrastructure accessibility (Actions T-4.2, T-4.8, T-4.9, T-4.10, T-4.11, and T-4.12).

Methodology and Assumptions

GHG emission reductions for the increased adoption of ZEVs are based on replacing fossil fueled vehicles with electric versions in the community. GHG emissions reductions from the adoption of ZEVs assumed a 15 percent adoption of ZEVs by 2030 and 50 percent by 2045. The GHG emissions forecast performed as part of the 2019 Community GHG Inventory and GHG Emissions Forecast assume that approximately 9 percent of total Hayward passenger vehicle VMT in 2030 would be by ZEVs, and 10 percent in 2045.⁴² This results in a 6 percent and 40 percent increase in ZEV adoption by 2030 and 2045, respectively, compared with the forecasted ZEV adoption levels in those target years. GHG emissions reduction are calculated by multiplying the percent of ZEV adoption beyond the forecasted values by the passenger VMT after implementation of Measure T-1 and T-2 in the target year. The weighted average passenger vehicle emission factor for internal combustion engines in the target years was applied to the calculated VMT reduction. This GHG reduction would be offset by electricity consumption which would generate GHG emissions in 2030. The calculations and assumptions used to estimate emission reductions from Measure T-4 are provided in Table 18.

⁴¹ SWEET. 2018. Cracking the Code on EV-Ready Building Codes. <https://www.swenergy.org/cracking-the-code-on-ev-ready-building-codes>. Accessed June 27, 2023

⁴² Projected EV adoption rates were obtained from the California Air Resources Board (CARB) EMFAC2017 vehicle emissions model. The model was run for 2030 and 2045 for Los Angeles County. <https://arb.ca.gov/emfac/2017/>.

Table 18 Measure T-4 GHG Emission Reduction Calculations

Calculation Factor	2030	2045
Passenger ICE VMT after mode shift to active and shared transit (miles) ¹	823,467,006	796,706,583
Passenger VMT ICE Emission Factor (MT CO ₂ e/VMT) ²	0.0003	0.0003
EV adoption beyond baseline	6.4%	39.8%
EV electricity usage (kWh/mile) ³	0.37	0.369708000
EV electricity usage from increased EV adoption (kWh)	19,648,777	117,142,057
Weighted electricity Emissions Factor (MT CO ₂ e/kWh) ⁴	0.0000028	0
Emission Reduction from EV increased adoption (MT CO ₂ e)	16,068	88,718
Emissions from electricity usage for EVs (MT CO ₂ e)	54	0
Total GHG Emissions Reductions (MT CO₂e)	16,014	88,718

Notes: MT CO₂e = metric tons of carbon dioxide; kWh =-kilowatt-hour; VMT = vehicle miles traveled; EV = electric vehicle

¹ Assumes the implementation of Measures T-1 and T-2 and uses the projected baseline passenger EV adoption rates for Alameda County from the CARB EMFAC2021 vehicle emissions model.

² Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP. Forecasted Passenger ICE Emission Factors based on the CARB EMFAC2021 vehicle model for Alameda County.

³ EV electricity usage is based on passenger fuel efficiency (kwh/mile) from the CARB EMFAC2021 vehicle model for Alameda County.

⁴ Electricity Emission Factor is weighted to account for the specific opt-out rates of residential and non-residential customers and assumes implementation of BE-4.

*Values may not add up due to rounding

Table 19 GHG Emission Reductions Associated with Measure T-4

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-4.1	Structural Change	Continue to enforce the Hayward EV Charger Reach Code requiring electric vehicle charging stations in new development projects.	16,014	88,718
T-4.2	Structural Change	Work with Ava Community Energy to install 100 new publicly accessible EV chargers by 2030 through public private partnerships and on City owned properties.	Supportive	Supportive
T-4.3	Structural Change	Continue to maintain a streamlined EV infrastructure permitting process and ordinance in accordance with AB 1236.	Supportive	Supportive
T-4.4	Structural Change	Require that new private parking lots grant zero emission vehicles (ZEVs) access to preferred parking spaces.	Supportive	Supportive
T-4.5	Structural Change	Coordinate with local agencies and community-based organizations, agencies, and non-profits to conduct zero-emission vehicle (ZEV) education events for residents and targeted events for low-income communities that would evaluate the barriers to ZEV adoption, include information on costs/benefits of owning ZEVs, steps on how to receive incentives for ZEVs, and other benefits.	Supportive	Supportive
T-4.6	Education/Equity	Explore opportunities with CARB, BAAQMD, or other agencies to start a purchase rebate program and provide higher trade-in value for combustion vehicles to assist lower-income households to purchase EVs.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-4.7	Equity	Develop outreach and education materials and distribute to local businesses and organizations on the financial, environmental, and health and safety benefits of ZEVs. Provide information on available funding opportunities.	Supportive	Supportive
T-4.8	Education	Work with Ava Community Energy and PG&E to incentivize residential electric vehicle charger installations through on-bill financing	Supportive	Supportive
T-4.9	Funding	Evaluate opportunities for EV or hydrogen charging infrastructure through State and utility programs, like LCFS or PG&E EV Fast Charge Program. Disseminate information via outreach and education materials.	Supportive	Supportive
T-4.10	Funding	Partner with Ava Community Energy to aid in Ava Community Energy's survey of existing publicly accessible electric vehicle chargers and their locations and identify a prioritized list of locations in Hayward for new electric vehicle charging stations with particular consideration for equitable distribution of chargers to residents of multi-family homes, low-income people, people on a fixed income, and communities of color.	Supportive	Supportive
T-4.11	Feasibility Study/Partnership	Support zero-emission vehicle (ZEV) car share companies in coming to the City. Coordinate with car share companies and community-groups to develop an affordable, zero-emission vehicle (ZEV) car share to serve affordable housing and/or multifamily developments with a priority to target low-income communities of color.	Supportive	Supportive
T-4.12	Partnership	Collaborate with neighboring jurisdictions and the Alameda County Transportation Commission to develop a connected network of ZEV car share.	Supportive	Supportive

Measure T-5 Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.

Background

The City has also adopted commercial ZEV adoption goals, with 10 percent by 2030 and 80 percent by 2045. This is backed by regulations that CARB adopted in June 2020, requiring truck manufacturers to transition from diesel trucks and vans to electric zero-emission trucks beginning in 2024, and establishing a target for every new truck sold in California to be zero-emission by 2045.⁴³ In 2023, CARB approved the Advanced Clean Fleets regulation, which requires a phased-in transition toward zero-emission medium-and-heavy duty vehicles. The regulation includes an end to combustion truck sales in 2036, a first-of-its-kind requirement.⁴⁴⁴⁵ Commercial ZEV adoption is

⁴³ CARB. <https://ww2.arb.ca.gov/news/california-takes-bold-step-reduce-truck-pollution#:~:text=SACRAMENTO%20%E2%80%93%20Today%2C%20the%20California%20Air,California%20will%20be%20zero%20emission.> Accessed June 2023

⁴⁴ CARB. Advanced Clean Fleets. <https://ww2.arb.ca.gov/news/california-approves-groundbreaking-regulation-accelerates-deployment-heavy-duty-zevs-protect#:~:text=The%20Advanced%20Clean%20Fleets%20rule%20includes%20an%20end%20to%20combustion,accelerated%20benefits%20for%20California%20communities..> Accessed June 2023

⁴⁵ Insider. Amazon says it has more than a thousand electric Rivian vans making deliveries across the US – see how they were designed. <https://www.businessinsider.com/amazon-creating-fleet-of-electric-delivery-vehicles-rivian-2020-2> . Accessed June 2023

projected to occur at a slower rate than passenger vehicle adoption, with the greatest decarbonization success projected in light-duty commercial vehicles.⁴⁶ To accelerate commercial electric vehicle adoption in the City, the City plans to actively identify and engage businesses/employers with vehicle fleets to accelerate ZEV adoption. Actions T-6.2 and T-6.3 commit the City to engaging with local employers and business fleet owners in the City to identify incentives and opportunities for accelerated fleet conversion to ZEV. With Actions T-6.4 and T-6.1, the City has also committed to collaborating with key stakeholders, including local major employers, to develop best practices and resources outlining funding for ZEV infrastructure. For businesses in the City subject to CARB's Advanced Clean Fleets rule and for those targeting accelerated ZEV adoption, the City will conduct a study to investigate specific opportunities for transitioning these vehicle fleets to ZEV (Action T-6.5).

Methodology and Assumptions

GHG reduction calculations for Measure T-5 were applied the same as those for Measure T-4, for passenger ZEVs. GHG emissions reductions from the adoption of ZEVs assumed a 10 percent adoption of ZEVs by 2030 and 80 percent by 2045. This results in a 3 percent and 50 percent increase in ZEV adoption by 2030 and 2045, respectively, compared with the forecasted ZEV adoption levels in those target years. GHG emissions reduction are calculated by multiplying the percent of ZEV adoption beyond the forecasted values by the commercial VMT. The weighted average commercial vehicle emission factor for internal combustion engines in the target years was applied to the calculated VMT reduction. This GHG reduction would be offset by electricity consumption which would generate GHG emissions in 2030. The calculations and assumptions used to estimate emission reductions from Measure T-5 are provided in Table 20.

Table 20 Measure T-5 GHG Emission Reduction Calculations

Calculation Factor	2030	2045
Commercial IC VMT (miles) ¹	75,010,498	61,580,840
Commercial VMT ICE Emission Factor (MT CO ₂ e/VMT) ²	0.00126	0.00121
EV adoption beyond baseline	3.4%	50.2%
EV electricity usage (kWh/mile) ³	1.1	1.1
EV electricity usage from increased EV adoption (kWh)	2,776,090	32,872,322
Weighted electricity Emission Factor (MT CO ₂ e/kWh) ⁴	0.000003	0
Emission Reduction from EV increased adoption (MT CO ₂ e)	3,171	37,461
Emissions from electricity usage for EVs (MT CO ₂ e)	9	0
Total GHG Emissions Reductions (MT CO₂e)	3,161	37,461

Notes: MT CO₂e = metric tons of carbon dioxide; kWh =-kilowatt-hour; VMT = vehicle miles traveled; EV = electric vehicle

¹ Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP.

² Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP. Forecasted Passenger ICE Emission Factors based on the CARB EMFAC2021 vehicle model for Alameda County.

³ EV electricity usage is based on commercial fuel efficiency (kwh/mile) from the CARB EMFAC2021 vehicle model for Alameda County.

⁴ Electricity Emission Factor is weighted to account for the specific opt-out rates of residential and non-residential customers and assumes implementation of BE-4.

*Values may not add up due to rounding

⁴⁶ Erica Schueller. FleetOwner. July 2021. What it will take to accelerate electric truck adoption. Accessed at: <https://www.fleetowner.com/drivers-seat/article/21167635/what-it-will-take-to-accelerate-electric-truck-adoption>

Table 21 GHG Emission Reductions Associated with Measure T-5

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-5.1	Structural Change	Work with stakeholders to develop and implement a plan for City-supported accelerated fleet electrification. As part of the plan, identify opportunities for accelerated fleet electrification and promote ZEV/EV adoption within business fleets.	3,161	37,461
T-5.2	Funding	Identify incentives for accelerated business fleet electrification and communicate that information to local businesses.	Supportive	Supportive
T-5.3	Education	Engage with local employers and business fleet owners in the City to identify opportunities for accelerated fleet conversion to ZEV/EV. Provide information on the requirements of the Advanced Clean Fleets rule and available funding sources for fleet replacements (e.g., LCFS, Clean Truck and Bus Voucher).	Supportive	Supportive
T-5.4	Partnership	Develop and maintain a collaborative of stakeholders (e.g., local major employers, commercial business) to lead the creation of best practices and the pursuit of funding for ZEV/EV infrastructure as well as public and private zero-emission business vehicle fleets.	Supportive	Supportive
T-5.5	Feasibility Studies	Conduct an inventory investigation of business vehicle fleets in Hayward and identify employers and businesses subject to the Advanced Clean Fleets rule as well as those to target for accelerating ZEV/EV adoption.	Supportive	Supportive

Measure T-6 Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045

Background

As estimated in the 2019 GHG inventory, off-road equipment in the City accounts for almost 4 percent of the community's GHG emissions. While this is only a small part of GHG emissions in the City, getting to carbon neutrality will involve decarbonizing most of the off-road equipment, which currently runs on gasoline, diesel, and natural gas. To support a gasoline and diesel phase-out ordinance for off-road equipment, Action T-6.1 commits the City to enforcing CARB's regulations requiring most newly manufactures small off-road engines such as those found in leaf blowers, lawn mowers, and other equipment be zero emission starting in Model Year 2024. CARB regulations will also require generators and large pressure washers to be zero emission starting in Model Year 2028.⁴⁷ Action T-6.2 commits the City to development and implementing a plan to replace all City owned end-of-life off-road equipment with zero-emission equipment and outlines a timeline for replacements that align with a transition of 15 percent of off-road equipment to zero-emission by 2030 and 80 percent by 2045.

Actions T-6.3, T-6.4, and T-6.5 promote more likely implementation of the regulations outlined above through increased funding opportunities for the City contractors, residents, and fleet operators, as well as providing stakeholders with information on carbon free off-road equipment

⁴⁷ CARB.2021. CARB approves updated regulations requiring most new small off-road engines be zero emission by 2024

through the development of an off-road equipment replacement program/outreach campaign. Through Actions T-7.6 and T-7.7, the City seeks to assess the technology and economic feasibility of replacing the City-owned off-road equipment fleets and identify fleets in the City with the highest decarbonization potential.

Methodology and Assumptions

In the 2019 GHG Inventory, a majority of off-road emissions (60 percent) were associated with diesel-powered equipment, 20 percent were associated with gasoline equipment, and 19 percent were associated with natural gas. While some off-road equipment does not have market-ready zero-emissions alternatives, lawn and garden equipment, light-duty off-road equipment, and portable off-road equipment can generally be electrified or use biodiesel today. In 2030, it is forecasted that portable and lawn and garden equipment would make up 25% total off-road equipment in the City.⁴⁸ In recent years market demand in North America for electric lawn equipment has dramatically increased, with the market share of electric equipment increasing from over 10% between 2015 and 2020 to make up about 40% of the market.⁴⁹ Further, market research shows battery-power lawn equipment sector growing at a rate three times faster than gas⁵⁰ and that customer demand for electric-lawn equipment is dramatically increasing. For example, electric lawn mower market is forecasted to have a compound annual growth rate of ~5% between 2023-2030.⁵¹ Therefore, a 15% reduction in overall offroad emissions is feasible through educating impacted businesses about CARB’s regulations requiring zero emission small off-road engines, including leaf blowers and lawn mowers, starting in model year 2024 and promoting available incentives to the community, such as the various Zero-Emission Landscaping Equipment Incentive Programs⁵² and Clean Off-Road Equipment Voucher⁵³, for transitioning to electric alternatives. The GHG reductions for Measure T-6 were quantified by assuming that actions, when implemented, would achieve a 15 percent reduction and 80 percent reduction in total off-road emissions by 2030 and 2045, respectively. Off-road diesel, gasoline, and natural gas emissions were estimated by using CARB EMFAC2021 fuel usage data for Alameda County apportioned to the City of Hayward and multiplied by respective emissions factors.⁵⁴ Emissions associated with electricity usage from increased use of electric alternatives was calculated by converting the forecasted gallons of fuel consumed to gasoline gallon equivalents which was then converted to electricity usage. The weighted communitywide electricity emission factor was applied to the electricity usage to estimate reduced emissions associated with that amount of fuel reduction. Sources for the emission and conversion factors used are detailed in Table 22.

Table 22 Measure T-6 GHG Emission Reduction Calculations

Inputs and Assumptions		
Off-Road Emissions from Diesel, Gasoline and LPG in 2019 (MT CO ₂ e) ¹		24,287
GHG Emissions Reductions Calculations		
Year	2030	2045

⁴⁸ Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP.

⁴⁹ <https://www.washingtonpost.com/climate-solutions/2021/06/30/electric-lawn-care/>

⁵⁰ <https://www.washingtonpost.com/climate-solutions/2021/06/30/electric-lawn-care/>

⁵¹ <https://www.grandviewresearch.com/industry-analysis/electric-lawn-mower-market-report>

⁵² <https://ww2.arb.ca.gov/our-work/programs/zero-emission-landscaping-equipment/zero-emission-landscaping-equipment-incentive>

⁵³ <https://ww2.arb.ca.gov/our-work/programs/clean-off-road-equipment-voucher-incentive-project/about>

⁵⁴ CARB. 2021. EMFAC21. <https://arb.ca.gov/emfac/emissions-inventory/c58cfe3d0072dfc3ea8eae4234049042e52ed4df>. Accessed June 27, 2023

Decarbonized Percentage	15%	80%
Forecasted Total Off-Road Emissions (MT CO ₂ e) ²	29,084	28,177
Total Fuel Used (GGE) ^{2,3}	3,346,962	3,025,552
Reduced Off-road Emissions (MT CO ₂ e)	4,363	22,542
Total Fuel Reduced (GGE) ^{2,3}	502,044	2,420,442
Electricity usage from increased electric option adoption (kWh) ³	16,194,976	78,078,773
Weighted Communitywide Electricity EF (MT CO ₂ e/kWh) ⁴	0.0000031	0
Emissions from electricity usage for electric equipment (MT CO ₂ e) ²	51	0
Total Reductions (MT CO₂e)	4,312	22,542

Notes: MT CO₂e = metric tons of carbon dioxide; VMT = vehicle miles traveled; NA = Not Applicable

¹ 2019 Community GHG Emissions Inventory. See Appendix B of the CAP.

² Legislative Adjusted GHG Emissions Forecast. See Appendix B of the CAP.

³ Fuel Conversion Factors to Gasoline Gallon Equivalent are sourced from the U.S. Department of Energy. <https://epact.energy.gov/fuel-conversion-factors>.

⁴ Weighted communitywide electricity emission factors assumes the implementation of Measure BE-4.

*Values may not add up due to rounding

Table 23 GHG Emission Reductions Associated with Measure T-6

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-6.1	Structural Change	Support and promote CARB's regulations requiring most newly manufactured small off-road engines such as those found in leaf blowers, lawn mowers, and other equipment to be zero emission starting in Model Year 2024. Phase 2 of the regulations will be implemented in Model Year 2028, when the emission standards for generators and large pressure washers will be zero. In addition, work with Hayward Chamber of Commerce to disseminate information regarding the regulation to impacted businesses (e.g., lawn equipment dealers, commercial landscapers, construction companies) and promote transition of equipment sales and equipment use to electric alternatives.	4,312	22,542
T-6.2	Structural Change	Develop and implement a plan to replace all City owned end-of-life off-road equipment with zero-emission equipment. Plan should include evaluation of current City-owned equipment, alternative low or zero-emission options, prioritize equipment to replace first (e.g., largest GHG emission reduction potential), and a timeline for replacements that align with goals and feasibility of replacement.	Supportive	Supportive
T-6.3	Education	Develop an Off-road Equipment Replacement Program and Outreach Campaign that provides information to contractors, residents, and fleet operators in Hayward regarding alternatives to fossil-fueled off-road equipment, public health and safety benefits of alternative equipment technology, and funding opportunities available (i.e., Clean Off-Road Equipment Voucher Incentive Program CORE)), Zero-Emission Landscaping Equipment Incentive Programs).[CORE]].	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
T-6.4	Funding	Partner with BAAQMD to identify funding opportunities to encourage residents to replace gas-powered landscaping equipment and off-road engines with zero emission equipment.	Supportive	Supportive
T-6.5	Partnership/ Funding	Partner with BAAQMD to develop a rebate and incentive program for upgrading off-road equipment and switching to biofuels.	Supportive	Supportive
T-6.6	Feasibility Study	Conduct a study to assess the technological and economic feasibility of replacing the City-owned off-road equipment fleets.	Supportive	Supportive
T-6.7	Feasibility Study	Conduct an investigation inventory of major off-road equipment fleets in Hayward and identify fleets with highest decarbonization potential.	Supportive	Supportive

Measure T-7 Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.

Background

Measure T-7 seeks to align the City's municipal vehicle fleet with the State of California's Zero emission vehicle (ZEV) goals outlined in the Advanced Clean Cars II regulation, to achieve 100 percent ZEV vehicle sales by 2035, and the Advanced Clean Fleets regulation, requiring a phased-in transition toward zero-emission medium-and-heavy duty vehicles.^{55,56} To align with these aggressive State goals, the City seeks to increase municipal passenger ZEV adoption to 75 percent by 2030 and 100 percent by 2045 and decarbonize emergency and heavy-duty vehicles as feasible. These targets, once achieved, will make Hayward a leader in California municipal fleet decarbonization. Specific structural changes action for Measure T-7, include establishing and adopting a ZEV fleet conversion and purchase policy including a schedule for replacement of fleet vehicles to transition 15 percent of the fleet to ZEV by end of FY2023 and 50 percent by end of FY2030 (Action T-7.1). To support this, the City will conduct a feasibility and cost assessment to determine the number of EV/ZEV charge and funds needed to support the fleet transition (Action T-7.2). The City will pursue funding opportunities to support this transition through the California Air Resources Board's Clean Vehicle Rebate Project, the Clean Truck and Bus Voucher Incentive Program (Action T-7.3), and the Low Carbon Fuel Standard (LCFS) program (Action T-7.4).

Methodology and Assumptions

Since vehicles that are included in the City vehicle fleet are also registered to an address in the City, there is risk for double counting emission reductions and are therefore, not separately quantified.

Table 24 GHG Emission Reductions Associated with Measure T-7

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045

⁵⁵ State of California. 2022. Advanced Clean Cars II. <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii>. Accessed June, 27 2023

⁵⁶ CARB. Advanced Clean Fleets. <https://ww2.arb.ca.gov/news/california-approves-groundbreaking-regulation-accelerates-deployment-heavy-duty-zevs-protect#:~:text=The%20Advanced%20Clean%20Fleets%20rule%20includes%20an%20end%20to%20combustion,accelerated%20benefits%20for%20California%20communities..> Accessed June 2023

			2030	2045
T-7.1	Structural Change	Establish and adopt Zero-emission Fleet Conversion and Purchase Policy that requires new, and replacement municipal fleet vehicle purchases are EVs or ZEVs. The policy will also include a schedule for replacement of fleet vehicles to meet a 100% carbon neutral fleet by 2040.	Supportive	Supportive
T-7.2	Structural Change/ Feasibility Study	Conduct feasibility and cost assessment to determine the number of EV/ZEV chargers and funds needed to support the fleet transition to 50% EV/ZEV by 2030. Expand EV/ZEV charging infrastructure for city fleet and employees in alignment with feasibility study.	Supportive	Supportive
T-7.3	Funding	Secure funding from programs such as the California Air Resources Board's Clean Vehicle Rebate Project and the Clean Truck and Bus Voucher Incentive Program to increase procurement of EV or ZEV cars, trucks, and other vehicles and installation of EV/ZEV charging/fueling infrastructure at municipal facilities.	Supportive	Supportive
T-7.4	Funding	Evaluate credit generation opportunities within the Low Carbon Fuel Standard (LCFS) program for ZEV/EV fueling and charging stations for the municipal fleet to offset cost of infrastructure development needed to support transition.	Supportive	Supportive

2.3 Water

Measure WW-1. Reduce water consumption by 15% by 2030 and maintain it through 2045.

Background

The City's primary source of potable water is purchased from San Francisco Public Utilities Commission (SFPUC) Regional Water System (RWS). Approximately 85 percent of the water supply to the SFPUC RWS originate in the Hetch Hetchy watershed, located in Yosemite National Park.⁵⁷ GHG emissions from water supply are generated by the electricity used to convey, treat, and distribute water. Although the water and wastewater sector GHG emissions only account for less than one percent of communitywide emissions in the City and will decrease to zero in 2045 as electricity becomes 100 percent carbon-free, access to clean and safe water supply has innumerable quality of life benefits. Residential and commercial buildings use water both indoors for cooking, cleaning, bathing, and toilet flushing, and outdoors to irrigate landscaping and maintain pools and fountains. Water efficiency measures not only reduce the amount of water used but also reduce the amount of energy needed to heat water because of conservation. Additionally, water consumption and wastewater generation are interconnected, therefore water conservation efforts will lead to decreases in wastewater generated, as less water is treated through the wastewater system.

The City has been successful in reducing potable water consumption through implementation of programs, policies, and regulations including the Bay-Friendly Water Efficient Landscape ordinance (Action WW-1.1), Water Conservation Standards (Action WW-1.2), and Recycled Water Program (Action WW-1.4). Measure WW-1 seeks to continue these same programs and efforts, while also focusing efforts on several new actions, including Action WW-1.11, developing a recycled water master plan to further expand recycled water use and establish a road for potable water

⁵⁷ City of Hayward. 2021. 2020 Urban Water Management Plan. https://www.hayward-ca.gov/sites/default/files/Hayward_2020%20UWMP_Public%20Release_2021%20July%2022.pdf. Access June 27, 2023

replacement, where appropriate. The City’s efforts to lessen dependence on imported water through increased use of recycled water can improve the City’s adaptive capacity to climate change by enhancing the capacity of local sources of water and reducing the GHG emissions associated with the high energy-intensity of imported water. While the GHG emission reductions from these efficiencies are not quantified due to the complexity of interactions with various agencies, they provide more evidence that the City will be able to achieve the established water reduction targets as part of Measures WW-1.

Actions including WW-1.3, WW-1.4, WW-1.5, WW-1.6, WW-1.7, WW-1.8, WW-1.9, WW-1.10, and WW-1.12 will further support the City’s water conservation efforts through continuing and expanding public education campaigns and programs to highlight water conservation practices, promote rebates and incentives for water conserving devices, and ensure access to information and resources to low-income and disadvantaged communities. Engagement on these topics has been shown to improve the efficacy of structural changes to water systems and build communitywide trust and stewardship.⁵⁸

Methodology and Assumptions

The GHG emission reductions associated with Measure WW-1 are a result of the decreased energy consumption required to convey, pump, treat, and distribute potable water to end users. Additionally, water conservation efforts will lead to decreased wastewater generation and therefore reduced energy consumption required to treat wastewater. It is expected that the collective efforts of all actions under Measure WW-1 will result in a per-capita reduction of water consumption of 15 percent by 2030 and maintain that 15 percent reduction through 2045, below the 2019 baseline. The reduced quantity of water was multiplied by the energy intensity factor for potable water and wastewater to determine the electricity consumption for water and wastewater conveyance and treatment. Assumptions regarding the average water and wastewater energy intensity and emission factors are provided in Table 25. Additional details regarding energy intensity can be found in Appendix B of the CAP.

Table 25 Measure WW-1 GHG Emission Reduction Calculations

Calculation Factor	2030	2045
Water		
Baseline Water Use per Service Population (MG) ¹	0.0002	0.0002
Service Population ²	239,498	261,673
Forecasted Water Use (MG) ²	52	57
Targeted Water Use (MG) ³	44	48
Saved Water (MG)	7.81	8.53
Average Energy Intensity of Water Supply (kWh/MG) ¹	1,318	1,318
Electricity Saved (kwh)	10,289	11,242
Electricity Emission Factor Adjusted for SB 100 (MT CO ₂ e/kWh) ⁴	0.00006	0
Total Water Emissions Reductions (MT CO ₂ e)	1	0
Wastewater		

⁵⁸ Dean AJ, Fielding KS, Ross H and Newton F. (2016) Community Engagement in the Water Sector: An outcome-focused review of different engagement approaches. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities. Accessed here: https://watersensitivecities.org.au/wp-content/uploads/2016/05/TMR_A2-3_CommunityEngagementWaterSector-1.pdf. Accessed June 27, 2023

Baseline Wastewater Generation per Service Person (MG) ¹	0.0263	0.0263
Service Population ¹	167,425	184,358
Forecasted Wastewater Generation (MG) ²	4,409	4,855
Targeted Wastewater Generation (MG) ³	3,748	4,127
Reduced Wastewater (MG)	661	728
Average Energy Intensity of Wastewater (kWh/MG) ¹	955	955
Electricity Saved (kwh)	631,655	695,539
Electricity Emission Factor Adjusted for SB 100 (MT CO ₂ e/kWh) ⁴	0.00006	0
Total Wastewater Emissions Reductions (MT CO ₂ e)	35	0
Total GHG Emissions Reductions (MT CO₂e)	36	0

Notes: MT CO₂e = metric tons of carbon dioxide; kWh = kilowatt-hour; MG = million gallons

¹ 2019 Community GHG Emissions Inventory. See Appendix B of the CAP.

² GHG Emissions Forecast. See Appendix B of the CAP.

³ Targeted water use determined as a 15% reduction in per capita water usage (15%) multiplied by the service population.

⁴ The electricity emission factor used is based on the forecasted emission factors for PG&E.

*Values may not add up due to rounding

Table 26 GHG Emission Reductions Associated with Measure WW-1

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
WW-1.1	Structural Change	Continue to implement the City's Bay-Friendly Water Efficient Landscape ordinance applicable to all land use types to decrease water consumption.	36	0
WW-1.2	Structural Change	Continue to implement and enforce the Water Conservation Standards within the Municipal Code via the Nonessential water Use Prohibition of Wasteful Water Practices Ordinance for households, businesses, industries, and public infrastructure.	Supportive	Supportive
WW-1.3	Structural Change	Continue to implement rebate and water conservation device tracking system to track the number of rebates and water devices distributed.	Supportive	Supportive
WW-1.4	Structural Change	Continue to implement the Recycled Water Program which includes expanding facilities if necessary to deliver recycled water to additional customers, working with customers to complete site retrofits, connecting customers to the recycled water system, and ensuring customer deliveries.	Supportive	Supportive
WW-1.5	Education/ Funding	Continue to offer water conservation programs to the community including educational programs like water education program for schools and water wise landscape classes as well as incentives like free water conserving devices, and rebates for rain barrels and turf replacement.	Supportive	Supportive
WW-1.6	Education/ Equity	As part of the water conservation programs offered implement a public education campaign that in addition to highlighting water conservation practices, with focus on low-income households with high utility bill burdens.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
WW-1.7	Equity	Ensure that water conservation educational materials, programs and outreach efforts are in multiple languages and accessible for low-income or disadvantaged communities.	Supportive	Supportive
WW-1.8	Equity	Perform targeted outreach to low-income communities and elderly households to provide free water conservation devices and aid disadvantaged community members in obtaining available rebates for water conservation devices.	Supportive	Supportive
WW-1.9	Partnerships/ Equity	Partner with programs such as Green House Call or other similar programs to support community members with installation of water saving devices with a particular focus of support for low-income, elderly, or disadvantaged elderly residents.	Supportive	Supportive
WW-1.10	Partnership	Continue to coordinate with commercial and industrial customers including the Hayward Area Recreation and Park District and the Hayward Unified School District to advance water recycling programs.	Supportive	Supportive
WW-1.11	Feasibility Studies	Develop a Recycled Water Master Plan to assess the feasibility of expanding the recycled water system and establish a roadmap for a recycled water expansion program. The plan will identify the locations available for recycled water use, the capacity needed to fully replace potable water use at identified locations and establish a schedule for potable water replacement with recycled water for appropriate applications.	Supportive	Supportive
WW-1.12	Education	Promote the use of on-site gray water and rainwater collection systems	Supportive	Supportive

2.4 Waste

Measure SW-1 Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics 75% by 2025 and 90% by 2045.

Background

Organic materials are the focus of the recent landmark legislation SB 1383 (Short-Lived Climate Pollutants: Organic Waste Reductions). This new State law has the immediate goal of reducing organic waste sent to landfills and the ultimate objective of reaching statewide methane emissions reduction goals. Specifically, it sets a statewide goal for the reduction in organic waste to landfills – 50 percent by 2020 and 75 percent by 2025 – in addition to the recovery of 20 percent of edible food waste for human consumption. SB 1383 requires local governments to provide organics collection to all generators and require all generators to subscribe. It also has specific mandates for container systems, education, and outreach programs, monitoring and contamination reporting, and enforcement of regulations. Full SB 1383 implementation began in 2022.⁵⁹

⁵⁹ California Air Resources Board. 2017. Short-Lived Climate Pollution Reduction Strategy. <https://ww2.arb.ca.gov/resources/documents/slcp-strategy>

The City is adopting and continuing the implementation of several structural changes including procurement policies to comply with SB 1383, exclusive hauling agreement with Waste Management of Alameda County (WMAC), edible food recovery ordinance, a fee system for incorrectly sorted materials with sensitivity to shared collection (Action SW-1.1, Action SW-1.2, Action SW-1.3, and Action SW-1.4). The City will support these structural changes with various education and engagement efforts to promote waste diversion and implementation of SB 1383 requirements to business owners, generators, haulers, facilities, schools, local community organizations, and local public agencies (Action SW-1.5, SW-1.6, SW-1.7, SW-1.9, SW-1.10, SW-1.11, and SW-1.13). The City will also support increased landfill diversion through partnerships to increase funding opportunities associated with edible food recovery and composting/waste containers (Actions SW-1.8 and SW-1.12). Additionally, through Action SW-1.14, the City will partner with StopWaste to conduct a feasibility study and identify next steps to ensure there is sufficient edible food reuse infrastructure in Hayward to achieve the recovery goals.

Methodology and Assumptions

Through the combination of all actions for Measure SW-1, as discussed above, it is assumed that waste reduction targets in line with SB 1383 will be met. A landfilled organic waste reduction target consistent with SB 1383 requirements is assumed in the GHG emissions calculations for Measure SW-1. This reduction target is applied to the total emissions associated with solid waste disposal because nearly all GHG emissions from the natural decay of solid waste come from organic waste.⁶⁰ The calculations and assumptions used to estimate emission reductions from Measure SW-1 are provided in Table 27.

Table 27 Measure SW-1 GHG Emission Reduction Calculations

Calculation Factor	2030	2045
Solid Waste Emissions ¹	47,899	52,334
Organic Waste Target Achievement	75%	90%
Total GHG Emissions Reductions (MT CO₂e)	35,924	47,101

Notes: MT CO₂e = metric tons of carbon dioxide

¹ GHG Emissions Forecast. See Appendix B of the CAP.

*Values may not add up due to rounding

Table 28 GHG Emission Reductions Associated with Measure SW-1

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
SW-1.1	Structural Change	Adopt procurement policies to comply with SB 1383 requirements for jurisdictions to purchase recovered organic waste products.	35,924	47,101

final#:~:text=The%20Short%2DLived%20Climate%20Pollutant,)%2C%20and%20anthropogenic%20black%20carbon. Accessed June 27, 2023.

⁶⁰ According to the Local Governments for Sustainability (ICLEI) U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Appendix E – Solid Waste Emission Activities and Sources, GHG emissions are generated by non-biologic wastes only if they are combusted.

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
SW-1.2	Structural Change	Continue to implement exclusive hauling agreement with Waste Management of Alameda County (WMAC) that regulates haulers collecting organic waste, including collection program requirements and identification of organic waste receiving facilities.	Supportive	Supportive
SW-1.3	Structural Change	Continue to implement edible food recovery ordinance for edible food generators, food recovery services, or organizations that are required to comply with SB 1383. Ordinance requires all residential and commercial customers to subscribe to an organic waste collection program and/or report self-hauling or backhauling of organics.	Supportive	Supportive
SW-1.4	Structural Change	Implement enforcement and fee for incorrectly sorted materials with sensitivity to shared collection. Utilize funding to implement programs and efforts to increase communitywide organic waste diversion.	Supportive	Supportive
SW-1.5	Education	Work with StopWaste to conduct targeted outreach with food recovery organizations, generators, haulers, facilities, and local agencies to promote strategies to implement requirements of SB 1383	Supportive	Supportive
SW-1.6	Education	Encourage businesses to educate their employees about organic waste diversion and proper sorting annually by providing training resources and rebate program to fund employee time for training.	Supportive	Supportive
SW-1.7	Partnership	Partner with local community organizations, public agencies like StopWaste and businesses to implement all required activities under SB 1383.	Supportive	Supportive
SW-1.8	Equity	Provide free compost bins and kitchen-top food waste containers to low-income communities of colors and elderly households in order to increase compost participation. Evaluate opportunities to have a community compost hub that is easily accessible to disadvantaged neighborhoods	Supportive	Supportive
SW-1.9	Equity	Establish relationships with multi-family property owners/managers to develop signage for their properties. Present at all Home-Owner Associations in Hayward annually and provide supplies and education for proper sorting.	Supportive	Supportive
SW-1.10	Partnership	Establish an edible food recovery program to minimize food waste. Leverage CalRecycle support for projects that prevent food waste or rescue edible food. Partner with existing food pantries like CSUEB, South Hayward Parish to identify and advertise locations for surplus food to be taken in the community.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
SW-1.11	Partnership	Work with contracted hauler to: - Provide quarterly route reviews to identify prohibited contaminants potentially found in containers that are collected along route. - Clearly label all new containers indicating which materials are accepted in each container, and by January 1, 2024 place or replace labels on all containers. - Develop and implement a comprehensive monitoring and quality control program with a focus on consumer behavior change.	Supportive	Supportive
SW-1.2	Partnership/Funding	Work with local organizations, StopWaste, and investigate various funding/ grant opportunities to fund edible food recovery organizations so they can expand and handle increased volume.	Supportive	Supportive
SW-1.13	Partnerships	Partner with schools, retirement communities, and other large institutions to create waste diversion and prevention program/procedure/plan.	Supportive	Supportive
SW-1.14	Feasibility Studies/ Partnership	Partner with StopWaste to conduct a feasibility study and identify next steps to ensure edible food reuse infrastructure in Hayward is sufficient to accept capacity needed to recover 20% of edible food disposed of within Hayward.	Supportive	Supportive

Measure SW-2 Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.

Background

To reach its zero waste goals, the City must increase community-wide overall landfill diversion of waste. Measure SW-2 and associated actions are anticipated to move the City towards an overall reduction in inorganic waste disposal but will not contribute to quantified emissions reductions targets. Measure SW-2 will contribute to the City's goal to reduce overall waste generation but will not directly contribute to the City's quantified emissions reduction target, which is associated with organic waste reduction, as supported by Measure SW-1. Emphasis is placed on reduction of organic waste sent to landfills, as landfilled organic waste is the major source of Hayward's waste-related greenhouse gas emissions.

The City is developing, adopting, and continuing the implementation of several structural changes actions including the Organics Reduction and Recycling Ordinance (ORRO), the hauling agreements and municipal codes with recent circular economy bills integrated, the Hayward Construction and Demolition Debris Recycling Ordinance, a Zero Waste Strategic Plan, a requirement for large events to hire an event waste management team, a fee for single-use foodware, post-consumer recycled content requirements, and bans on "problem materials" (i.e., items without means of recycled or recycling markets) (Actions SW-2.1, SW-2.2, SW-2.3, SW-2.4, SW-2.5, SW-2.7, SW-2.12, SW-2.14).

Other actions, including Action SW-2.6, Action SW-2.8, Action SW-2.9, Action SW-2.10, and Action SW-2.13, commit the City to partnering with Waste Management of Alameda County, StopWaste, the business community, local organizations, schools, and libraries to promote waste prevention and waste diversion best practices by creating multi-lingual education materials and providing technical assistance. Through Action SW-2.11, the City will conduct a consumption-based GHG emissions inventory to understand community habits and potential emission reduction opportunities. Action SW-2.15 commits the City to continue participation in the Alameda County All in Eats initiative by identifying funding opportunities to increase the circular food economy.

Methodology and Assumptions

Measure SW-2 is intended to be supportive of the overall zero waste goals of the CAP and to the GHG emission reductions associated with Measure SW-1. As such, Measure SW-2 does not have any direct GHG emissions reduction that can be quantified and is considered to GHG emissions reduction elsewhere.

Table 29 GHG Emission Reductions Associated with Measure SW-2

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
SW-2.1	Structural Change	Continue to implement the Organics Reduction and Recycling Ordinance (ORRO) adopted in November 2021 in alignment with the Countywide ORRO ordinance. Support StopWaste and County Environmental Health in the enforcement of the ORRO within the City.	Supportive	Supportive
SW-2.2	Structural Change	Review recent circular economy bills signed by the governor (i.e., SB 343, AB 881, AB 1201, AB 962, AB 1276) and incorporate requirements into hauling agreements, and municipal codes for full-service restaurants and local manufacturing businesses.	Supportive	Supportive
SW-2.3	Structural Change	Continue to enforce the Hayward Construction and Demolition Debris Recycling Ordinance.	Supportive	Supportive
SW-2.4	Structural Change	Adopt a Citywide Zero Waste Goal and develop a Zero Waste Strategic Plan to increase diversion from the landfill by 85% 2045.	Supportive	Supportive
SW-2.5	Structural Change	Create a requirement for large events to hire an event waste management team.	Supportive	Supportive
SW-2.6	Partnership	Regularly evaluate and update new franchise agreement with Waste Management of Alameda County to meet SB 1383 requirements and to implement new components to further divert waste from landfills. Work with (WMAC) to determine data necessary to meet zero waste goals and establish protocol for regular collection and reporting of associated metrics. Identify dedicated staff responsible for this.	Supportive	Supportive
SW-2.7	Structural Change/ Funding	Require food service providers to implement a fee for single-use food ware.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
SW-2.8	Education/Equity	Partner with StopWaste to conduct targeted, multi-lingual, culturally appropriate, and geographically diverse waste prevention educational and technical assistance campaigns based on outcomes of a waste characterization study (WCS). Such as food waste prevention, edible food recovery strategies, proper storage, how to fix clothes/electronics, how to donate, reusable alternatives, effects of over consumption, sustainable consumption habits, buying second hand, buying durable, sharing, repurposing. Continue to conduct outreach regarding AB 1276 to full-service restaurants.	Supportive	Supportive
SW-2.9	Partnership	Continue to work with StopWaste and haulers to monitor participation in residential recycling programs, create education materials for the community, provide technical assistance to business to implement mandatory recycling, and identify other opportunities and means to promote zero waste efforts.	Supportive	Supportive
SW-2.10	Partnership	Work with StopWaste and the business community to design and promote extended producer responsibility such as take-back programs.	Supportive	Supportive
SW-2.11	Feasibility Study	Conduct a consumption-based GHG emissions inventory to understand the community's worst consumption habits and emission reduction potential and provide educational materials on a closed-loop circular economy.	Supportive	Supportive
SW-2.12	Structural Change	Work with local businesses to establish post-consumer recycled content requirements that meet SB 343 recyclability claims as part of their purchasing criteria.	Supportive	Supportive
SW-2.13	Partnership/Equity	Partner with local organizations, schools, and libraries to establish pop-up repair cafes for commonly broken and easily repaired items. Partner with the library to promote reuse by increasing accessibility to shared tools through a tool lending library.	Supportive	Supportive
SW-2.14	Structural Change	Based on existing StopWaste waste characterization studies and Litterati litter assessment, increase bans on "problem materials" (i.e., items without means of recycling or recycling markets, such as sale of polystyrene, plastic packaging, straws, plastics #4-7, mixed materials). Enforce the single-use plastic pre-checkout ban, by January 1, 2025, in alignment with SB-1046.	Supportive	Supportive
SW-2.15	Funding	Explore funding opportunities to increase the circular food economy.	Supportive	Supportive

2.5 Carbon Sequestration

Measure CS-1 Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.

Background

The City is generally considered a built-out City where a majority of new development or growth will involve the redevelopment of underutilized parcels or renovation of existing structures. Although built-out, the City has the opportunity to engage in carbon sequestration activities through enhancing open space, urban greening, and protecting and increasing the City's urban forest or tree stock. Over time as emissions are removed from more and more sectors, carbon sequestration will play an increasingly important role in California's ability to achieve carbon neutrality. The City currently has approximately 30,000 trees within its borders.⁶¹ Measure CS-1 strives to enhance the City's ability to plant more trees in the public right of way and preserve or replace trees that are intended to be removed from private property. Specifically, Action CS-1.1, proposed an update to the tree preservation ordinance by Q2 2024 to ensure existing carbon stock is maintained and that replacement trees are climate resilient and rough tolerant. The updated ordinance would include a development requirement to protect or replace value-to-value existing trees and greenspace and require a cash mitigation fee equal to the value of tree removed. In order to reach the target of planting 7,000 net new trees by 2030, the City will need to maintain the current tree stock and plant about 1,000 net new trees each year. Potential for planting new trees to meet the targets would be identified through an Urban Forest Management Plan developed as part of Action CS-1.2. The City is also committed to conducting several feasibility studies to identify the best locations for new greenbelts for wildfire defense and risk reduction (CS-1.13), identify areas in the City that have below average canopy coverage (CS-1.6), and identify and map public spaces that can be converted to green space (CS-1.3). To encourage tree planting, the City is committed to pursuing partnerships, providing educational information on climate appropriate trees and providing funding options to community members, community groups and businesses through Actions CS-1.4, Action CS-1.7, Action CS-1.8, Action CS-1.9, Action CS-1.10, Action CS-1.11, Action CS-1.12. Through Action CS-1.5, the City committed to adopting a standard policy and set of practices to expand trees and vegetation between busy roadways and development to minimize pollutants from traffic.

Methodology and Assumptions

The actions making up this measure align with the best practices in urban forestry that have been shown to be effective ways to increase and maintain tree stocks within the urban environment.⁶² As such, it is assumed that through implementation of these actions that the goal of this measure will be reached and the tree stock maintained. GHG emission reductions were estimated based on the number of trees to be added to the inventory and the average CO₂e accumulation factor per tree (0.0354 MT CO₂e/tree/year).⁶³ The calculations and assumptions used to estimate emission reductions from Measure CS.1 are provided in Table 30.

⁶¹ City of Hayward Landscape Maintenance Division. 2023. Urban Forest. <https://www.hayward-ca.gov/your-government/departments/landscape-maintenance-division>. Accessed June 27, 2023

⁶² Michael Leff, The Sustainable Urban Forest: A Step-by-Step Approach. U.S. Forest Service and Davey Institute, 2016. https://www.itreetools.org/documents/175/Sustainable_Urban_Forest_Guide_14Nov2016.pdf. Accessed July 20, 2023

⁶³ CAPCOA. 2011. Quantifying Greenhouse Gas Mitigation Measures. <http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>. Accessed June 27, 2023

Although not quantified herein, urban greening can further reduce building carbon emissions by reducing the heat island effect in cities which reduces the need to rely on air conditioning in homes.⁶⁴

Table 30 Measure CS-1 GHG Emission Reduction Calculations

Calculation Factor	2030	2045
Newly Planted Trees	6,000	21,000
Tree Sequestration Factor (MT CO ₂ e/tree/year) ¹	0.0354	0.0354
Total GHG Emissions Sequestered (MT CO₂e)	212	743

Notes: MT CO₂e = metric tons of carbon dioxide; kWh =-kilowatt-hour

¹ Default annual CO₂e sequestration per tree per year with a maximum lifespan of 20 years per tree is 0.0354 MT CO₂e/tree/year was obtained from CAPCOA. 2010. Quantifying Greenhouse Gas Mitigation Measures.

*Values may not add up due to rounding

Table 31 GHG Emission Reductions Associated with Measure CS-1

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
CS-1.1	Structural Change	Update the Tree Preservation Ordinance by Q2 2024 to maintain existing carbon stock is maintained and that replacement trees that are climate resilient and drought tolerant for Hayward's climate. Ordinance updates may include development requirements to protect or replace value-to-value existing trees and greenspace; and a requirement for a cash mitigation fee equal to the value of trees removed.	212	743
CS-1.2	Structural Change	Develop and adopt an Urban Forest Management Plan that identifies: City's potential capacity for new tree planting; timeframe and mechanism for implementation; a management plan for existing trees; and a tracking system to assess progress towards annual benchmark. (Replaces existing General Plan program HQL-5.)	Supportive	Supportive
CS-1.3	Feasibility Study	Identify and map public spaces that can be converted to green space, including freeway airspace that can be made into green space, vertical walls that can be planted with vines, and rooftops of public buildings that can be developed into gardens.	Supportive	Supportive
CS-1.4	Partnership/Funding	Partner with community groups to apply for community garden grants and develop new or expand existing community gardens based on the identified public spaces available for green space conversion.	Supportive	Supportive
CS-1.5	Equity	Adopt a standard policy and set of practices for expanding the urban tree canopy and placing vegetative barriers between busy roadways and developments to reduce exposure to air pollutants from traffic.	Supportive	Supportive

⁶⁴ The Trust for Public Land (TPL). Quantifying the greenhouse gas benefits of urban parks. August 2008. Accessed June 27, 2023

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
CS-1.6	Feasibility Study/Equity	Conduct an urban canopy study to identify areas in Hayward that have below average canopy coverage and implement a tree planting program focusing on the least covered portions of the City. Establish a goal of having no significant difference in canopy coverage between high and low-income areas citywide by 2030.	Supportive	Supportive
CS-1.7	Education	In addition, or as an expansion to the Adopt-a-Block Program establish an adopt-a-tree or adopt-a-street program that is specific to further greening and tree planting. The program will enable individuals, businesses, and community organizations to plant and care for trees in selected communities. Program should provide formalized information on appropriate trees eligible for planting in Hayward (i.e., native, drought tolerant, locations)	Supportive	Supportive
CS-1.8	Funding	Dedicate staff time to obtaining grant funding for tree planting. Identify and apply for applicable federal (e.g., USDA) and state (e.g., California ReLeaf, Affordable Housing and Sustainable Communities Program (AHSC), Urban and Community Forestry Program) grants for tree planting and maintenance projects.	Supportive	Supportive
CS-1.9	Funding	Explore opportunities to fund the Urban Forest Management Program. Possibilities include use of general tax revenues, permit fees, or revenues from the municipal tree ordinance enforcement.	Supportive	Supportive
CS-1.10	Funding	Establish a Tree Trust or Tree Endowment where the interest on the principal can be used for purchasing trees, paying for tree maintenance, or for staff resources for the Urban Forest Management Program.	Supportive	Supportive
CS-1.11	Partnerships	Partner with private developers, CSU, Chabot College, HARD, HUSD, and other community-based organizations to support and contribute to the Urban Forest Management Program	Supportive	Supportive
CS-1.12	Funding	Establish alternative fee mechanisms, similar to the SF Carbon Fund, to fund nature-based solutions. By 2026, create permanent code and financial incentives for homeowners and other private landowners to preserve existing mature trees and shrubs and to plant local native species.	Supportive	Supportive
CS-1.13	Feasibility Study	Identify existing greenbelts and the best locations for new greenbelts for wildfire defense and risk reduction. Incorporate these locations into comprehensive wildfire planning at regional, county, city, and community levels and in all municipal service reviews.	Supportive	Supportive

Measure CS-2 Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030.

Background

SB 1383 requires each jurisdiction in California to procure recycled organics products to meet specific procurement targets, as notified by CalRecycle by 2022. Measure CS-2 commits the City to meeting these procurement requirements. The City expects to meet these requirements through the procurement of compost and will work with Alameda County and StopWaste to identify opportunities for a regional compost procurement program (Action CS-2.8), resulting in carbon sequestration benefits for the City. The application of suitable composted organic material to existing open spaces can be used to enhance the sequestration of CO₂e. The application of compost allows for carbon to be stored in the soil and, over time, to be captured in the stems, leaves, and roots of grasses, woody plants, and trees.

The City is committed to enforcing and adopting structural changes including a minimum level of compost application per year on applicable/appropriate land throughout the City (Action CS-2.1), procurement policies to comply with SB 1383 requirements to purchase recovered organic waste products (Action CS-2.2) and urban park guidelines promoting carbon sequestration (Action CS-2.3). Through Action CS-2.4 and Action CS-2.10, the City will conduct a feasibility study to identify location in the City to apply compost and opportunities to enhance or create new natural areas to increase carbon sequestration potential. The City is seeking to partner with StopWaste, Chabot College, Cal State East Bay, and local schools to promote best practices for using compost in landscaping and increase application (Action CS-2.5, Action CS-2.7, and Action CS-2.9). Through Action CS-2.11, the City will create and distribute resources to train residents, City gardening staff and other entities on how to both increase carbon sequestration and biodiversity through landscaping. Finally, the City will explore funding opportunities associated with the use of the parkland in-lieu fees from the updated City's Property Developers- Obligations for Parks and Recreation Ordinance to implement the Carbon Management Activities Program (Action CS-2.6).

Methodology and Assumptions

Guidance from CalRecycle has set a total population procurement target for the City of 158,089 tons of recovered organic waste products (e.g., compost).⁶⁵ The City procurement requirement per capita, 0.08 tons/person, was calculated using the total population procurement target for the City and the total population forecasted for 2030 and 2045. Based on this procurement target, the City's population, and the carbon sequestration potential per ton of mixed organics compost (0.23 MT CO₂e/ton)⁶⁶, the carbon sequestration potential for the City's compost procurement for 2030 and 2045 was calculated. The methods and assumptions used to calculate the GHG emissions reductions associated with Measure CS-2 are shown in the Table 32.

Table 32 Measure CS-2 GHG Emission Reduction Calculations

Calculation Factor	2030	2045
Population	167,425	184,358

⁶⁵ CalRecycle. 2021. Jurisdiction Procurement Targets Based on January 1, 2021 Population Estimates.

<https://calrecycle.ca.gov/organics/sllcp/procurement/recoveredorganicwasteproducts>. Accessed June 27, 2023.

⁶⁶ Industrial Strategies Division, Transportation and Toxics Division, California Air Resources Board, & California Environmental Protection Agency. 2017. Method for Estimating Greenhouse Gas Emission Reductions from Diversion of Organic Waste from Landfills to Compost Facilities. <https://ww2.arb.ca.gov/sites/default/files/classic/cc/waste/cerffinal.pdf>. Accessed June 27, 2023.

Estimated procurement requirement ¹	13,394	14,748
Per Capita Sequestration (MT CO ₂ e/person) ²	0.018	0.018
Total GHG Emissions Sequestered (MT CO₂e)	3,081	3,392

Notes: MT CO₂e = metric tons of carbon dioxide; kWh =kilowatt-hour

¹ Hayward procurement requirement per capita = 0.08. CalRecycle

² Emissions avoided from mixed organics compost application (MT CO₂e/ton) =0.23. CARB. Method for Estimating GHG Emission Reductions from Diversion of Organic Waste from Landfills to Compost Facilities.

*Values may not add up due to rounding

Table 33 GHG Emission Reductions Associated with Measure CS-2

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
CS-2.1	Structural Change	Enforce compliance with SB 1383 by establishing a minimum level of compost application per year on applicable/appropriate land throughout the City including City-owned land.	3,081	3,392
CS-2.2	Structural Change	Adopt procurement policies to comply with SB 1383 requirements for jurisdictions to purchase recovered organic waste products.	Supportive	Supportive
CS-2.3	Structural Change/ Equity	Work with Hayward Area Recreation and Park District to develop and adopt urban park guidelines that 1) Provide flexible solutions for developing urban parks in infill areas where traditional neighborhood and community parks are not feasible; 2) Establish guidelines for achieving the greatest carbon sequestration potential of parks via design; 3) Are equitable in ensuring such urban parks are accessible for lower-income residents while avoiding displacement, in alignment with the Parks Master Plan.	Supportive	Supportive
CS-2.4	Feasibility Study	Identify locations within Hayward to apply compost to help meet the procurement requirements of SB 1383.	Supportive	Supportive
CS-2.5	Education	Work with StopWaste to provide residents, businesses, and developers with educational material on best practices for using compost in landscaping.	Supportive	Supportive
CS-2.6	Funding	Explore opportunities to use the parkland in-lieu fees from the updated City's Property Developers - Obligations for Parks and Recreation Ordinance (Article 16 of City's municipal code) to implement the Carbon Management Activities Program (NR 15).	Supportive	Supportive
CS-2.7	Partnerships	Collaborate with Chabot College, CSUEB, and local schools to identify opportunities to apply compost to landscaping.	Supportive	Supportive
CS-2.8	Partnerships	Work with Alameda County and StopWaste to identify opportunities for a regional compost procurement program to help meet the organics procurement provisions of SB 1383.	Supportive	Supportive
CS-2.9	Partnership	Work with the City's franchisee under the new franchise agreement with Waste Management of Alameda County to provide compost throughout the community.	Supportive	Supportive

Action ID	Pillars	Action	Emission Reductions (MT CO ₂ e)	
			2030	2045
CS-2.10	Feasibility Study	Conduct a study to identify opportunities to enhance or create new natural areas in existing open spaces, parklands, and fields with native species, biodiverse ecology, higher carbon sequestration potential and improved recreational connectivity for the community.	Supportive	Supportive
CS-2.11	Education	Create and deliver a range of resources to train residents, city gardening staff, and other institutions on how to incorporate biodiversity, soil, and carbon sequestration techniques into landscaping and gardening projects.	Supportive	Supportive

3 Total GHG Measures Reduction Achievement

Table 34 shows the GHG emission reductions achieved from implementation of the CAP measures, GHG emissions forecast after measure reductions, and the City's 2030 and 2045 targets for both per-capita and mass emissions. With the implementation of the CAP measures and actions, the City is projected to meet its 2030 per capita target. 2045 GHG emission reductions quantified in the CAP are not yet enough to meet the per capita goal. The CAP document discusses the City's trajectory towards achieving the 2045 climate action target in further detail.

Table 34 GHG Emissions Reductions and Targets

Year	2030	2045
1990 Baseline GHG Emissions – Per Capita (MT CO ₂ e) ¹	5.9	5.9
Climate Action Targets – Per Capita (MT CO ₂ e)	3.12	0
GHG Emission Reduction – Mass Emissions (MT CO ₂ e)	121,656	436,200
GHG Emission Reductions – Per Capita (MT CO ₂ e)	0.73	2.37
GHG Emissions after Measure Reduction – Per Capita (MT CO ₂ e)	3.11	1
Gap to Climate Action Target – Per Capita (MT CO ₂ e)	-0.1	1
Percent Reduction from 1990 Baseline Levels – Per Capita	47%	81%

Notes: MT CO₂e = metric tons of carbon dioxide

³ 1990 per capita GHG emissions level is estimated as 15% below the 2005 baseline per capita emissions level of 6.9. The 2005 per capita emissions level was calculated by dividing the 2005 mass emissions (973,244 MT CO₂e) determined in the 2009 CAP by the 2005 population (140,530).

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Appendix E

GHG Reduction Measures Cost Ranges



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Project: **Hayward Climate Action Plan Update**

Re: GHG Measures Cost Ranges Memorandum

Introduction

As part of its Climate Action Plan (CAP) Update, the City of Hayward is developing a comprehensive strategy for reducing communitywide greenhouse gas (GHG) emissions to 55 percent below 2005 levels by 2030 and to carbon neutral by 2045. However, achieving GHG emissions reduction and carbon neutrality requires strategic investments related to many aspects associated with each measure, including new policies, infrastructure, technology, and behavior change. In order to develop transparency around the prioritization of these investments, Rincon, with assistance from Hatch, has prepared this memorandum detailing the estimated cost ranges associated with the implementation of each of the 17 GHG measures proposed as part of the CAP Update. The intent of this memorandum is to convey highly variable community and City cost considerations and to provide respective cost ranges related to the implementation of GHG measures proposed as part of the CAP Update.

Cost Considerations and Variables

For each measure, the cost description focuses on both internal (City) costs and external (community) costs and provides insight into the variability of these costs including the primary variables that may affect cost effectiveness including several primary considerations including upfront costs, lifecycle costs, incremental or marginal costs, and the cost of doing nothing. This analysis is not intended to provide exact and precise cost estimates for each of the measures. The costs described for each measure are variable and provide a general range carried by differed parties associated with the measures.

Upfront versus Lifecycle Costs

When discussing how much a strategy or action costs, it is important to differentiate between the upfront costs, the cost of, for example, an LED light bulb, versus the lifecycle costs of purchasing, operating, maintaining, and ultimately disposing of that lightbulb. While LED lightbulbs may be more expensive up front when compared to an incandescent bulb, the lifecycle costs of owning an LED lightbulb are significantly lower, providing a significant return on investment.

Incremental or Marginal Costs

It is also important to specify the difference between how much a strategy costs overall and what the incremental or marginal cost is. The incremental or marginal cost is the difference in cost between the new action and the old or standard action. For example, purchasing a new electric vehicle (EV) could cost \$30,000 which should be considered a high cost. However, the marginal cost of purchasing an electric vehicle versus purchasing a new internal combustion vehicle may be zero or near zero because of reduced long-term operating and maintenance costs including no fluids to replace, fewer moving parts like transmissions, and less brake wear. It is important to consider what the incremental/marginal costs are for each strategy by keeping in mind what the alternative costs are. In many cases, the difference is negligible.

The Cost of Doing Nothing

Finally, it's also important to keep in mind that doing nothing to prepare for and mitigate climate change will also carry a cost. The alternative to implementing these strategies is not zero. One immediate example is the cost to install conduit and panel capacity for electric vehicle chargers for all new construction. While this action increases upfront construction costs by a few hundred dollars, doing that same work after the building is completed can be an order of magnitude higher (~\$3,000). Given the move towards electric vehicles, the cost of not installing EV infrastructure today could cost the community significantly more in the future. In a similar vein, adaptation strategies will cost the city and the community today. Planting trees, installing microgrids, and setting up cooling centers all have upfront costs. However, it's imperative that we weight these costs against the costs of a future without these adaptive strategies given what we know about the climate. Research published in the journal *Nature* predicts the cost of not decreasing GHG emissions to carbon neutrality by mid-century could range between \$149.78 trillion to \$791.98 trillion globally by the end of the century.¹ That same study found that if we mitigate climate change and achieve carbon neutrality by mid-century the world could see a \$127-to-\$616 trillion-dollar economic benefit after considering the cost of mitigation. The humanitarian impact is also significant. The Red Cross and Red Crescent Societies estimate that the number of people in need of humanitarian aid each year could double to \$200 million annually by 2050

¹ Wei, Yi-Ming et al. *Nature Communications*. 2020. Self-preservation strategy for approaching global warming targets in the post-Paris Agreement era. Accessed at <https://www.nature.com/articles/s41467-020-15453-z>. Accessed August 2022.

due to climate change costing \$20 billion per year.² Furthermore, the World Resources Institute has found that investing in adaptation and resilience provides a benefit-cost ratio ranging from 2:1 to 10:1, meaning that for every dollar invested in resilience and adaptation we stand to see \$2 to \$10 dollars' worth of benefits.

Cost Range Analysis

Climate Action Plans exhibit high variability in implementation costs depending on the measures identified, their level of specificity, and the accompanying funding and financing strategies, which may vary depending on the scope of the project. The cost range estimates are based on cost data derived from past projects, case studies, and available research.

The GHG measures proposed for the CAP Update and listed below have been broken down into 3 cost segments which include:

1. **Low-Cost:** the low-hanging fruit for the City and community to reduce GHG emissions, generally delineated as measures associated with relatively low upfront costs to the City or community, e.g. policy ordinances and outreach
2. **Moderate-Cost:** intermediate level of costs per measure implementation associated with consultant and moderate infrastructure changes, moderate upfront or lifecycle costs associated with e.g. feasibility studies, program development, retrofitting existing infrastructure, program and tax fees, and small capital investments such as purchasing a tree
3. **High-Cost:** longer term projects requiring substantial investments into major infrastructure or technology over time to reduce emissions, e.g., electrification equipment, electric buses, energy storage, bike lanes, infrastructure changes

The tables below categorize each measure into a low, moderate, or high City and community cost categories as described above and also explain the variables and existing data and case studies on which these categorizations were made.

Measure BE-1: Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026	
City Costs	Moderate Cost
City Cost Variables	- Staff time to develop and adopt ordinance and code amendments - Staff time to produce collateral for educational programs and engagements - Collateral materials
City Cost Discussion	Adopting reach codes and building codes generally requires staff time to implement. City staff will need to dedicate time to create educational materials and publish on the website, a low cost, with large potential audience. Workshops, however, will require one-time costs and support from <i>Communications and Media Relations</i> and <i>Environmental Services and Building</i> divisions.
Community Cost	Moderate Cost

² International Federation of Red Cross and Red Crescent Societies. 2019. The Cost of Doing Nothing: The Humanitarian Price of Climate Change and How it Can be Avoided. Accessed at <https://reliefweb.int/report/world/cost-doing-nothing-humanitarian-price-climate-change-and-how-it-can-be-avoided>. Accessed August 2022.

Community Costs Variables	- Cost savings of all electric homes compared to mix fuel - Long-term costs on energy bills
Community Costs Discussion	Cost effectiveness studies completed for Hayward's climate zones show that new building electrification costs less to build than mixed fuel buildings. Single family homes are \$5,149 dollars less expensive to build all-electric compared to a mixed fuel home. However, annual energy bills are expected to increase by \$423 in an all-electric new home versus a mixed fuel home. ¹ Therefore, this measure is considered to be a moderate cost.
Source: 1. Local Energy Codes - City of Hayward Cost Effectiveness Explorer. https://explorer.localenergycodes.com/jurisdiction/hayward-city/study-results/3-PGE?only_study_type=new-buildings . Accessed August 2022	

Measure BE-2: Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.

City Costs	High Cost
City Cost Variables	- Staff time to develop and adopt ordinance - Staff time to develop strategic plans - Staff time for partnerships with businesses and private property owners - Staff time to produce collateral for education and engagements - Staff time for new program management - Collateral materials including the update on online permitting process
City Cost Discussion	Actions related to this measure will require a larger amount of time from City staff as compared to other Building Electrification measures. The most significant resource will be needed for the expansion of the <i>Residential Energy Performance Assessment and Disclosure</i> ordinance with an additional full-time equivalent (FTE) staff to monitor compliance and further facilitate permitting online, as well as developing an electrification strategy with building analysis to be authored by the City. Creating a strategy for electrification of buildings, and devoting staff time for collaborative partnerships, such as with the California Air Resources Board (CARB), to allow neighborhood level electrification/banning of natural gas will also be a significant lift to City and City officials.
Community Cost	High Cost
Community Costs Variables	- Cost of converting to electric homes from mix fuel - Long-term costs on energy bills
Community Costs Discussion	Electrifying an existing single-family residential building holds significant upfront costs. Electrifying a home assumes including a heat pump for heating and cooling, heat pump water heater, and an electric resistance clothes dryer and stove. With these appliances considered, electrification upfront costs can range from \$7,930 to \$25,780, without incentives. Additionally, in Hayward's climate zones, annual energy bill costs are expected to increase by up to 33%. However, if electrification is paired with installation of solar PV, annual energy bill savings can almost double. ¹ Existing single-family home electrification is considered high cost, without offset solar.
Source: Berkeley, City of. Existing Building Electrification Strategy. 2021. https://berkeleyca.gov/sites/default/files/2022-01/Berkeley-Existing-Buildings-Electrification-Strategy.pdf . Accessed August 2022.	

Measure BE-3: Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.

City Costs	High Cost
City Cost Variables	- Staff time to develop strategic plan such as Decarbonization Strategy - Staff time to enforce ordinance - Staff time to produce collateral for education and engagements
City Cost Discussion	Creating a Decarbonization Strategy, while high cost to the city to create, is an important step informing subsequent actions to decarbonize existing commercial and multi-family buildings. The proposal to enforce compliance of a newly adopted electrification ordinance may likely come at high a cost to the City, particular with increased staff time. Enforcement may require additional staff training. Preparation, distribution, and sharing of collateral will also impact key departments such as the <i>City Manager</i> and <i>Development Services</i>.
Community Cost	Moderate Cost
Community Costs Variables	- Cost savings of all electric homes compared to mix fuel - Long-term costs on energy bills
Community Costs Discussion	Cost effectiveness studies completed for Hayward's climate zones show that new building electrification costs less to build than mixed fuel buildings. Multi-family homes are \$3,361 dollars, office buildings are \$75,337 dollars, and retail buildings are \$28,308 dollars less expensive to build all-electric compared to a mixed fuel home. However, annual energy bills are expected to increase by \$176 for multi-family homes, \$4,774 for office buildings and \$481 for retail buildings in an all-electric new home versus a mixed fuel home.¹ Therefore, this measure is considered a moderate cost.
Source: 1. Local Energy Codes. City of Hayward Cost Effectiveness Explorer. https://explorer.localenergycodes.com/jurisdiction/hayward-city/study-results/3-PGE?only_study_type=new-buildings. Accessed August 2022	

Measure BE-4: Support Ava Community Energy in providing 100% carbon-free electricity by 2030.

City Costs	Moderate Cost
City Cost Variables	- Staff time to manage development of Resolution Plan for 100% Carbon-free Electricity and identify funding and subsidy plan - One-time staff time to develop process to monitor rates
City Cost Discussion	The adoption of a City resolution to be 100% carbon-free electricity must include identification of funding and subsidy plan to ensure cost continuity. The effort to identify funds, manage continued partnerships with Ava Community Energy, and authoring a resolution is typical to the City's process today, and is not expected to significantly impact staff resources. More significant, however, is the time that will be required to develop a process and enabling the monitoring of annual opt-out rates in the City of Hayward.
Community Cost	Low Cost

Community Costs Variables - Electricity Costs per Rate Plan

Community Costs Discussion	Decarbonizing Ava Community Energy's electricity may cost the community a marginal increase in money spent per kWh. However, this increased electricity cost depends on the rate plans used by the household/business. Based on the rate schedule of Measure BE-1, Measure BE-2, and Measure BE-3 and an average monthly usage of 416 kWh, monthly bills would increase approximately \$4 per month under the Ava Community Energy Renewable 100 rate plan for both standard and CARE rates. ¹
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Sources:

1. PG&E. EBCE Joint Rate Comparisons. https://www.pge.com/pge_global/common/pdfs/customer-service/other-services/alternative-energy-providers/community-choice-aggregation/ebce_rateclasscomparison.pdf. Accessed August 2022.

Measure BE-5: Continue to promote energy efficiency improvement, in alignment with the existing the 2014 Climate Action Plan

City Costs	Moderate Cost
City Cost Variables	- Staff time to manage multiple programs - Staff time to procure funding
City Cost Discussion	Continuing to promote energy efficiency improvements will lead to moderate costs to the City. Primarily, costs are associated with staff time needed to manage programs (e.g., weatherization program and energy benchmarking trainings) and time needed to obtain funding for the weatherization program.
Community Cost	Moderate Cost
Community Costs Variables	- Cost associated with procuring energy efficient equipment and appliances - Cost associated with energy benchmarking programs
Community Costs Discussion	Community costs are associated with the upfront costs related to procurement of energy efficient equipment and appliances. However, over time, energy efficient upgrades lead to electricity and natural gas resource and cost savings to community members. Nonresidential building owners may face costs associated with energy benchmarking programs.

Measure BE-6: Generate carbon-neutral electricity on City facilities meeting 80% of the municipal operational electricity needs by 2030.

City Costs	Moderate Cost
City Cost Variables	- Staff time to streamline permitting for battery storage - Staff time to manage inventory of and implementation at key locations for energy storage and/or generation projects (solar projects; inventory of appliance; others) - Staff time to advocate for smooth integration of identified solar projects into the grid
City Cost Discussion	Creating a streamlined permitting process for battery storage is a new process and requires staff training. The development of energy resiliency strategies, a transition of natural gas appliances to electric in City facilities plan, and the plan and schedule for future solar projects will also require substantial staff time to complete but is an important skeleton to implement actions outlined.

Community Cost	No expected community costs
Community Costs Variables	No expected community costs
Community Costs Discussion	There are no community costs associated with this measure. The City is not expected to raise local taxes to fund this measure. The City would have to receive voter approval to raise local taxes.

Measure T-1: Increase active transportation mode share to 15% by 2030 and to 20% by 2045.

City Costs	High Cost
City Cost Variables	- Staff time to develop and adopt an ordinance and code amendments - Staff time to procure funding (i.e., grant management) - Cost and staff time to manage and implement Street Improvements Priority List
City Cost Discussion	Actions required to develop and implement an <i>Active Transportation Plan</i> will require staff time for oversight. The City will also need time to adopt new policies, such as the <i>micromobility</i> policy and <i>mobility share</i> policy, as well as review and update regulations in the <i>Transportation Demand Plan</i>, <i>Zoning Codes</i>, and <i>Building Code</i>. Further, the implementation of a <i>pilot bike-share</i> program will require oversight from the City staff; however, this are typically one-time costs. The table notes below showcase typical funding received by municipalities in for these policies.¹ Amending the <i>Off-Street Parking Regulation of Municipal Code</i> to update ongoing incentives and requirements for transportation will also incur City costs as the program already faces limited staffing and fiscal resources. Staff time will also need to be devoted to identifying, applying, and monitoring compliance for grant opportunities to improve mobility in the community (1 FTE) is anticipated given the typical size of funds received. Additionally, developing a priority list of street improvements will be an added time cost for the City, depending on the City's current method for tracking street conditions. Identifying streets for permanent active transportation traffic may also be politically challenging; and thus, require additional staff time for engagement and stakeholder management.
Community Cost	Low Cost
Community Costs Variables	Costs associated with funding mechanism, e.g. sales tax or parcel tax
Community Costs Discussion	Community costs may include potential funding mechanisms for this infrastructure, such as a parcel tax, sales tax, and more. However, substantial cost savings opportunities exist within diverting drivers from the road to improve health and quality of life. Additionally, the institution of car-free days downtown can enable more active transportation and pedestrian-friendly events (e.g., farmers markets).

Notes:

1. Orange County, California, employs several transit incentives programs for individuals, including monetary incentives for starting a carpool, online platforms for connecting carpool and vanpool partners, reimbursements for bus and train passes, monetary incentives for electric vehicles, Club Rideshare which offers monthly prize drawings and merchant discounts, and reimbursements for emergency rides home. Participation levels in these programs is not reported. The City of Palo Alto, CA, has received \$1.1 million in federal USDOT Mobility on Demand funding for developing a pilot program involving commuter trip reduction software, a mobility aggregation multimodal trip planning app, workplace parking rebates and analytics to compare commutes in order to reduce vehicle commuting.

Measure T-2: Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.

City Costs	High Cost
City Cost Variables	- Staff time to develop and adopt an ordinance and code amendments - Staff time to manage multiple programs - Staff time to procure funding (i.e., grant management) - Student Transit Pass Program cost
City Cost Discussion	Staffing time and expanding city staff capacity are two key drivers of City costs for this measure. Of lower magnitude costs is the required policy work such as: adopting a policy or code for transit accessible public spaces, adopting parking requirements for mixed-use consistent with the <i>Parking Management Plan</i>, adopting an ordinance to require carshare in new developments, and implementing a requirement for employer developed Transportation Demand Management (TDM) Plan. Additional time will be required to identify and pursue funding for City transit and TDM projects (anticipated as 1 FTE), as well as for obtaining grant funds for AC Transit expansion (1 FTE). The City will also need to expand oversight of transit programs. This includes additional responsibilities for transit stops, evaluating needed renovations to meet <i>Pedestrian Design Standards</i> for transit stops. Further, expansion of the <i>Student Transit Pass Program</i> will be completed by the City. Lastly, actions required to implement transit programs include at least three feasibility studies that City staff will need to oversee in some capacity.
Community Cost	Low Cost
Community Costs Variables	- Transit Passes
Community Costs Discussion	Community members will incur costs from transit passes. A monthly local transit pass and a monthly Transbay pass from AC Transit are \$84.60 and \$216 respectively.¹ Savings opportunities exist through less driving and better health outcomes resulting from better air quality and more active transportation methods, like share bike lanes. Variable costs stem from new requirements resulting from future ordinances that consider a shift away from single occupancy vehicles, such as parking reductions or minimums, bike parking requirements, parking prices, and more.
Source: 1. AC Transit. Fares. https://www.actransit.org/fares. Accessed August 2022	

Measure T-3: Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-2 and T-3

City Costs	Low Cost
City Cost Variables	- Cost of updating Transportation Demand Management Plan - Cost of setting up and disseminating disincentive programs
City Cost Discussion	Updating the City's TDM Plan that includes strategies to reduce peak-hour traffic will require significant City time to author and subject matter expertise. Political challenges involved in reducing parking minimums and maximums may also be a cost to the City staff in meeting this measure, requiring coordination across key departments such as <i>Public Works and Development Services</i>.

Community Cost	Moderate Cost
Community Costs Variables	- Costs associated with disincentive programs or mechanisms - TDM Compliance
Community Costs Discussion	The cost to the local business community due to the implementation of a TDM Plan requirement may vary depending on the transportation management measures, including cost of transit passes and cost of compliance. For example, allowing employees to continue telecommuting 1-2 days a week could cost employers nothing, while providing transit subsidies could be \$100 per employee per month, and charging for parking could generate revenue for a monthly bike commute competition. Implementation costs will be developed as part of the TDM plan. The community may also face costs from specific disincentive programs. For example, as stated in action T-3.5, a congestion charge program would charge drivers a fee to drive in congested areas of the City during rush areas. Program revenue would be used to expand active and transit services. San Francisco's current proposed pricing chargers based on income levels with middle and high-income drivers being charge the most at \$6.50 to low-income drivers being charged \$2.17 and very low-income driver not being charged.¹ Additionally, as stated in T-3.9, a Transportation Network Company (TNC) user tax would impose a fee for ride-hail vehicle trips. San Francisco County imposes a 3.25% surcharge on all individual rides and a 1.5% surcharge on shared rides that originate in San Francisco.² Program revenue would also be utilized to expand active and transit services. Savings opportunities exist through less driving and better health outcomes resulting from better air quality and more active transportation methods, like shared bike lanes.
Sources:	1. San Francisco County Transportation Authority- Downtown Congestion Pricing. https://www.sfcta.org/downtown#:~:text=Congestion%20pricing%20involves%20charging%20drivers,used%20to%20improve%20transit%20service. Accessed August 2022 2. San Francisco County Transportation Authority – TNC Tax. https://www.sfcta.org/funding/tnc-tax#:~:text=The%20tax%20imposes%20a%203.25,that%20originate%20in%20San%20Francisco. Accessed August 2022.

Measure T-4: Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045

City Costs	Moderate Cost
City Cost Variables	- Cost of EV chargers - Staff time to establish partnerships and produce collateral for education programs and engagements
City Cost Discussion	Costs incurred by the City in increasing passenger zero-emissions vehicle adoption will depend on various factors. The total cost of purchasing and installing EV chargers will depend on the number of chargers in City-owned properties determines is feasible and the capacity for Ava Community Energy to support the City. An example of municipal EV infrastructure funding is showcased below.¹ Also related to this measure, the City will likely need to dedicate significant time to forming partnerships with ZEV car share companies, but may leverage collaboration with neighboring jurisdictions.
Community Cost	Moderate Cost
Community Costs Variables	- Cost of charging infrastructure - Marginal cost of EV selected (Cost of combustion vehicle compared to EV alternative) - Lifecycle costs of EV ownership - Lifecycle costs of combustion vehicle ownership

Community Costs Discussion	The community may see increased upfront costs associated with the purchase of an EV. The cost of an electric vehicle varies significantly depending on the EV chosen. Since the purchase of an EV will likely offset the purchase of an internal combustion vehicle, the marginal cost should be considered here. EVs also offer considerable opportunities for lifecycle cost savings compared to their internal combustion (ICE) or hybrid vehicle counterparts since they do not need oil changes, transmission fluid changes, spark plugs etc. For example, the electric MINI cooper emits approximately half of the greenhouse gas emissions than that of its ICE and hybrid models while costing considerably less per month in fuel, maintenance, and total vehicle costs per month.¹ In general, new electric vehicles may or may not cost more upfront, but generally cost less over their lifetime compared to combustion vehicles. There will also be community costs associated with EV charging stations. While community members may utilize public charging stations, many need to utilize charging at home overnight. Installing a Level 2 charger at home is about \$2,000 for parts and installation.²
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Notes:

1. The County of San Diego procured \$21.7 million in funds to support EV infrastructure needs. The California Electric Vehicle Infrastructure Project (CALeVIP), a program funded by CEC that provides incentives for EV charger installations, provided the county with \$15.8 million in funds. The San Diego Association of Governments and San Diego County Air Pollution Control District provided the remaining \$5.9 million through sales tax revenue and motor vehicle fees. These funds were used to provide individual rebates up to \$6,000 for Level 2 charger.

Sources:

1. MIT Trancik Lab. Carbon Counter. Accessed at <https://www.carboncounter.com/#!/explore?cars=35870;35756;36427>. Accessed August 2022.
2. Property Manager Insider. 2019. How Much do EV Charging Stations Cost? <https://www.propertymanagerinsider.com/how-much-do-ev-charging-stations-cost/>. Accessed August 2022.
2. How much does it cost to charge an electric car? <https://www.kbb.com/car-advice/how-much-does-it-cost-to-charge-an-ev/>. Accessed August 2022

Measure T-5: Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.

City Costs	Low Cost
City Cost Variables	- Staff time to produce collateral for education programs and engagements
City Cost Discussion	Actions required to increase business zero-emission vehicle adoption require significant engagement efforts for city personnel with local stakeholders. Depending on current staff capacity to conduct additional engagement and outreach, as well as current relationships with key community employers, the magnitude of this cost may vary.
Community Cost	Moderate Cost
Community Costs Variables	- Cost of charging infrastructure - Marginal cost of EV selected (Cost of combustion vehicle compared to EV alternative) - Lifecycle costs of EV ownership - Lifecycle costs of combustion vehicle ownership
Community Costs Discussion	The community costs to businesses for increased ZEV adoption is expected to be the same as the cost to passengers.

Measure T-6: Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045.

City Costs	Moderate Cost (Near-term)
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City Cost Variables	- Staff time to develop and adopt an ordinance - Staff time to manage programs and feasibility studies - Cost to develop City-owned End-of-Life Off-Road Equipment Plan - Staff time to produce collateral for educational programs and engagements
City Cost Discussion	The development and implementation of a City-owned <i>End-of-Life Off-Road Equipment</i> Plan and the <i>Small Off-Road Equipment</i> Ordinance that includes evaluation of current equipment, alternative options, and replacement timeline will require significant time for City personnel to create, including staff in-reach and training campaign. Oversight of the replacement program will also be a significant for the <i>Maintenance Services</i> department.
Community Cost	Moderate Cost
Community Costs Variables	- Cost of charging infrastructure - Marginal cost of electric off-road equipment selected (Cost of combustion equipment compared to electric alternative) - Lifecycle costs of electric off-road equipment ownership - Lifecycle costs of combustion equipment ownership
Community Costs Discussion	The community may incur upfront costs associated with electric off-road equipment. The cost of electric off-road equipment varies depending on the type of off-road equipment and version chosen. Off-road equipment includes landscape equipment, such as leaf blowers and lawn mowers, tractors, forklifts, construction equipment, and agricultural equipment. Some electric off-road equipment has lower upfront costs than combustion off-road equipment, whilst other electric off-road equipment has significantly higher upfront costs. For example, a battery-powered leaf blower has an average cost of \$137 and a gas leaf blower has an average cost of \$206. An electric forklift cost varies between \$20,000 and \$45,000, with the additional cost of a battery and charger, while an internal combustion forklift cost varies between \$20,000 and \$50,000. In many cases the upfront cost of electric large construction and agricultural equipment is higher than combustion options. However, generally, the operational and maintenance costs of combustion off-road equipment are higher than electric alternatives. Electric off-road equipment such as tractors and forklifts often require additional charging equipment which poses an additional upfront cost to the owner.
Sources:	1. Lawn Starter. Pricing Guide. https://www.lawnstarter.com/blog/cost/leaf-blower-price/. Accessed August 2022. 2. Toyota Forklifts. Forklift Pricing 101. https://www.toyotaforklift.com/resource-library/material-handling-solutions/finance/forklift-pricing-101-what-you-should-know. Accessed August 2022.

Measure T-7: Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.

City Costs	High Cost
City Cost Variables	- Cost of Zero-Emission Fleet Conversion and Purchase Policy Development - Staff time to manage feasibility studies - Staff time to procure funding (i.e., grant management from CARB)
City Cost Discussion	Establishing a <i>Zero-Emission Fleet Conversion and Purchase Policy</i> that includes replacement schedule will require staff time, however the additional costs are not significant as this policy supports existing Policy N.R-2.9 for City purchase of zero-emission vehicles.

The most significant cost to the City in meeting this measure will be determined by the number of EV/ZEV chargers needed to meet the City's transition goals and any additional ZEV infrastructure determined through the conversion plan. Upfront costs of implementing the transition will be high. As an example, the cost of Level 2 charging station is \$5,000 to \$10,000 and cost of electricity over an eight-year period is \$4,000.¹ Disregarding the future costs to purchase charging infrastructure, the costs are low for this measure.

Community Cost	Low Cost
Community Costs Variables	- Cost associated with funding mechanism, e.g. sales tax or parcel tax
Community Costs Discussion	Community costs may include potential funding mechanisms for this investment, such as a parcel tax, sales tax, and more. The City, however, may opt to utilize grant funding or other funding mechanisms to pay for costs associated with decarbonizing the municipal fleet.
Notes 1. Cost of Level 2 charging station are average. Assumes 100,000 miles traveled over 8-year period. Maintenance costs include insurance, routine service and engine wear. Electric prices based on July 2019 average for LA-Long Beach-Anaheim. Electricity and maintenance may vary. San Francisco Department of Environment Services; Bureau of Labor Statistics	

Measure SW-1: Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics by 75% by 2030 and 90% by 2045.

City Costs	Moderate Cost
City Cost Variables	- Staff time to produce collateral for educational programs and engagements - Staff time to adopt an ordinance - Staff time to manage programs and policies - Cost of compost bins and food waste containers
City Cost Discussion	The primary cost variable for this measure is time. Enforcing a fee for incorrectly sorted materials as well as implementing a monitoring and quality control program will be ongoing costs to the City, including the time to vet existing vendors' practices. City staff will also need to dedicate additional time to manage and oversee the various partnerships outlined to reduce landfill organics to create diversion and prevention programs, investigate funding opportunity for food recovery, and conduct feasibility studies. Additional policy work required includes adopting procurement policies in compliance with SB 1383. The City will also incur costs in providing free outdoor compost bins and kitchen-top food waste containers to low-income communities of colors and elderly households. Example estimate costs of outdoor waste, compost, and recycling receptables are as follows:² ▪ Outdoor waste receptacles – landfill, recycling & compost: \$1,750 - \$4,000 ▪ Outdoor waste receptables – regular/single stream: \$660 - \$970
Community Cost	Moderate Cost
Community Costs Variables	- Cost to implement composting at home - Cost to businesses to implement composting - Cost of businesses to implement waste diversion techniques

Community Costs Discussion To satisfy the requirement of SB 1383, Cal Recycle estimates the cost to the community to be \$17 per household per year after full implementation, and \$662 annually for small businesses.¹ However, the costs for individuals will vary significantly, as the cost is dependent on the amount of waste that is currently disposed and the ability of the business to reduce the amount of organic disposal.

1. CalRecycle. 2020. Proposed Regulation for Short-Lived Climate Pollutants: Organic Waste Methane Emissions. https://www.dof.ca.gov/Forecasting/Economics/Major_Regulations/Major_Regulations_Table/documents/Final_Sria_11-16%20.pdf#search=%22SB%201383%20Economic%20Analysis%22. Accessed August 2022
2. Based on current market sales from select vendors: Trashcan Warehouse and Waste360. Accessed August 2022

Measure SW-2: Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045.

City Costs Moderate Cost

City Cost Variables

- Staff time to update and adopt an ordinance
- Staff time to produce collateral for educational programs and engagements
- Staff time to develop Zero Waste Strategic Plan
- Cost of re-routing collected landfill waste hauling to Material Recovery Facility

City Cost Discussion

City time will be required to complete policy actions that increase communitywide landfill diversion that include adopting a *Waste Diversion Ordinance*, updating municipal codes and hauling agreements to reflect recent legislation, creating waste management requirements for large events, establishing a post-consumer recycled content requirement, and increasing bans on “problem materials”.

The development of a *Zero-Waste Strategic Plan* will also require significant initial staff time, though it will inform subsequent actions in meeting the target. These actions require numerous partnerships and exploration of funding opportunities, which may require additional time to oversee.

Staff will also need to oversee the implementation of a single-use food ware fee. The City may also incur a cost in re-routing collected landfill waste to a Materials Recovery Facility (MRF).

Community Cost Moderate Cost

Community Costs Variables

- Cost to implement composting at home
- Cost to businesses to implement composting
- Increased cost of food items served in reusable/compostable food ware
- Cost to businesses to implement waste diversion techniques

Community Costs Discussion

Community costs associated with organic waste diversion are explained in the community costs discussion for Measure SW-1. Community costs are moderate while providing beneficial emission reductions to the City. Ordinances are known to be an effective means to influence consumer behavior. For example, after the passing of the 2013 Alameda County Reusable Bag Ordinance, which charged \$0.10/bag, bag purchases by affected retail stores declined 85%.¹ For businesses, costs include the marginal cost of providing compostable foodware compared to the cost of foodware already in practice. In Alameda County, the *Rethink Disposable* program, in partnership with StopWaste, demonstrated that several businesses that voluntarily minimized single-use foodware saw net cost savings of \$1,000 to -\$22,000 per year.² Developers may see additional operating costs associated with the separation of waste for proper reuse and recycling for better rates of waste diversion and consumers may see variable cost increases to food items as a result of these food items being provided in new compostable foodware.

Sources:

1. City of Berkeley Zero Waste Department. 2020. Passing a Single-Use Foodware and Litter Reduction Ordinance in Berkeley, CA. Accessed at https://zwconference.org/wp-content/uploads/presentations/nrc-nzwc_detournay_c.pdf. Accessed August 2022
2. City of Berkeley. 2018. Single Use Disposable Foodware and Litter Reduction Ordinance. Accessed at <https://ecologycenter.org/wp-content/uploads/2018/11/Disposable-Free-Dining-Ordinance.pdf>. Accessed August 2022

Measure WW-1: Reduce water consumption by 15% by 2030 and maintain it through 2045.

City Costs	Moderate Cost
City Cost Variables	- Staff time to produce collateral for educational programs and engagements - Recycled Water Plan Development
City Cost Discussion	To implement this measure, the City will need to dedicate staff to overseeing numerous engagement and partnership efforts to continue and implement water conservation and water recycling programs. Managing numerous engagements to oversee feasibility studies and work with community stakeholders may be an added cost. A city authored <i>Recycled Water Master Plan</i> , while requiring significant staff time to create, will serve as a useful roadmap in overseeing these engagement and partnership efforts.
Community Cost	Low Cost
Community Costs Variables	- Cost of water conservation efforts - On-bill water savings
Community Costs Discussion	Decreasing water consumption directly leads to lower water bills for the community. Community costs may include investment into water conservation practices such as a City high water efficient washer rebate or lawn conservation rebate. Incentives provided to the community by the City lead to relatively fast returns in water savings and water bill savings long-term. Some outdoor watering conservation practices may reduce bills by 50%. ¹

Notes:

1. The City of Mountain View estimated that the costs associated with a water conservation program that included outreach and technical assistance would be equivalent to 80% to 100% FTE.

Source: EPA. 2022. WaterSense. <https://www.epa.gov/watersense/start-saving>. Accessed August 2022.

Measure CS-1: Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.

City Costs	Moderate Cost
City Cost Variables	- Staff time to update an ordinance - Staff time to manage programs and policies - Staff time to procure funding - Cost of tree maintenance - Staff cost to develop Hayward Urban Forest Management Plan
City Cost Discussion	Policy actions for this measure include expanding <i>Hayward Street Tree Ordinance</i> , updating <i>Hayward Tree Preservation Ordinance</i> , adopting policy and practices for expanding tree canopy, creating cool roof requirements, and creating a code to preserve trees on homeowners' land, which will need to be adopted by the City.

The City will incur capital costs in increasing the tree canopy through planting and maintenance. Tree care activities include pest management, watering, pruning, and removal when necessary.

Annual maintenance costs for urban street trees are estimated below. Cost estimates are based on a nationwide survey of municipal in-house budgets for street tree maintenance and the associated number of street trees with each tree care activity.¹

- Tree Pest Management (Per tree per year): \$36
- Tree Watering (Per tree per year): \$62
- Tree Pruning (Per tree per year): \$139
- Tree Removal (Per tree per year): \$368

There are examples of municipal tree pruning and maintenance costs/tree planting partnerships.¹

City staff will also need to dedicate time to implement and enforce the tree removal in-lieu fee and oversee both the tree planting and adopt-a-tree program, and manage the Tree Trust or Fund established for this measure. Lastly, City staff will need time to explore grant funding for tree planting (anticipated as 1 FTE).

Community Cost	Moderate Cost
Community Costs Variables	- Cost of trees - Cost of water/maintenance of trees
Community Costs Discussion	Community members may incur costs associated with planting trees, conducting maintenance and watering over time. The cost of planting a new tree varies between \$150 to \$3,000 depending on variety factors including size, species, location, labor costs, equipment costs, and permit or inspection fees. ² City programs may provide incentives or subsidies for residents to plant and/or maintain trees. Watering and other maintenance is likely to be minimal (a few dollars a summer) while trimming costs may increase in the future once the tree is larger. Co-benefits of carbon sequestration projects to the community include more open spaces, savings on electricity bills if trees help shade your home, more greenery in the surrounding environment, and enhanced climate resiliency against natural disasters, like flooding, urban wildfires, and drought, improving the overall health and well-being of the community.

Notes:

1. The City of Claremont contracts with West Coast Arborist for pruning and other maintenance and pays \$67 (2016) per tree for pruning services. The San Francisco Department of Public Works has partnered with a nonprofit, Friends of Urban Forest (FUF), to manage tree planting and establishment. The municipal government provides FUF with 60% of their annual revenue. The Department of Public Works manages a municipal program that aims to take the burden of maintenance off of property owners.

Sources:

1. Based on the Urban Forest Management information from San Mateo County. Accessed August 2022
2. Bob Villa. How Much Does it cost to Plant a Tree? 2022. <https://www.bobvila.com/articles/cost-to-plant-a-tree/>. Accessed August 2022.

Measure CS-2: Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030 and 2045.

City Costs	Low Cost
City Cost Variables	- Staff time to produce collateral for educational programs - Cost of collateral materials - Staff time to enforce policy compliance
City Cost Discussion	City staff will need time to complete actions towards this measure. A lower cost to the City includes time needed to adopt procurement requirements of SB 1383 and distribute educational materials regarding compost. Greater costs to the City include time to develop and adopt urban park guidelines, implementation of shoreline master plan. Enforcing compliance with SB 1383 by establishing a minimum level of annual compost application would be the greatest requirement and may require applying outside City.

Community Cost	No expected community costs
Community Costs Variables	No expected community costs
Community Costs Discussion	There are no expected community costs associated with the City applying compost in the community to sequester carbon.

Conclusion Summary

A summary of estimated City and community cost range for each measure is shown in the table below. For building energy and transportation measures, there's a low to high community cost range. For waste measures there's a moderate community cost range. For water/wastewater and carbon sequestration measures, there's a low community cost range.

ID #	Measure	City Cost Range	Community Cost Range
Building Energy			
BE-1	Continue the all-electric requirement for new residential construction. Adopt an all-electric requirement for new non-residential construction to take effect by 2026.	Moderate	Moderate
BE-2	Electrify existing single-family residential buildings in order to achieve 100 therms/person/year by 2030 and 0 therms/person in 2045.	High	High
BE-3	Decarbonize existing commercial and multi-family buildings in order to achieve 53 therms per service person in 2030 and 0 therms per service person in 2045.	High	Moderate
BE 4	Support Ava Community Energy in providing 100% carbon-free electricity by 2030.	Moderate	Low
BE 5	Continue to promote energy efficiency improvement, in alignment with the existing the 2014 Climate Action Plan.	Moderate	Low
BE-6	Generate carbon-neutral electricity on City facilities meeting 80% of the municipal operational electricity needs by 2030.	Moderate	Low
Transportation			
T-1	Increase active transportation mode share to 15% by 2030 and to 20% by 2045.	High	Low
T-2	Implement public and shared transit programs to increase mode shift to public and shared transit mode to 15% by 2030 and 30% by 2045.	High	Low
T-3	Develop disincentives for driving single passenger vehicles to support the bicycle/pedestrian and public transit mode share goals of Measures T-1 and T-2.	Low	Moderate
T-4	Increase passenger zero-emission vehicle (ZEV) adoption to 15% by 2030 and 50% by 2045	Moderate	Moderate
T-5	Increase zero-emission vehicle (ZEV) adoption by businesses to 10% by 2030 and 80% by 2045.	Low	Moderate
T-6	Transition 15% of off-road equipment to zero-emission by 2030 and 80% by 2045.	Moderate	Moderate
T-7	Increase municipal passenger zero-emission vehicle (ZEV) adoption to 75% by 2030 and 100% by 2045 and decarbonize emergency and heavy-duty vehicles as feasible.	High	Low
Waste			

SW-1	Implement and enforce SB 1383 requirements to reduce communitywide landfilled organics by 75% by 2030 and 90% by 2045.	Moderate	Moderate
SW-2	Increase communitywide overall landfill diversion of waste to 75% by 2030 and 85% by 2045. Reduce water consumption by 15% by 2030 and maintain it through 2045.	Moderate	Moderate
Water and Wastewater			
WW-1	Reduce water consumption by 15% by 2030 and maintain it through 2045.	Moderate	Low
Carbon Sequestration			
CS-1	Increase carbon sequestration by planting and maintaining 1,000 new trees annually through 2030 to sequester carbon and create urban shade to reduce heat island effect.	Moderate	Low
CS-2	Increase carbon sequestration by applying 0.08 tons of compost per capita annually in the community through 2030 and 2045.	Low	Low

Given the number of the GHG measures contemplated by the City of Hayward for the CAP Update that involve creation and enforcement of new building codes, the City is anticipated to need additional staff, particularly in the Development Services department. The City is also likely to need resources to design educational and outreach programs, adding to the need for staff with skills in community and stakeholder engagement. Key departments responsible for interface with stakeholders such as the public and partner organizations such as the City Manager's Office, Communications and Media Relation division, Information Technology, among others will likely see an increase in staff costs. Select subject matter experts, such as the Environmental Services and Code Enforcement divisions, will be required to provide insights in collateral material associated with these programs. Additional outreach and engagement efforts may cost up to \$0.84 per communication depending on the type of outreach.³

While GHG measures proposed as part of the CAP Update (such as those related to off-road City-owned equipment) will require some capital investment, the City's budget and capital improvement plans are not expected to be significantly affected within the near-term (next 5 years) timeframe of the CAP Update. Community costs are expected to be the highest for building electrification and decarbonization measures, which, depending on the measure, require notable capital investments and pose lifecycle costs associated with energy bills (BE-1, BE-2, and BE-3). Additionally, the community may face significant upfront costs associated with procurement of new decarbonized vehicles and equipment (T-4, T-6, and T-7). They may also face ongoing costs from future single passenger driving disincentive programs and mechanisms (T-3). Measures that aim to reduce City operational GHG emissions pose low costs to the community as the community is not likely to bear a cost burden associated with implementing these measures.

³ Email (per household) cost: \$0.00 - \$0.01; Direct Mail (per household) cost: \$0.60 - \$0.66; Phone Call (per household) cost: \$0.74 - \$0.83