



City of
SACRAMENTO

Preliminary
**Climate Action &
Adaptation Plan**



Public Review Draft

July 1, 2022





PREPARED FOR

City of Sacramento

Sacramento City Hall
915 I Street
Sacramento, CA 95814

<https://www.cityofsacramento.org/>

City of
SACRAMENTO

In Consultation With:

Dyett & Bhatia
Rincon Consultants, Inc.
AIM Consulting, Inc

Preliminary Draft

July 1, 2022

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Dear Community Members:

It is with great pleasure that we announce the release of the Preliminary Public Review Draft of the stand-alone Sacramento Climate Action Plan (CAP). Developed over three years of planning with extensive engagement from the community, the document sets new and ambitious targets for the City and identifies key decarbonization strategies and implementable actions that form the foundation of Sacramento's goal for achieving carbon neutrality by 2045.

The Preliminary Public Review Draft CAP is a critical component of the larger Sacramento 2040 effort that involves a comprehensive update of the Sacramento General Plan, the complete Climate Action and Adaptation Plan (CAAP), and a Master Environmental Impact Report (MEIR). The Preliminary Public Review Draft CAP is being released now for a 30-day review period to provide the community with an opportunity for advanced review and comment on the draft mitigation measures proposed to reduce the City's greenhouse gas emissions (GHGs). During this 30-day preliminary community review, the planning team will continue preparation of the climate adaptation and vulnerability assessment portions of the CAAP as well as the rest of the 2040 General Plan and MEIR, diligently working to release the draft documents for public review in Fall 2022.

The full suite of Sacramento 2040 Public Review Draft documents will be available for a 45-day public review period in the Fall, including the Public Review Draft CAAP that incorporates preliminary community feedback on the Preliminary Public Review Draft CAP. At that time a range of community engagement activities are planned to facilitate community review of the documents, including a series of orientation webinars, a 45-day virtual open house, and a City Council Workshop. It is important that the Sacramento 2040 Public Review Draft documents are all released together to tell the full story, to allow the community to see the interaction between all the draft policies, and for the community to review the evaluation of any potential environmental impacts as a result of the draft policies. However, the phased release of the documents as described above is proposed to break up the volume of information the community is asked to review in a particular timeframe. For the same reason, the Age-Friendly Community Action Plan, originally proposed to be released with the Sacramento 2040 draft documents will be released for public review in 2023, after the adoption of Sacramento 2040 documents.

Public Comment on the Preliminary Public Review Draft CAP

The 30-day public review period runs from July 1 through July 31, 2022. To submit comments on the Preliminary Public Review Draft CAP send an email to CAP@cityofsacramento.org

Additionally, a City Council workshop is scheduled for August 16, 2022, to provide a forum for discussion of additional potential actions that could be taken to achieve carbon neutrality in advance of the CAAP's target date of 2045.

Sincerely,

A handwritten signature in cursive script, appearing to read "Greg Sandlund".

Greg Sandlund, Planning Director

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ACRONYMS, ABBREVIATIONS, AND GLOSSARY

A

AB – Assembly Bill

Actions – The implementable steps that together will achieve a Measure goal.

Active Transportation – Includes walking, biking, skating/rolling.

Adaptation – Improving the durability of community infrastructure and/or services to withstand climate change impacts (e.g., floods, extreme heat, etc.).

Adjusted Forecast – Adjusted version of a BAU forecast to account for State- and federal-level legislation and policies that are expected to reduce emissions for all jurisdictions in California.

ADU(s) – Accessory Dwelling Unit(s)

Affordable by Design – Describes a dwelling unit that is affordable to residents making less than 120% of the area’s median income by virtue of its design rather than government subsidy (include ADUs and small dwelling units).

Albedo – Reflectivity; the proportion of light or radiation that is reflected by a surface

AMBAG – Association of Monterey Bay Area Governments

ARI – Asian Resources, Inc.

B

BAU Forecast – Business-as-Usual Forecast; estimates how Sacramento’s emissions would change based on current activities and projected growth in population and jobs.

C

CAAP – Climate Action and Adaptation Plan

CAP – Climate Action Plan

CARB – California Air Resources Board

Carbon Neutrality – Carbon neutrality means balancing the emissions created within the City (e.g., through combustion of gasoline or usage of electricity) with the emissions sequestered (e.g., through carbon absorbed in trees or soils) within that boundary. For Sacramento to achieve carbon neutrality, all emissions will need to be offset by sequestered emissions.

Carbon Sequestration – The process of capturing, securing and storing carbon dioxide from the atmosphere.

CBO – Community-Based Organizations

CCA – Community Choice Aggregation

CEQA – California Environmental Quality Act

CH₄ – Methane

Climate Action Targets – Community-level GHG emissions reduction goals for 2030 and 2045.



Climate Equity – The City of Sacramento defines climate equity as the equitable protection from climate change impacts and environmental hazards (e.g., extreme heat, increased energy prices, etc.), as well as access to environmental benefits for all communities (e.g., programs, policies, and projects that mitigate climate change impacts). This means developing programs, policies, and projects that target historically under-resourced communities within Sacramento, according to the understanding that these communities have been historically disadvantaged by policies in the City, and in the United States more generally.

COPD – Chronic Obstructive Pulmonary Disease

CO₂ – Carbon dioxide

CRP – Community Resource Project

D

E

EF – Emissions Factor

EJ – Environmental Justice

EJCGC – Environmental Justice Collaborative Governance Committee

EJWG – Environmental Justice Working Group

Electrification – Conversion of fossil fuel equipment, such as a gas-fired furnace or gasoline-powered car to electric-powered equipment.

EO – Executive Order

EPA – United States Environmental Protection Agency

Equity or Just Transition – Refers to the transition from a consumption-based, extractive economy to a regenerative economy, with special consideration to address the past harm to frontline communities.

ESPC – Energy Savings Performance Contract

EV(s) – Electric Vehicles

F

Funding and Financing – Refers to the breadth of financial solutions available to fund projects or initiatives. Funding specifically refers to money provided or allocated for a particular purpose with no expectation of repayment. Financing specifically refers to money provided with the expectation of repayment over time, with interest (e.g., a loan).

Frontline Communities – Are those that experience continuing injustice—including people of color, immigrants, people with lower incomes, people experiencing homelessness or houselessness, differently-abled persons, seniors, and indigenous people—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.

CLIMATE ACTION & ADAPTATION PLAN

G

GHG(s) – Greenhouse Gas(es)

GHG Emissions Sector – A category of GHG emissions within a community that broadly describes where GHG emissions are coming from (e.g., transportation, buildings, etc.).

GWP(s) – Global Warming Potential(s)

H

HFC(s) – Hydrofluorocarbon(s)

HVAC – Heating, Ventilation, and Air Conditioning

I

ICLEI – Local Governments for Sustainability

Infill Growth – Rededication of land within an existing urban area to new construction to avoid expansion of the urban area.

Infiltration Capacity (of soil) – Maximum rate at which soils and rocks can absorb rainfall

IPCC – Intergovernmental Panel on Climate Change

J

K

Key Performance Indicator – A pre-defined and measurable success metric to concretely evaluate the success of an initiative.

L

LED – Light-emitting diodes; high-efficiency lightbulb technology.

Levee – An embankment built to prevent the overflow of a river.

LFLP – Local Food, Local Places

LHMP – Local Hazard Mitigation Plan

LID – Low Impact Development

M

Measure – Specific, data-driven opportunity for reducing GHG emissions in a specific sector.

Mobility – Movement of a person or people from place to place.

Mode share – Percentage of trips within a community attributable to a particular mode (or type) of transportation, such as car or bike.

MPOs – Metropolitan Planning Organizations

MT CO₂e – Metric Tons of Carbon Dioxide equivalent

N

NCDC – National Climatic Data Center

Net-energy Metering – A billing mechanism that credits solar energy system owners for the electricity they add to the grid.

N₂O – Nitrous oxide

O

OPR – Governor's Office of Planning and Research



P

PACE – Property-Assessed Clean Energy programs

PM_{2.5} – Particulate Matter

PPA – Power Purchase Agreement

Q

Qualified GHG Reduction Plan – A GHG reduction plan that meets the requirements of the California Environmental Quality Act (CEQA) Guidelines 15183.5(b) and acts as a tool for streamlining the CEQA process for new development that aligns with the plan.

R

Regional San – Sacramento Regional Sanitation District

RNG – Renewable Natural Gas

ROI – Return On Investment

RPS – Renewable Portfolio Standard

RWA – Sacramento Regional Water Authority

S

SacEV – Sacramento EV

SacRT – Sacramento Regional Transit

SB – Senate Bill

SB 1383 – A landmark waste mandate adopted by the State of California in 2016, which requires the State to reduce organic waste disposal 75% below 2014 levels by 2025 and increase edible food recovery 20%.

Small-lot Home – Equal to or less than 5,200 square feet for interior lots and 6,200 square feet for corner lots.

SMUD – Sacramento Municipal Utility District

T

TNC – Transportation Network Company (e.g., Uber, Lyft)

TSMP – Transportation System Management Plan

U

USDN – Urban Sustainability Directors Network

V

VMT – Vehicle Miles Traveled

W

Waste Diversion – Recycling or composting rather than sending waste to the landfill.

Weir – Low dam built across a river to regulate its flow.

X

Y

Z

ZEV(s) – Zero Emission Vehicle(s)



INTRODUCTION



Sacramento Climate Action & Adaptation Plan

The City of Sacramento's Climate Action and Adaptation Plan (CAAP) is a crucial step in the City's long-standing efforts to mitigate and adapt to climate change. The CAAP builds off the City's 2012 Climate Action Plan, the City's Climate Emergency Declaration, and incorporates recommendations from the Mayors' Commission on Climate Change. Recent events continue to emphasize the urgent need for

climate action. Developed over three years with extensive community engagement, the CAAP will position Sacramento to reduce greenhouse gas (GHG) emissions while adapting to the inevitable impacts that are already taking place.

In order to avoid the most destructive and costly impacts of climate change, the world must achieve carbon neutrality by the middle of this century.¹ With less than 30 years remaining to reach this goal, the CAAP sets new and ambitious targets for the City and identifies key strategies and actions that form the foundation of Sacramento's goal of achieving carbon neutrality by 2045.

1. International Panel on Climate Change (IPCC). (2022). *Special Report: Global Warming of 1.5°C*. Retrieved from: <https://www.ipcc.ch/sr15/>

CLIMATE ACTION & ADAPTATION PLAN

KEY CAAP TERMS

CARBON NEUTRALITY: Carbon neutrality means balancing the emissions created within the City (e.g., through combustion of gasoline or usage of electricity) with the emissions sequestered (e.g., through carbon absorbed in trees or soils) within that boundary.

CLIMATE EQUITY: The City of Sacramento defines climate equity as the equitable protection from climate change impacts and environmental hazards (e.g., extreme heat, increased energy prices, etc.), as well as access to environmental benefits for all communities (e.g., programs, policies, and projects that mitigate climate change impacts). This means developing programs, policies and projects that target historically under-resourced and low-income communities within Sacramento.

Coupled with the urgency to act, the City must center policies and actions around climate equity. Climate change is expected to most profoundly impact under-resourced communities. To ensure the equitable distribution of both short-term costs (through the targeted application of funding and financing) and long-term benefits (by prioritizing historically under-resourced communities during implementation) the CAAP was designed to help mitigate the upfront cost impacts to low-income communities that are associated with CAAP implementation and includes key actions and metrics to work towards a just and resilient future for Sacramento.



Sacramento Farmers Market



THE MAYORS' COMMISSION ON CLIMATE CHANGE

In 2019, the Mayors of Sacramento and West Sacramento convened a Commission on Climate Change to chart a path towards carbon neutrality by 2045. The Commission was made up of 19 representatives from major partners in the region. In addition, dozens of other leaders were engaged in technical working groups on the key topics of equity, mobility, the built environment, community health and resilience, and finance and funding. These technical reports fed into a final report (dated June 2020) from the Commission that outlines a high-level pathway towards carbon neutrality for Sacramento and West Sacramento.

These recommendations, which are summarized in [Figure 1-1](#) by topic area, became the foundation for CAAP development, providing the high-level guidance and leadership required to establish an aggressive yet implementable plan. From the high-level policy directions such as building electrification and increased mobility, the CAAP has developed specific actions that the City will take to make progress towards the carbon neutrality goal and the targets identified by the Commission. [Chapters 5 and 6](#) provide additional detail on the CAAP's consistency with the intent and direction of the Mayors' Commission on Climate Change recommendations.²

2. The complete Mayors' Commission on Climate Change Report can be found here, along with more information on the Commission, meeting materials, and recorded meetings: <https://www.lgc.org/climatecommission/>

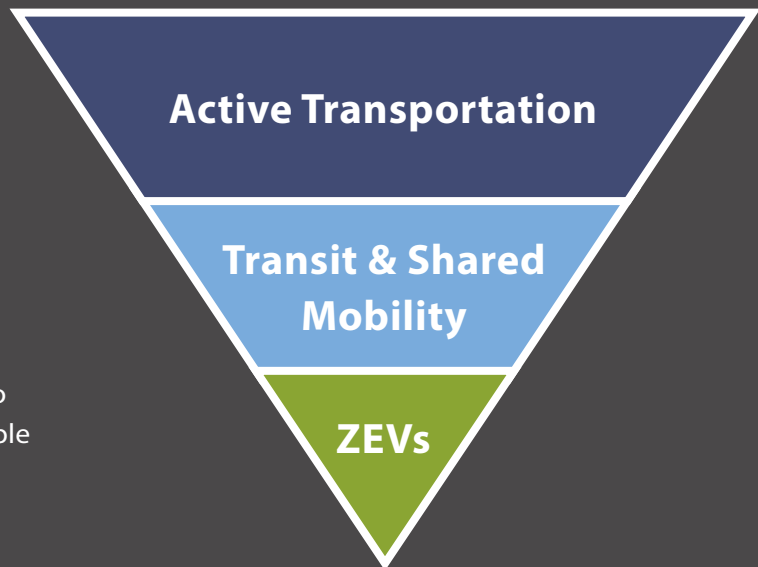


California State Capitol Building

Figure 1-1. Mayors Commission on Climate Change Recommendations

MOBILITY

Investments to reduce emissions stemming from the Mobility sector, the largest source of emissions for both Sacramento and West Sacramento, should follow a hierarchy that first prioritizes active transportation, followed by transit and shared mobility, and finally ZEVs. Following this hierarchy will enable the cities to achieve equitable outcomes and deliver multiple benefits to communities.



Active Transportation

Expand and enhance accessibility to low-stress, connected infrastructure for walking and rolling, prioritizing improvements that address specific community and neighborhood needs so that:

- 30% of all trips are by active transportation by 2030.
- 40% by active transportation by 2045.



Transit & Shared Mobility

Expand and improve transit and shared mobility services to be more accessible, affordable, timely and attractive than single-occupancy-vehicle use so that:

- 30% of all trips are by transit and pooled shared mobility by 2030.
- 50% by transit and pooled shared mobility by 2045.



Zero-Emission Vehicles

Develop a comprehensive package of incentives, disincentives and policies to encourage the adoption of zero-emission vehicles (ZEVs) so that:

- 70% of new vehicle registrations will be for ZEVs by 2030.
- All public, private and shared fleets fully electrified by 2045.

BUILT ENVIRONMENT

Investments to reduce emissions stemming from the Mobility sector, the largest source of emissions for both Sacramento and West Sacramento, should follow a hierarchy that first prioritizes active transportation, followed by transit and shared mobility, and finally ZEVs. Following this hierarchy will enable the cities to achieve equitable outcomes and deliver multiple benefits to communities.



Sustainable Land Use

Support infill growth consistent with the regional Sustainable Communities Strategy to ensure that:

- 90% of the cities' growth is in the established and center/corridor communities and is 90% small-lot and attached homes by 2040.
- Project level VMT is 15% below (or 85% of) the regional average.



Electrification of New Construction

Mandate all-electric construction to eliminate fossil-fuel use in new low-rise* buildings by 2023 and all buildings by 2026**

**Low-rise defined as under 4 stories.*

***Provided that the costs to go all-electric are cost-effective including the incremental costs of electrical infrastructure upgrades and the technology has shown to be feasible.*



Electrification of Existing Buildings

Transition 25% of existing residential and small commercial buildings to all electric by 2030.

COMMUNITY HEALTH AND RESILIENCY



Urban Greening and Forestry

Expand green infrastructure to ensure that all neighborhoods, starting with historically marginalized communities and tree-deficient neighborhoods, have:

- Access to green space within a quarter-mile by 2030.
- A baseline canopy of 25% by 2030, and 35% by 2045.



Sustainable Food Systems

Increase food security and access to healthy, affordable food for all communities, while supporting a regenerative food system by:

- Access to green space within a quarter-mile by 2030.



Electrification of Existing Buildings

Transition 25% of existing residential and small commercial buildings to all electric by 2030.

Climate Action Plan and Sustainability in Sacramento

Sacramento is a growing City with a long history of climate action and sustainability. This history helped guide the framework for the CAAP. As of 2016, Sacramento had reduced GHG emissions 19% since 2005.

Mobility

Sacramento has taken major steps to improve transit and active transportation opportunities. The City installed miles of new parking protected bikeways, improved crosswalks, opened the city to electric bike and scooter share, and provided free transit passes for youth. All of these efforts can shift City travel away from single occupancy vehicles and towards healthier and more sustainable options.

Electric Vehicles

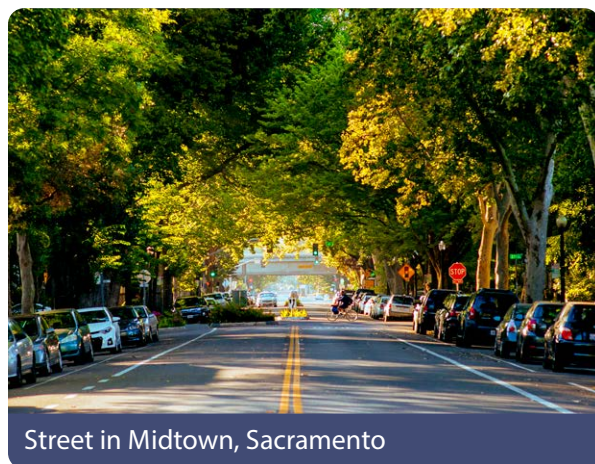
Sacramento has been a leader in increasing electric vehicle (EV) adoption by expanding public and workplace charging stations (now over 600 citywide), adopting forward-thinking charger requirements for new construction, building innovative partnerships, and planning for a future of emissions-free and even self-driving cars.

Energy and Buildings

Sacramento has unique opportunities to transition the built environment away from fossil fuels. Between Sacramento's newly adopted new building electrification ordinance and the leadership of the Sacramento Municipal Utility District (SMUD), a carbon-free built environment is closer than historically thought. Now is the right time to start electrifying due to the combination of SMUD's low rates (some of the lowest in California), excellent rebates, and Sacramento's climate.

City of Trees

Sacramento is well known as the City of Trees, with more than 19% of the city covered by tree canopy. These trees provide numerous benefits to Sacramento by cleaning the air, sequestering carbon, reducing water runoff, and keeping temperatures manageable during extreme heat events. By expanding the canopy, especially in neighborhoods with low tree coverage, the City can increase carbon sequestration, address climate injustice, and build resilience to a changing climate.



Street in Midtown, Sacramento



A QUALIFIED GHG REDUCTION PLAN

This CAAP provides a pathway for the City of Sacramento to reduce GHG emissions consistent with state goals. In particular, the CAAP Update was developed to exceed the requirements of Senate Bill (SB) 32, which calls for a reduction in statewide GHG emissions 40% below 1990 levels by 2030. The CAAP also demonstrates the City's plan for substantial progress towards consistency with Executive Order (EO) B-55-18 and the expected adoption of the 2022 Scoping Plan which sets a path to achieve carbon neutrality by 2045.³ In addition, this CAAP will fulfill the requirements of the California Environmental Quality Act (CEQA) Guidelines § 15183.5(b) to be a “qualified” GHG reduction plan. Under CEQA, local agencies must evaluate the environmental impacts of new development projects, including impacts from GHG emissions associated with their construction and operation. This process can be cumbersome for local agencies and developers alike and may result in project delays. The CEQA Guidelines recognize this and provide an option for new development projects to streamline the analysis of GHG emissions under CEQA, a process called “tiering.” As a qualified GHG reduction plan, the CAAP addresses six criteria per CEQA Guidelines § 15183.5(b)⁴, as follows:

1. Quantify existing and projected GHG emissions within the plan area (CAAP [Chapter 2](#) and [Appendix A](#))
2. Establish a reduction target based on SB 32 (CAAP [Chapter 3](#))
3. Identify and analyze sector-specific GHG emissions from Plan activities (CAAP [Chapters 5 and 6](#) and [Appendix C](#))
4. Specify policies and actions (measures) that local jurisdictions will enact and implement over time to achieve specified reduction target (CAAP [Chapters 5 and 6](#))
5. Establish a tool to monitor progress and amend if necessary (CAAP [Chapter 8](#))
6. Adopt in a public process following environmental review (Associated EIR Resolution XX)

This CAAP meets CEQA requirements for qualified GHG reduction plans and will provide the City of Sacramento and its developers a critical tool for streamlining development through 2030 (i.e., the horizon year associated with SB 32). The CAAP is also consistent with the City's General Plan Update, using the same population, housing, and VMT growth projections. The City considers this especially important, given the current need for new affordable housing. By developing a qualified GHG reduction plan the City has provided new construction a viable pathway through CEQA and provides a pathway for development to meet the long-term goals of the City in a cost-effective manner.

3. The details of SB 32 and EO B-55-18, as well as other relevant legislation, is included in [Appendix B](#).

4. [https://govt.westlaw.com/calregs/Document/I872A68805F7511DFBF66AC2936A1B85A?viewType=FullText&originationContext=documenttoc&transitionType=StatuteNavigator&contextData=\(sc.Default\)](https://govt.westlaw.com/calregs/Document/I872A68805F7511DFBF66AC2936A1B85A?viewType=FullText&originationContext=documenttoc&transitionType=StatuteNavigator&contextData=(sc.Default))

The Science of Climate Change

GHG EMISSIONS AND CLIMATE CHANGE

GHG emissions are molecules in the Earth's atmosphere that trap energy from the sun. This is called the greenhouse effect (See [Figure 1-2](#)). Historically, the greenhouse effect has made Earth warm enough to sustain life. However, since the Industrial Revolution, anthropogenic (human-caused) activities have increased the concentration of GHGs in the atmosphere, amplifying the greenhouse effect and causing a global change in climate patterns. Over 97% of climate scientists agree that climate change is occurring and that human activities are the root cause.⁵

At the community level, carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) are the most common GHGs, making up 97% of the GHG emissions generated in the United States.⁶ GHGs are predominantly released into the atmosphere via the combustion of fossil fuels or as a result of other chemical reactions. In cities, GHG emissions come from four main sectors: buildings, transportation, waste, and water. Building emissions are associated

with electricity and natural gas used by commercial, residential, and municipal buildings. Transportation emissions are generated by fuels used to power cars, trucks, and off-road vehicles. Waste generates methane emissions from trash (especially organic materials) decomposing in the landfill. Water-related emissions are generated by the electricity used to transport water for residential, commercial, and agricultural use, as well as emissions from wastewater treatment processes.

The International Panel on Climate Change (IPCC) projects that a reduction in GHG emission to carbon neutrality by mid-century or earlier is required to limit warming trends from climate change to 2.7 degrees Fahrenheit and limit the worst impacts of climate change.⁷



I Street Bridge and Downtown Sacramento

5. NASA. (2022). Scientific Consensus: *Earth's Climate is Warming*. Retrieved from: <https://climate.nasa.gov/scientific-consensus/>

6. World Resources Institute. (2022). *4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors*. Retrieved from: <https://www.wri.org/blog/2020/02/greenhouse-gas-emissions-by-country-sector>

7. International Panel on Climate Change (IPCC). (2021). *IPCC Sixth Assessment Report Working Group 1: The Physical Science Basis*. Retrieved from: <https://www.ipcc.ch/report/ar6/wg1/>



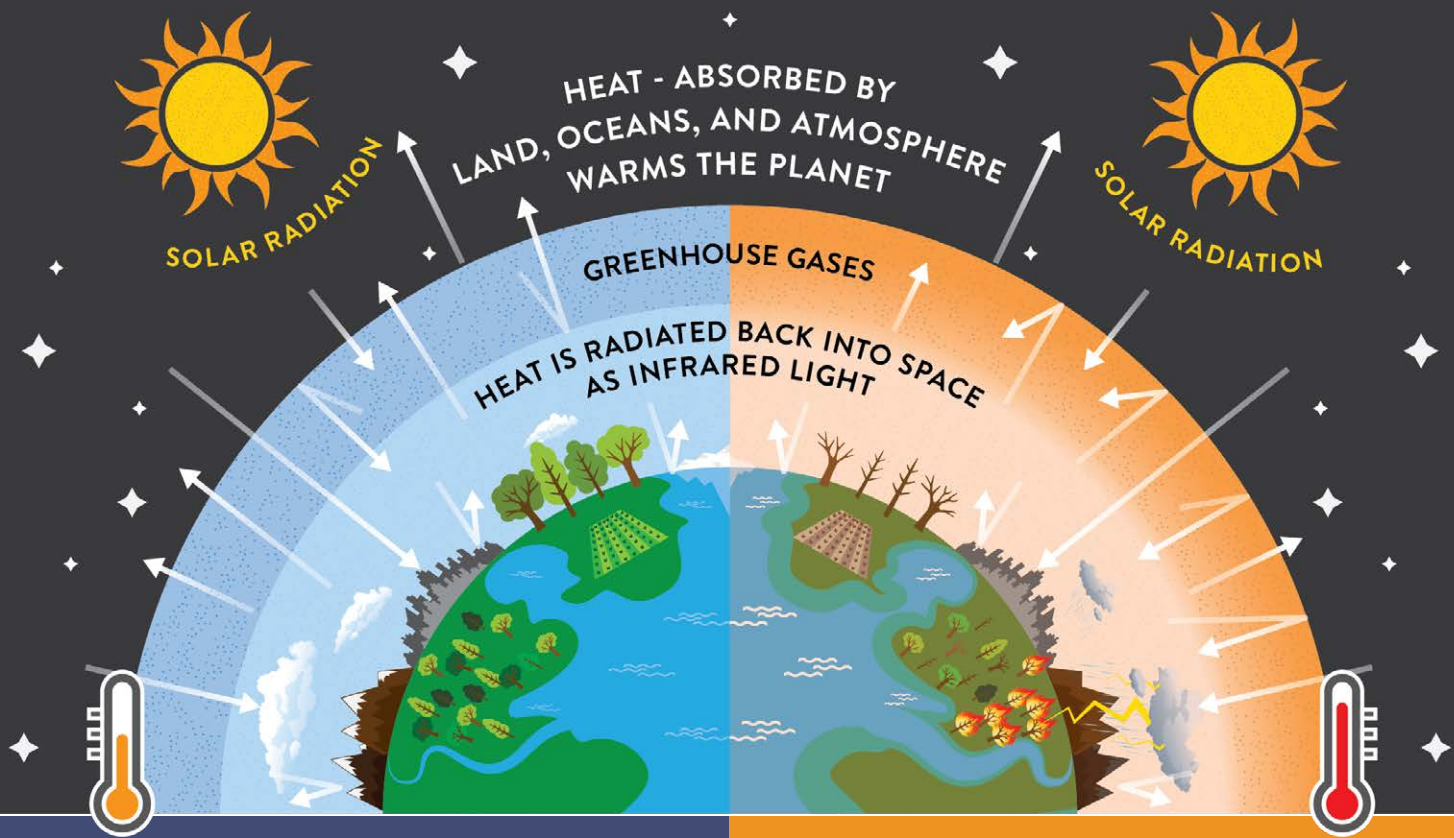
Figure 1-2. Greenhouse Effect

In the last century, human activities such as burning fossil fuels and deforestation have caused a jump in the concentration of greenhouse gases in the atmosphere.

THE RESULT: Extra trapped heat and higher global temperatures.

WITH NORMAL GREENHOUSE GASES

WITH INCREASED GREENHOUSE GASES



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

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).

**LESS GAS =
LESS HEAT TRAPPED IN THE ATMOSPHERE**

Retaining more reliable:

- Weather
- Temperature
- Rainfall
- Sea Level

**MORE GAS =
MORE HEAT TRAPPED IN THE ATMOSPHERE**

More intense:

- Storms
- Heat
- Drought
- Sea Level Rise

HOW WILL CLIMATE CHANGE AFFECT SACRAMENTO?

Climate change is projected to cause increasingly hazardous conditions for life on Earth, including increased heat waves, wildfires, drought, extreme storms, flooding, and sea level rise. In addition to these direct impacts, secondary impacts of climate change include adverse changes to biological resources and public health.⁸ The following section outlines the key climate risks expected in the Sacramento region, drawing on publicly available data produced by the Geospatial Innovation Facility at the University of California, Berkeley with funding and advisory oversight by the California Energy Commission and the California Strategic Growth Council, comparing the historical period to mid-century projections.

Temperature Increase

As GHG emissions increase, temperatures are also increasing globally, placing growing stress on human health, water resources, energy systems, and other assets. Sacramento's climate is no exception. Historically (i.e., pre-2005), the average annual maximum temperature in Sacramento has been 74.1°F.⁹ Temperatures are projected to increase by 4 to 5°F throughout Sacramento by mid-century (*Figure 1-3*). Under these conditions, Sacramento could experience hotter and significantly drier conditions. The effects of temperature increase are likely to be felt throughout Sacramento – especially in more densely developed areas with less green space – between May and October each year, with temperatures peaking in July and August. Therefore, these impacts are felt more acutely by under-resourced and lower income communities. Overall temperature increase can also lead to more frequent extreme heat days and heatwaves; the intensification of the urban heat island effect;¹⁰ greater heat-related illnesses such as heat stroke and heat exhaustion; and stress to infrastructure, as discussed below.

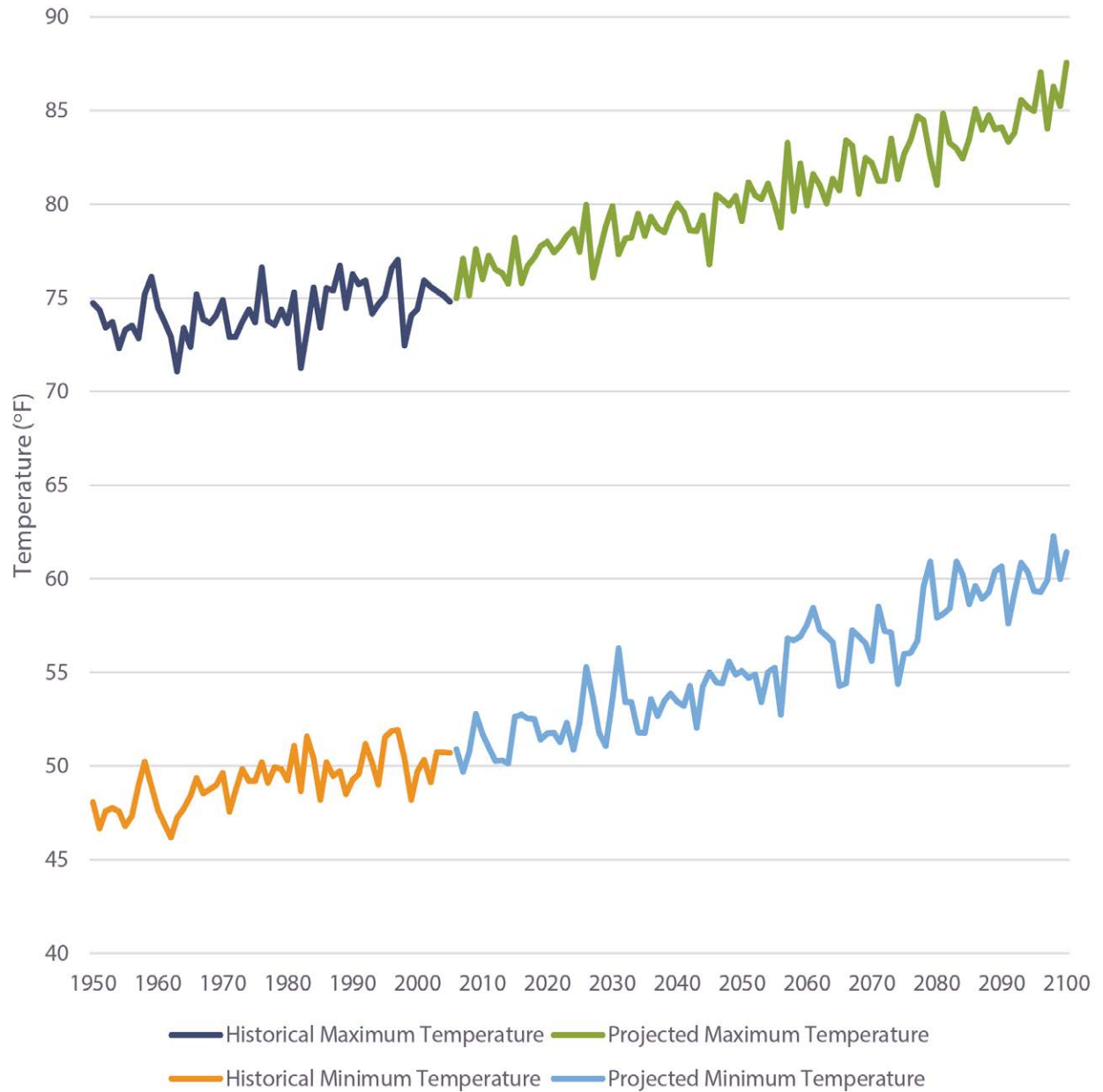
8. National Resources Defense Council (NRDC). (February 2019). *Climate Change and Health in California*. Retrieved from: <https://www.nrdc.org/sites/default/files/climate-change-health-impacts-california-ib.pdf>

9. Per Cal-Adapt, annual average maximum temperature is the average of the hottest (maximum) temperatures for every day in a year, calculated using each day's highest projected temperature and then averaging those daily highs across the entire year

10. Urban heat island effect occurs from higher levels of combustion and paved/built surfaces in urban areas, which retains heat in the urban area relative to less dense surrounding areas.



Figure 1-3. Annual Average Temperature (°F) Changes in Sacramento



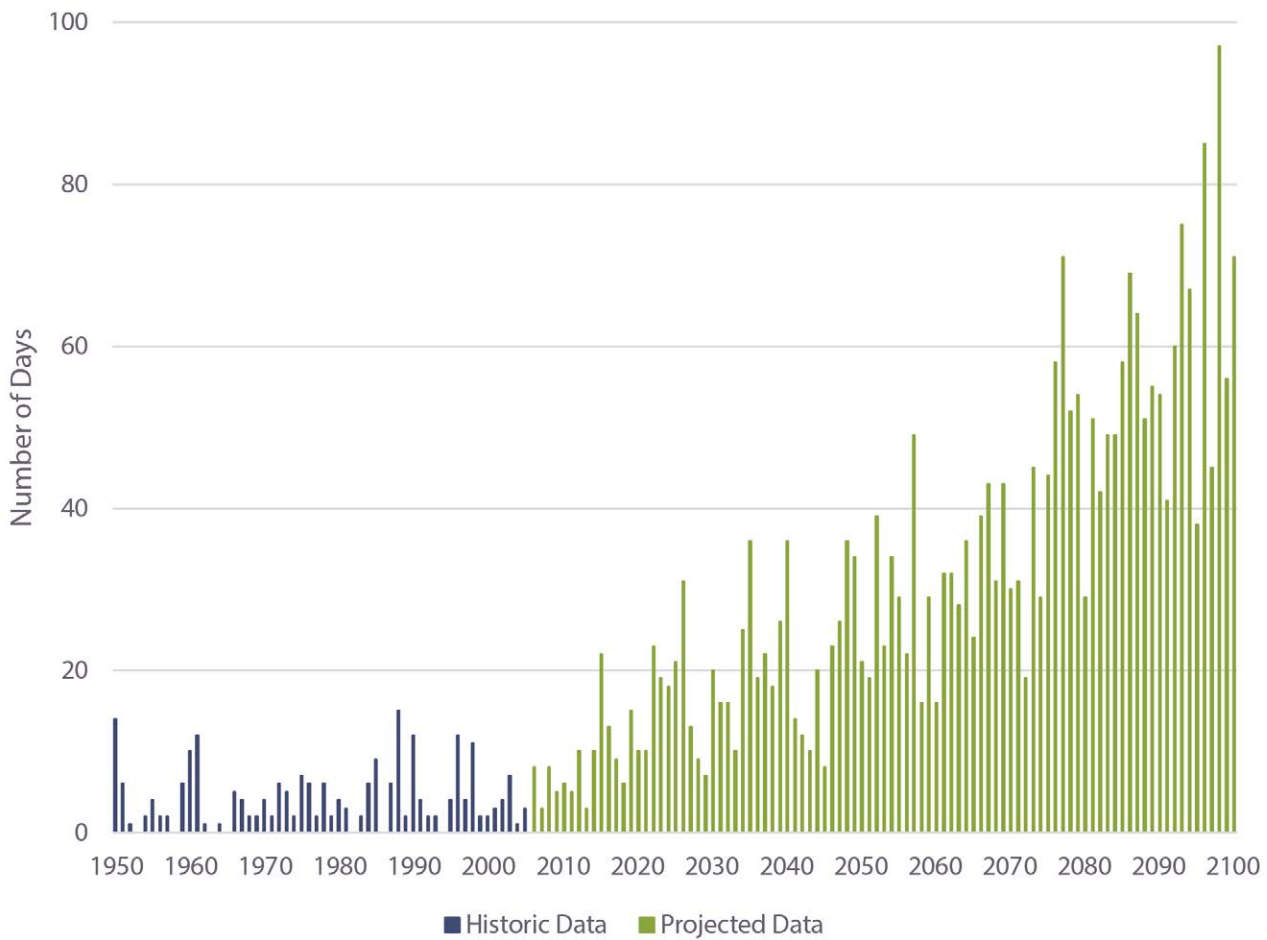
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Extreme Heat Days

Historically (pre-2005), Sacramento has experienced about four extreme heat days per year, which are defined as days with maximum temperature over 103.9°F. By mid-century, Sacramento is projected to experience between 18 and 22 extreme heat days per year (Figure 1-4). July and August are likely to be the most critical months for increased temperature

effects, but the effects of high heat days will likely be felt throughout the spring and summer. The average temperature of a high heat day is also projected to increase to 108.4°F by the end of the century. Communities without access to air conditioning or cooling centers will be most at risk.

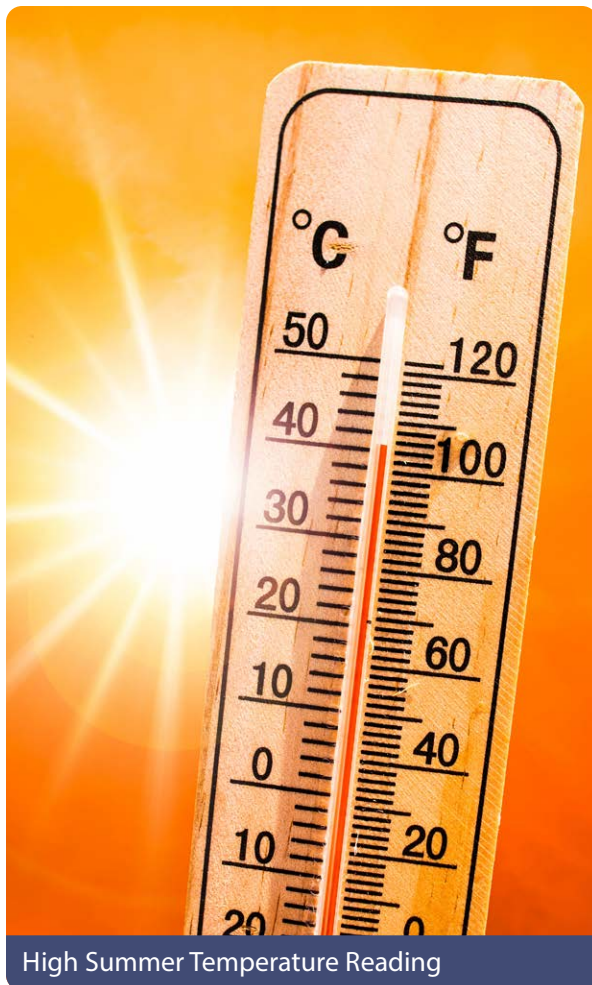
Figure 1-4. Annual Number of Extreme Heat Days





Heat Waves

Heat waves are periods of four or more days of sustained, extreme heat. Historically, the Sacramento region experienced about one to two heatwaves per decade. By midcentury, Sacramento is projected to experience three multi-day heat waves per year, each projected to last between 7.6 to 9.1 days.



High Summer Temperature Reading

Heat-Related Illnesses

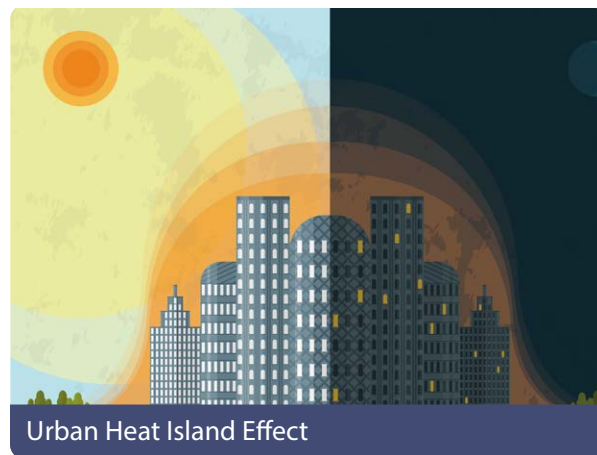
Heat waves and sustained high heat days are the nation's deadliest weather disaster and can cause heat-related illness such as heat exhaustion or heat stroke. Many people can take refuge in cooler environments to reduce their exposure to excessive heat; however, outdoor workers, unhoused residents, and people without air conditioning equipment or adequate ventilation, and people who may be unable to pay for increased energy use by using air conditioning are most vulnerable, making extreme heat a public health issue. Those who fear exposure to crime may hesitate to open windows, residents with limited transportation options may be unable to travel to cooler locations, while some may not be aware of the dangers posed by high heat or may not think of themselves as susceptible. Some individuals, including the elderly, those taking certain types of medication, and children, can also be more sensitive to the effects of heat. Extreme heat currently kills as many as 12,000 people a year in the United States, an issue that is expected to worsen due to climate change without a focus on adaptation.¹¹

11. Shindell, Drew; Zhang, Yuqiang; Scott, Melissa; Ru, Muye; Stark, Krista; Ebi, Kristie L. (March 2020). *The Effects of Heat Exposure on Human Mortality Throughout the United States*. Retrieved from: [The Effects of Heat Exposure on Human Mortality Throughout the United States \(duke.edu\)](https://www.duke.edu/~shindell/pubs/20200301-heat-exposure-on-human-mortality-throughout-the-united-states)

Urban Heat Islands

Heat islands are urbanized areas that experience higher temperatures than less developed outlying areas due to human activities. Structures such as buildings, roads, and other infrastructure absorb and re-emit the sun's heat more than features of the natural landscape such as forests and water bodies. Urban areas where these structures are highly concentrated and greenery is limited become "islands" of higher temperatures relative to outlying areas. Increased daytime temperatures, reduced nighttime cooling, and higher air pollution levels associated with urban heat islands can impact public health and lead to heat stroke, heat exhaustion, or even loss of life. In Sacramento, the urban heat island effect is most prevalent in or near industrial areas. Residents living near urban heat islands without access to heat relief and lacking air conditioning are most vulnerable to these health effects, and most often comprise low-income households and people of color. Over the course of the next several decades as average daily temperatures continue to increase, the urban heat island effect will become more pronounced in Sacramento. Increasing the number of trees and green space is one of the most effective ways to reduce the intensity of the urban heat island effect, but the use of high-albedo materials that lower heat absorption by buildings and roads can also help. Likewise, misters and drinking fountains can offer respite, especially in vulnerable areas.

Urban Heat Islands and Tree Canopy: Due to the urban heat island effect, heat can fluctuate by as much as 8 degrees between different areas of the City according to canopy cover. The distribution of heat is inequitable in the community. Some North Sacramento neighborhoods can be as much as 12.68 degrees Fahrenheit warmer than outside of City limits, and neighborhoods along south Franklin Boulevard can be as high as 15.15 degrees warmer than outside city limits. The City partnered with NASA for an analysis of urban heat impacts in the community. An interactive story map is available [online](#).





Heat-Related Infrastructure Impacts

High temperatures can impact key infrastructure, including energy generation and distribution and transportation. High temperatures decrease the efficiency of power lines while increasing the demand for energy-intensive uses such as air conditioning and other cooling equipment. This results in a higher risk of blackouts and increases energy bills. These impacts can strain household budgets, increase exposure to heat, and disrupt medical and social services. Extremely high temperatures can also damage roadways, railways, and bridges, as well as reduce the comfort and feasibility of walking, biking, and taking public transit. Sacramento Regional Transit (SacRT) powers their light rail system with overhead catenary systems lines, which can stretch with heat and may lead to severing of the connection with the rail car.

Changes in Precipitation Patterns

Overall, annual precipitation is expected to increase in the Sacramento region to between 20.3 and 25.7 inches per year;¹² however, this increase will not occur at a uniform rate throughout the year. Rainfall will become more concentrated in the winter months and fall in fewer, higher-intensity events. These high intensity storms may produce higher volumes of runoff, contribute to increased flood risk, damage transportation infrastructure such as roads and bridges, and contribute to levee failure. Meanwhile, the spring and summer months are expected to see the largest reductions in rainfall compared to historical patterns. These changes could lead to drought, groundwater depletion, increased wildfire risk, changes in streamflow, decreased drinking water supply and availability, and strain to health, energy, and infrastructure systems.

12. Per Cal-Adapt Local Climate Change Snapshot Tool, projected Annual Average Precipitation at Mid-Century under a Medium Emissions (RCP 4.5) Scenario and a High Emissions (RCP 8.5) Scenario.



SacRT Rail Car in Motion



Sacramento River

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Flooding

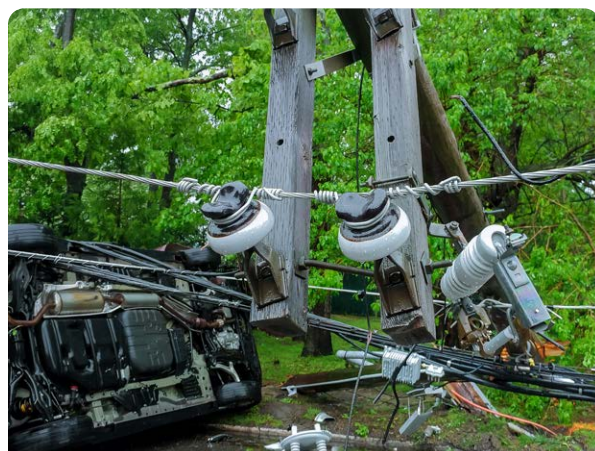
Historically, flooding has been the most frequent natural hazard in the Sacramento region. The extensive network of levees, dams, and weirs built for flood protection face a monumental task, which only looms larger as infrastructure ages and climate change induces larger storms and promotes sea level rise. Historic floods have damaged bridges and levees and resulted in significant numbers of people injured, killed, or forced to evacuate. Between 1996 and 2015, the National Climatic Data Center (NCDC) reported 32 flood events within Sacramento County, amounting to a total of \$13,326,000 in lost property damages. Large floods can result in damage to electric and transportation infrastructure, destruction of homes and businesses, increased rates of flood-borne disease, and loss of life. Flooding effects will be felt most strongly in low-lying areas, areas dependent on levee protection, and areas with inadequate stormwater infrastructure.



Flooded Sacramento Street

Storms

Storm runoff, particularly during high-intensity storms, can lead to erosion and localized flooding. This could result in significant impacts to local species and habitats and poses a risk to human health and structures. The strong winds that can occur during heavy storms can also damage structures and pose a threat to electricity infrastructure. Wooden crossbars and pole-mount transformers on distribution-voltage utility poles can be damaged by wind speeds as low as 60 miles per hour. Moderate winds can damage distribution-voltage utility poles and cause lines to sway and result in cross-phase shorting. Individuals living in mobile homes are especially vulnerable to the effects of high winds.



Fallen Power Pole



Changes in Winter Snowpack

Sacramento’s municipalities, industries, and ecosystems rely on the gradual melting of the Sierra snowmelt to provide a reliable supply of summertime freshwater and hydroelectric power. As temperatures increase, more precipitation will fall as rain instead of snow and snowmelt will occur earlier in the year, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent.¹³ Disruption to the processes that ensure adequate snow supply will have a significant impact on energy generation, water availability, flood risk, and ecosystem health throughout California and in Sacramento. Earlier snowmelt will reduce the amount of water available for consumption during the summer, potentially leading to water scarcity. Reductions in winter snowpack are associated with declines in summer soil moisture content, which in turn increases wildfire risk and can impair water quality.

13. Data from Cal-Adapt, Local Climate Change Snapshot Tool: Snowpack, <https://cal-adapt.org/tools/snowpack>.

14. Data from Cal-Adapt Local Climate Change Snapshot Tool: Extended Drought Scenarios, <https://cal-adapt.org/tools/extended-drought>

Drought

The combination of warmer temperatures, changing precipitation patterns, and decreased winter snowpack will likely cause longer and more intense droughts in California and the Sacramento region. Modeling of an extended late-Century drought scenario indicates that average annual precipitation between 2051 and 2070 could be as low as 78 percent of historical median annual precipitation averaged over the North Coast and Sierra California regions.¹⁴ While drought on this scale would have far reaching consequences, drought on a lesser scale can lead to reduced soil moisture, increased risk of wildfire, and reductions in streamflow. Drought conditions have profound impacts on water availability and increase demand for groundwater and compromise levee integrity. Other impacts of drought include dust storms, flash flooding, lower crop yields, and reduced water quality.



Reduced Sierra Nevada Snowpack



Lost Soil Moisture

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Groundwater Supply

Streamflow declines and changes in precipitation patterns anticipated under continued global climate change will likely increase demand for groundwater. Groundwater currently comprises about one-third of the Sacramento region's water use, and studies have shown that regional rates of groundwater extraction increase under drought conditions. While the City's groundwater supplies are currently being managed sustainably, too much stress on the groundwater supply can lead to higher groundwater pumping costs, decreased streamflow, land surface subsidence, and loss of wetland ecosystems.



American River at the Auburn Recreation Area

Water and Soil Quality

Even after a fire is put out, it can continue to have detrimental effects on the environment and surrounding communities. The infiltration capacity of soil is reduced following wildfire, increasing the risk of landslides and waterbody contamination. Ash debris from wildfires may contain high levels of heavy metals and cause long-term effects on soil and water quality.



Grass Fire Ash Debris

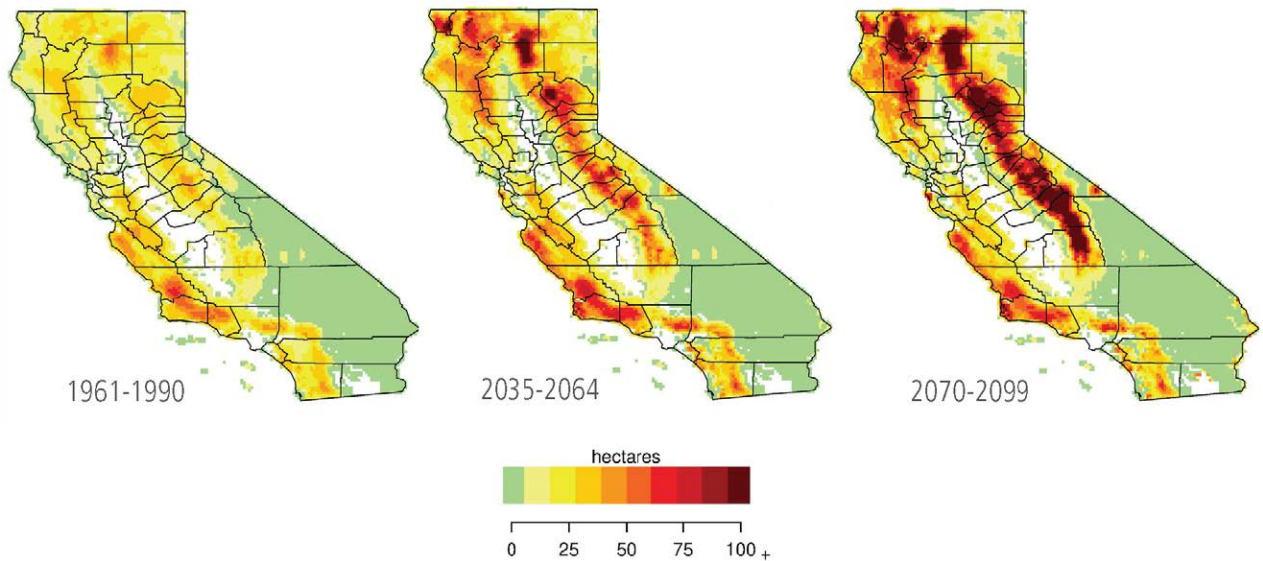


Wildfire

Wildfire risk and intensity will continue to increase as climate change brings increased temperatures, a reduced snowpack, and altered precipitation patterns. California has an extensive history of wildfires, with large-scale, highly-destructive fires becoming increasingly common. Within Sacramento County itself, three major wildfires, causing a total of three million dollars in property damage, occurred between 2014 and 2021. While wildfire is unlikely within City limits, Sacramento the

smoke caused by wildfire creates impacts on air, and wildfires within the County can regionally affect water and soil quality, cause damage to energy infrastructure and roads, and create strain on local firefighting resources as the fire department is called to respond to fires across the region and state. Projections from California's Fourth Climate Change Assessment predict that fires could burn up to 178% more acres per year by the end of the century compared to current averages (*Figure 1-5*).¹⁵

Figure 1-5. Wildfire in the 20th and 21st Centuries in California



15. California Natural Resources Agency. (2018). *California's Changing Climate 2018*. Retrieved from: https://www.energy.ca.gov/sites/default/files/2019-11/20180827_Summary_Brochure_ADA.pdf

CLIMATE ACTION & ADAPTATION PLAN

Air Quality

Wildfires are projected to increase in severity across Northern California, and their impacts on health will be felt in Sacramento. Particulate matter from wildfire dissipates throughout the Central Valley and degrades air quality for extended periods of time. During the 2018 Camp Fire, Sacramento's $PM_{2.5}$ (particulate matter) concentrations were among the highest in the world (over 300 micrograms per cubic meter of air).

Wildfire smoke can cause adverse health effects including restricted breathing; eye irritation; aggravation of respiratory and cardiovascular diseases including asthma, chronic obstructive pulmonary disease (COPD), bronchitis, and pneumonia; and increased cancer risk and impaired immune function. Vulnerable populations include young children; middle-aged

and older adults; pregnant women; those with hypertension, diabetes, and COPD; and smokers. Some studies have also found associations between low socioeconomic status and health effects related to wildfire smoke exposure. During wildfire events, Sacramento residents may avoid active transportation, spend less time outdoors, or avoid unventilated public transit facilities. These changes may have ripple effects on community health, energy use, and transportation-related emissions as residents may not be able to partake in daily exercise or may choose to prioritize the use of private vehicles. Poor air quality disproportionately affects low-income and disadvantaged communities, which experience higher exposure to pollution and lower access to healthy food, recreation, and healthcare.



Poor Air Quality in Sacramento



Sea Level Rise

Climate models anticipate some degree of sea level rise in all areas that are connected to ocean bodies. While Sacramento is not a coastal city, the Sacramento and American Rivers drain into the Sacramento-San Joaquin Delta, which in turn drains into the San Francisco Bay and the Pacific Ocean. Water levels in the Delta are not much higher than coastal sea levels and therefore, Sacramento will be effected by sea level rise. Further, the Delta and surrounding lands are low-lying and vulnerable to water level increases and storm surges that can compound the effects of flooding.¹⁶ As such, sea level rise will exacerbate flood risk in Sacramento and threaten the structural integrity of the levee system that protects the City. Depending on the nature of changes to the estuary's

shoreslines in coming decades (hardened sea-walls and levees vs. restored wetlands) the tidal regime could become more amplified or more dissipated, with varying effects on levee stability. Sea level rise will also increase saltwater intrusion in the Sacramento-San Joaquin Delta, impacting freshwater quality, agricultural production, the wellbeing of aquatic species, and the health of the health of aquatic ecosystems. Sea level rise is projected to progress gradually, affecting the areas immediately surrounding the Sacramento River and Sacramento River Deep Water Ship Channel. As the century progresses, the areas immediately around the American River and in agricultural areas south of Sacramento may also be affected.

16. Dettinger, M., J. Anderson, M. Anderson, L. Brown, D. Cayan and E. Maurer. (2016). *Climate change and the Delta, San Francisco Estuary and Watershed Science* 14(3): Article 5, doi: <http://dx.doi.org/10.15447/sfews.2016v14iss2art5>



Flooded Agricultural Fields



GHG EMISSIONS IN SACRAMENTO



Conducting a GHG Emissions Inventory

A community's GHG emissions can be quantified by conducting a GHG emissions inventory. An inventory provides information about where the largest sources of GHG emissions originate and opportunities for GHG emissions reductions. An inventory also establishes a baseline from which a GHG emissions forecast

and climate action targets can be established and progress tracked. Consistent with guidance from the Governor's Office of Planning and Research (OPR), Sacramento's community inventory uses the methods established in the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Version 1.2).¹ For a full overview of methods used for developing Sacramento's inventory, including updates to previous inventories, see [Appendix A](#). The U.S. Community Protocol separates a jurisdiction's GHG-generating activities into categories known as emissions sectors. These emissions sectors broadly describe

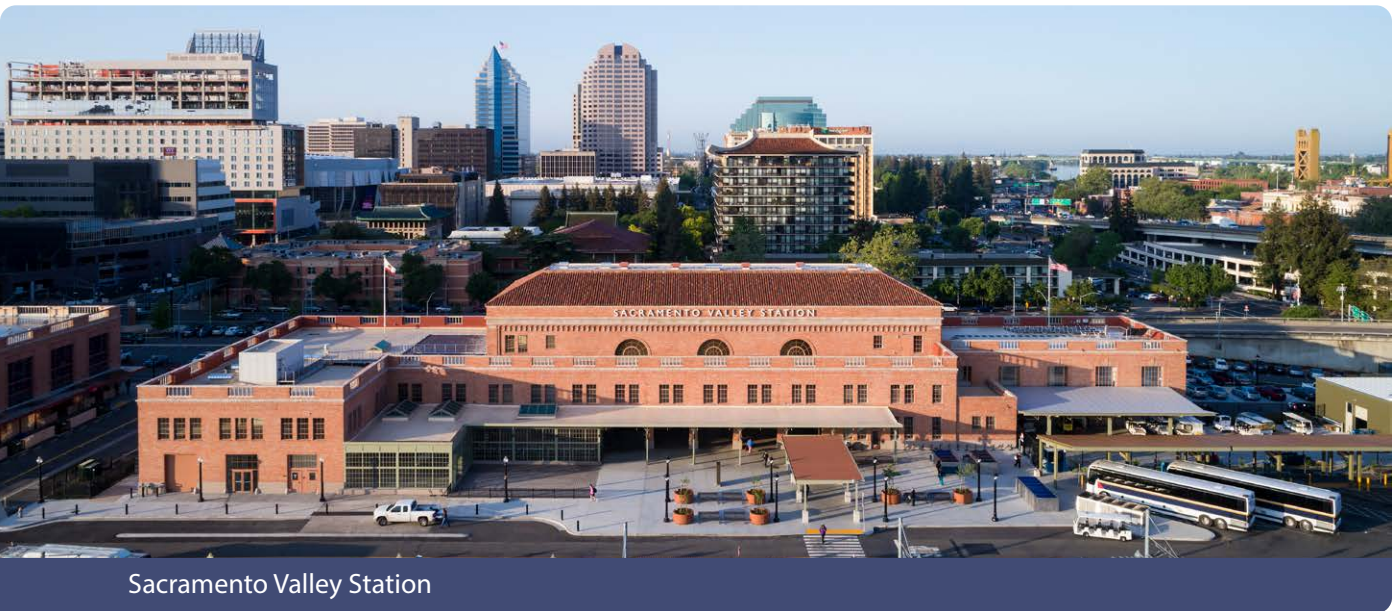
1. ICLEI – Local Government for Sustainability USA, C40 Cities Leadership Group, World Resources Institute. (2019, July). Global Protocol for Community Scale Greenhouse Gas Inventories. Retrieved September 20, 2021, from <https://icleiusa.org/us-community-protocol/>.

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where GHG emissions are coming from within a city. For example, Sacramento’s GHG emissions sectors include:

- The transportation sector (which captures combustion emissions from passenger and commercial vehicle trips that start and/or end in Sacramento)
- The building sector (which captures emissions from residential, commercial, and industrial electricity, natural gas, and other energy source usage within the city)
- The waste sector (which captures emissions from all solid waste generated within the city, as well as passive emissions from closed landfills within city limits)
- The water and wastewater sector (which captures emissions from delivering and treating water and wastewater for local residents and businesses)

In general, GHG emissions inventories used for local planning purposes, like Sacramento’s CAAP, include GHG emissions sectors that are under some level of the City’s jurisdictional control or influence. Emissions sectors that fall outside of the City’s jurisdictional control are typically excluded, as the City would not be able to enact policies or programs outside of its jurisdictional control. For example, combustion emissions from cars traveling through Sacramento, with origins and destinations outside of city limits, were excluded from Sacramento’s inventory because the local government cannot reasonably influence this pass-through travel activity. Additional sources of emissions not included in the inventory include agricultural emissions, which are limited within the city, and industrial sources,



Sacramento Valley Station



which are covered under the State's Cap-and-Trade Program and for which data are not readily available.

To calculate the GHG emissions inventory, activity data are collected for each GHG emissions sector for a single calendar year. GHG emissions are calculated from activity data using GHG emission factors, which are science-based conversion factors that convert activity data to GHG emissions. Inventories

measure GHG emissions in units of metric tons of carbon dioxide equivalent (MT CO₂e).² One MT is equivalent to 2,205 pounds, roughly the same volume as a small two-story house and roughly the weight of a small sports car (Figure 2-1). The average car produces 5 MT of CO₂e in 1 year.³ Alternatively, planting 17 new trees removes about 1 MT CO₂e from the atmosphere over 10 years.⁴

Figure 2-1. Volume of 1 MT CO₂e



2. Carbon dioxide equivalent (CO₂e) is a unit of measure used to standardize the climate effects of various greenhouse gases. For example, 1 metric ton (MT) of carbon dioxide (CO₂) has equivalent climate effects (or global warming potential) as 1 MT of CO₂e; 1 MT of methane (CH₄) has approximately equivalent climate effects as 28 MT of CO₂e; and 1 MT of nitrous oxide (N₂O) has approximately equivalent climate effects as 265 MT of CO₂e. See [Appendix A](#) for more information on global warming potentials.
3. Environmental Protection Agency (EPA). March 2022. *Greenhouse Gas Equivalencies Calculator*. Accessed at: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.
4. Ibid.

Current GHG Emissions in Sacramento

A GHG inventory was developed for Sacramento’s CAAP using data from 2016—the most recent year for which reliable community-wide data was available at the time this plan was developed. The Sacramento inventory includes community-wide GHG emissions from sources within sectors that are under some level of jurisdictional control or influence of the City, which include buildings, transportation, waste, water, and wastewater. [Figure 2-2](#) and [Table 2-1](#) show the results of

the GHG emissions inventory, with the buildings sector broken out by residential electricity use, commercial electricity use, residential gas use, and commercial gas use. The largest GHG emissions sector is transportation, followed by buildings, waste, wastewater, and water. Based on these results, the greatest opportunities for GHG emissions reductions are in the transportation and buildings sectors. Further details on the data, calculations, and results of the inventory are included in [Appendix A](#).

94%
**OF TOTAL GHG EMISSIONS
IN SACRAMENTO ARE
FROM BUILDINGS AND
TRANSPORTATION.**

Figure 2-2. Sacramento’s 2016 GHG Emissions by Sector

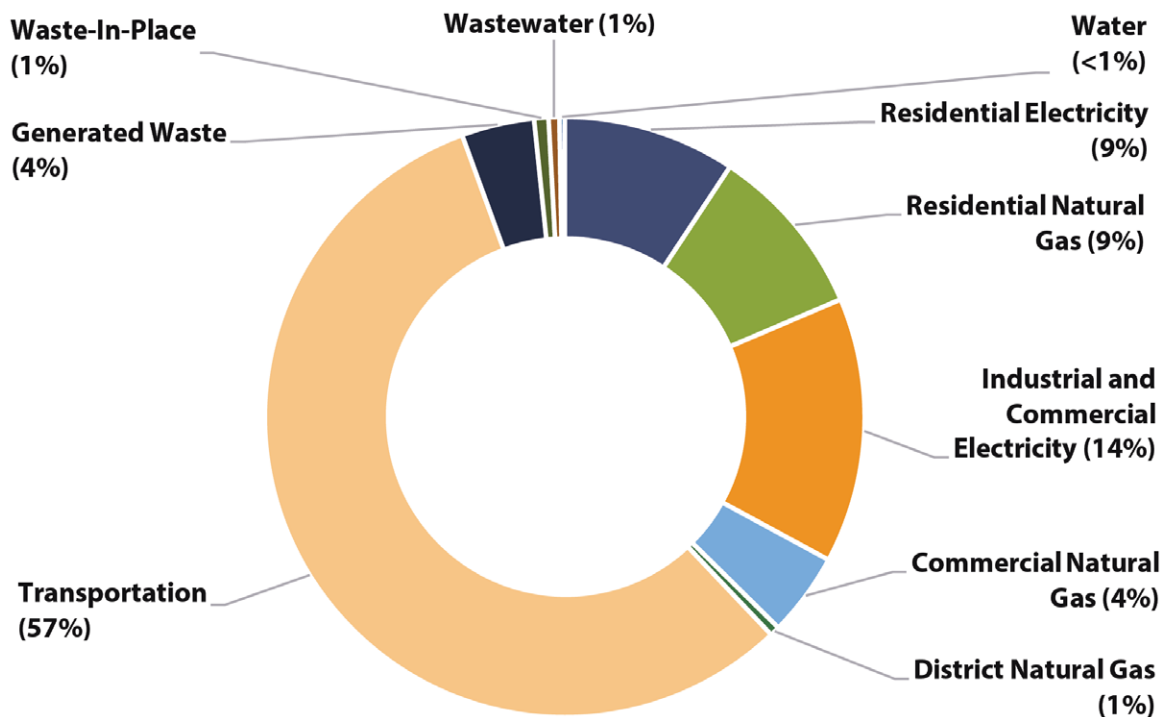




Table 2-1. Sacramento’s 2016 GHG Emissions by Sector

Sector	Activity Data	Emission Factors	MT CO ₂ e
Transportation	4,347,013,534 VMT	0.000445 MT CO ₂ e/mile	1,935,870
Industrial and Commercial Electricity	2,191,180,705 kWh	0.00022 MT CO ₂ e/kWh	489,945
Residential Natural Gas	59,977,656 therms	0.00531 MT CO ₂ e/therm	318,304
Residential Electricity	1,423,419,583 kWh	0.000224 MT CO ₂ e/kWh	318,275
Commercial Natural Gas	28,980,911 therms	0.00531 MT CO ₂ e/therm	153,803 ¹
Generated Waste	525,968 tons	0.255412 MT CO ₂ e/ton	134,339
Waste-in-Place	N/A ²	N/A ²	26,504
Wastewater	N/A ³	N/A ³	19,867
District Natural Gas	3,432,409 therms	0.00531 MT CO ₂ e/therm	18,216 ¹
Water	42,963,998 kWh	0.00022 MT CO ₂ e/kWh	9,607
Total Emissions			3,424,729

MWh: megawatt hours; kWh: kilowatt hours; CO₂e: carbon dioxide equivalent; MT: metric tons; VMT: vehicle miles traveled

¹ No natural gas usage was reported for large industrial users due to California Public Utilities Commission privacy rules. The remaining industrial usage is from Pacific Gas & Electric “district” users.

² Waste-in-place is a direct output of a landfill gas modeling system and does not have activity data.

³ Wastewater is a combination of stationary and process emissions, further detailed in Section 3.3.

Sacramento's GHG Emissions Over Time

Previously, the City completed a community GHG inventory for 2005 and an estimated GHG inventory for 2011. The City's three inventories demonstrate a steady reduction in GHG emissions over time, including achievement of the City's 2020 target to reduce GHG emissions 15 percent below 2005 levels by 2020. This corresponds to a return to 1990 levels (Figure 2-3 and Table 2-2). Since 2005, GHG emissions in Sacramento have decreased 20 percent, despite a 10 percent increase in

population, with reductions in every sector. Major reductions occurred in the waste and wastewater sectors, although these sectors make up a smaller portion of Sacramento's total GHG emissions. Increasing gas appliance efficiency helped reduce natural gas usage in buildings while increasing efficiency of fuels drove reductions in the transportation sector. Increased usage of renewables for electricity also decreased emissions from electricity usage in the buildings sector.

SACRAMENTO ACHIEVED A 20% REDUCTION BELOW 2005 LEVELS IN 2016, EXCEEDING THE 2020 TARGET.

Figure 2-3. Historic GHG Emissions by Year and Source (MT CO₂e)

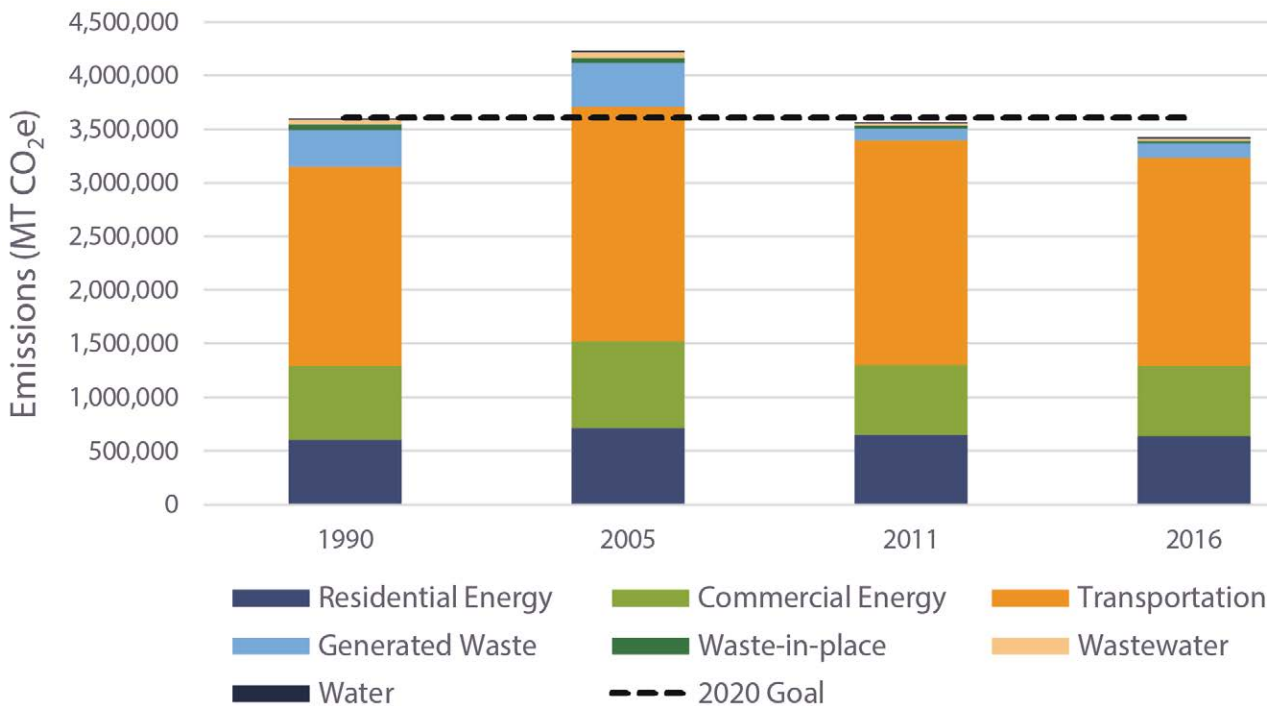




Table 2-2. Historic GHG Emissions by Year and Source (MT CO₂e)

Sector	1990 ¹	2005	2011	2016
Transportation	1,856,925	2,184,617	2,091,154	1,935,870
Commercial & Industrial Energy	689,637	811,337	650,627	661,964
Residential Energy	607,052	714,178	656,472	636,578
Generated Waste	344,506	405,301	113,192	134,339
Waste-in-place	42,432	49,921	25,773	26,504
Wastewater	48,773	57,380	18,719	19,867
Water	10,889	12,810	9,804	9,607
Total Emissions	3,600,213	4,235,545	3,565,741	3,424,729
Emissions per capita	9.75	9.57	7.58	7.25

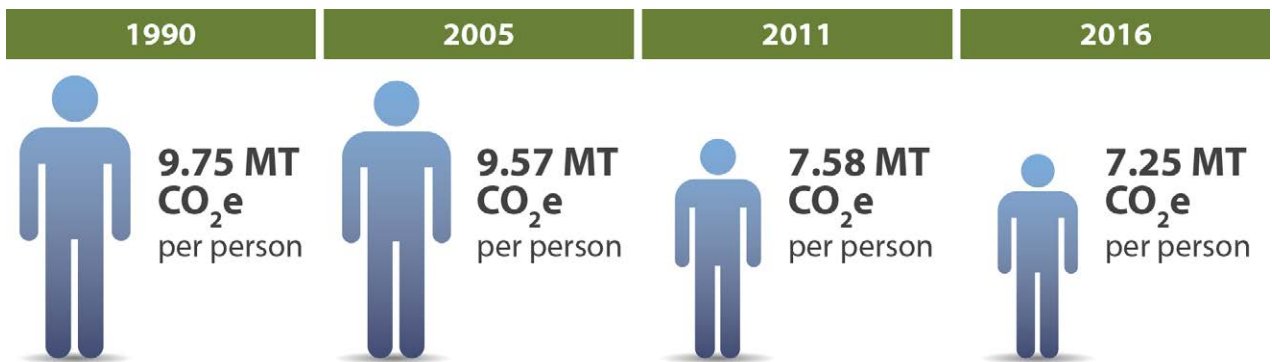
MT CO₂e: metric tons of carbon dioxide equivalent

¹ All 1990 inventory data calculated as a 15% reduction from 2005 inventory levels per California Air Resources Board guidelines.

Sacramento’s per capita emissions (in units of MT CO₂e per person) have experienced even larger reductions. Since 2005, per capita emissions have decreased 26 percent ([Figure 2-4](#)).

These reductions have positioned Sacramento well for adopting the even more ambitious climate action targets contained in this CAAP.

Figure 2-4. Per Capita GHG Emissions over Time



*1990 per capita emissions are estimated by dividing the 1990 emissions backcast (15% below 2005 levels) by the City’s 1990 population.

GHG Emissions Forecast

GHG emissions forecasts provide an estimate of future GHG emissions levels based on the projected growth and change in a community over time. Forecasts also account for current legislative actions from the State and federal governments that are expected to reduce future emissions. In order to clearly demonstrate how Sacramento's emissions will look in the future, two forecasts were developed—a business-as-usual (BAU) forecast and an adjusted forecast.

- The BAU forecast estimates how Sacramento's emissions would change based on current activities and projected growth in population and job growth.
- The adjusted forecast adjusts the BAU forecast to account for State- and federal-level legislation and policies that are expected to reduce emissions for all jurisdictions in California.

Sacramento developed the GHG emissions forecasts based on the 2016 inventory to project how GHG emissions in Sacramento will change over time. The forecasts extend from 2016 through 2045 and include milestone years 2025, 2030, and 2040. The BAU forecast was developed using growth projected trends in population, housing, employment, and transportation activity over time, consistent with city and regional projections.

The State legislation and policies included in the adjusted forecast are the Advanced Clean Cars Program, Title 24 Building Energy Efficiency Standards, and California Renewable Portfolio Standard (RPS). The Advanced Clean Cars Program is a comprehensive car emissions control program which regulates smog, soot-causing pollutants, and GHG emissions into a single coordinated package of requirements for passenger cars and light trucks sold in California with model years 2017 through 2025 to reduce California's GHG emissions by 34 percent in 2025.⁵ Title 24 Building Energy Efficiency Standards regulate new residential and commercial development in California by requiring increased efficiency related to space heating and cooling, lighting, and water heating, and are updated every three years. The California RPS program requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from renewable energy resources. For example, electricity service providers must procure electricity from 50 percent renewable resources by 2026, 60 percent by 2030, and 100 percent by 2045, leading to significant statewide decreases in electricity emissions. See [Appendix B](#) for more information on these and other programs and policies that are driving climate action in Sacramento and throughout California. The adjusted forecast is considered a more realistic picture of Sacramento's emissions in the future. The BAU and adjusted forecasts can be compared to show the extent to which State-level policies and programs will help to reduce GHG emissions in Sacramento ([Figure 2-5](#) and

5. California Air Resources Board (CARB). (2017). *Advanced Clean Cars Program*. Retrieved September 20, 2021, from <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/about>.



Table 2-3). The results of the forecasts show us that while State legislation will reduce GHG emissions in Sacramento through 2045, more work is needed at the local level to achieve Sacramento’s GHG reduction goals.

The adjusted forecast is the best estimate of how emissions will look over time in the city of Sacramento without additional actions at the municipal and community level. From the adjusted forecast and current State legislation, Sacramento established climate action targets

based on feedback from community engagement, adopted General Plan Vision & Guiding Principles, the Mayors’ Commission on Climate Change recommendations, and current State guidance and legislation. These considerations and the 2030 and 2045 climate action targets are outlined in [Chapter 3](#). For a complete explanation of the methods, data, and calculations used to create Sacramento’s forecasts, see [Appendix A](#).

Figure 2-5. Sacramento’s Business-as-Usual and Adjusted GHG Emissions Forecasts (MT CO₂e)

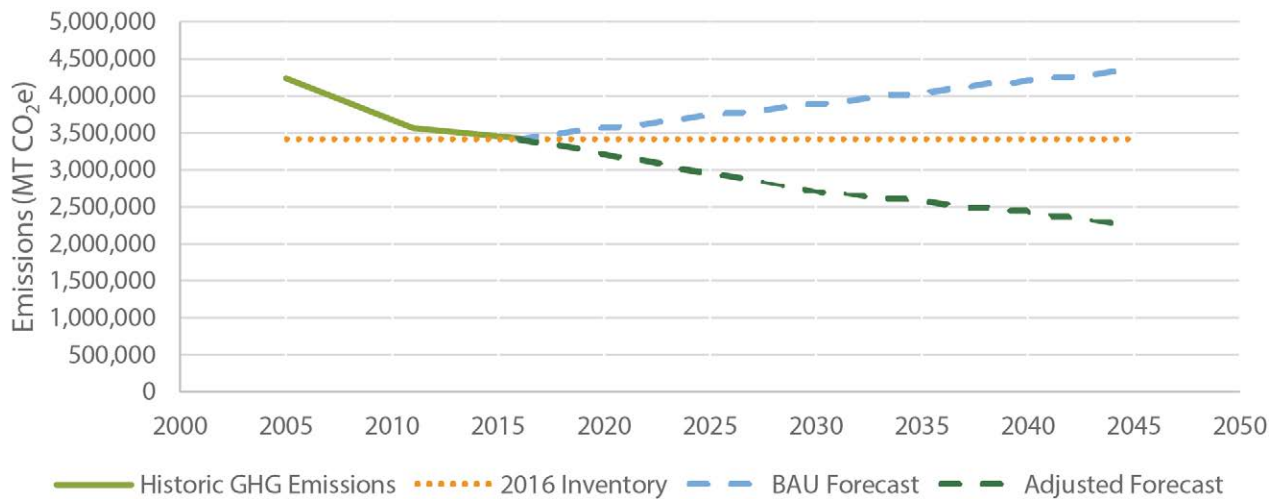


Table 2-3. Sacramento’s BAU and Adjusted Forecasts (MT CO₂e)

Emissions Forecast	2020	2025	2030	2040	2045
BAU Forecast	3,558,871	3,726,548	3,894,225	4,203,918	4,342,257
Reductions from State Legislation	344,615	780,096	1,190,660	1,775,373	2,114,935
Adjusted Forecast	3,214,256	2,946,452	2,703,565	2,428,545	2,227,322
Adjusted Forecast Percent Reduction from 2016	-6%	-14%	-21%	-29%	-35%

MT CO₂e: metric tons of carbon dioxide equivalent



CLIMATE ACTION TARGETS



Key State Legislation

As a leader in climate action, California has established extensive legislation, policies, and programs to reduce GHG emissions in the State. California's climate action goals are enshrined in Assembly Bill (AB) 32, SB 32, and EO B-55-18, which together set statewide GHG reduction targets for 2020, 2030, and 2045. Sacramento has historically aligned with state-level goals around climate change, as shown in [Figure 3-1](#). A full list of relevant state-level legislation is included in [Appendix B](#).



California State Capitol Building

CLIMATE ACTION & ADAPTATION PLAN

AB 32: AB 32 codified the statewide goal of reducing GHG emissions to 1990 levels by 2020 and required the California Air Resources Board (CARB) to prepare a Scoping Plan that outlines the main strategies California will employ to meet the 2020 target. The AB 32 Scoping Plan was first adopted in 2008, with subsequent updates in 2013 and 2017. The 2017 Scoping Plan¹ calls on cities throughout California to adopt GHG reduction targets in line with the State regulations that will provide their fair share of GHG reductions, support California in achieving the 2030 target (SB 32), and make substantial progress towards the 2045 goal of carbon neutrality (EO B-55-18).

SB 32: The successor legislation to AB 32 requires California to achieve a statewide reduction in GHG emissions of 40 percent below 1990 levels by 2030. The SB 32 Scoping Plan was adopted in 2017.

EO B-55-18: EO B-55-18 established a new statewide goal of achieving and maintaining carbon neutrality as soon as possible and no later than 2045. Executive orders have not been codified by California but are binding for State agencies; it is therefore considered best practice for qualified GHG reduction plans to address EO B-55-18. CARB began the 2022 Scoping Plan Update in 2021 to assess progress towards the State's 2030 GHG emissions reduction target and develop a pathway to achieve carbon neutrality by 2045.

1. California Air Resources Board (CARB). (2017). *California's 2017 Climate Change Scoping Plan*. Retrieved September 20, 2021, from https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

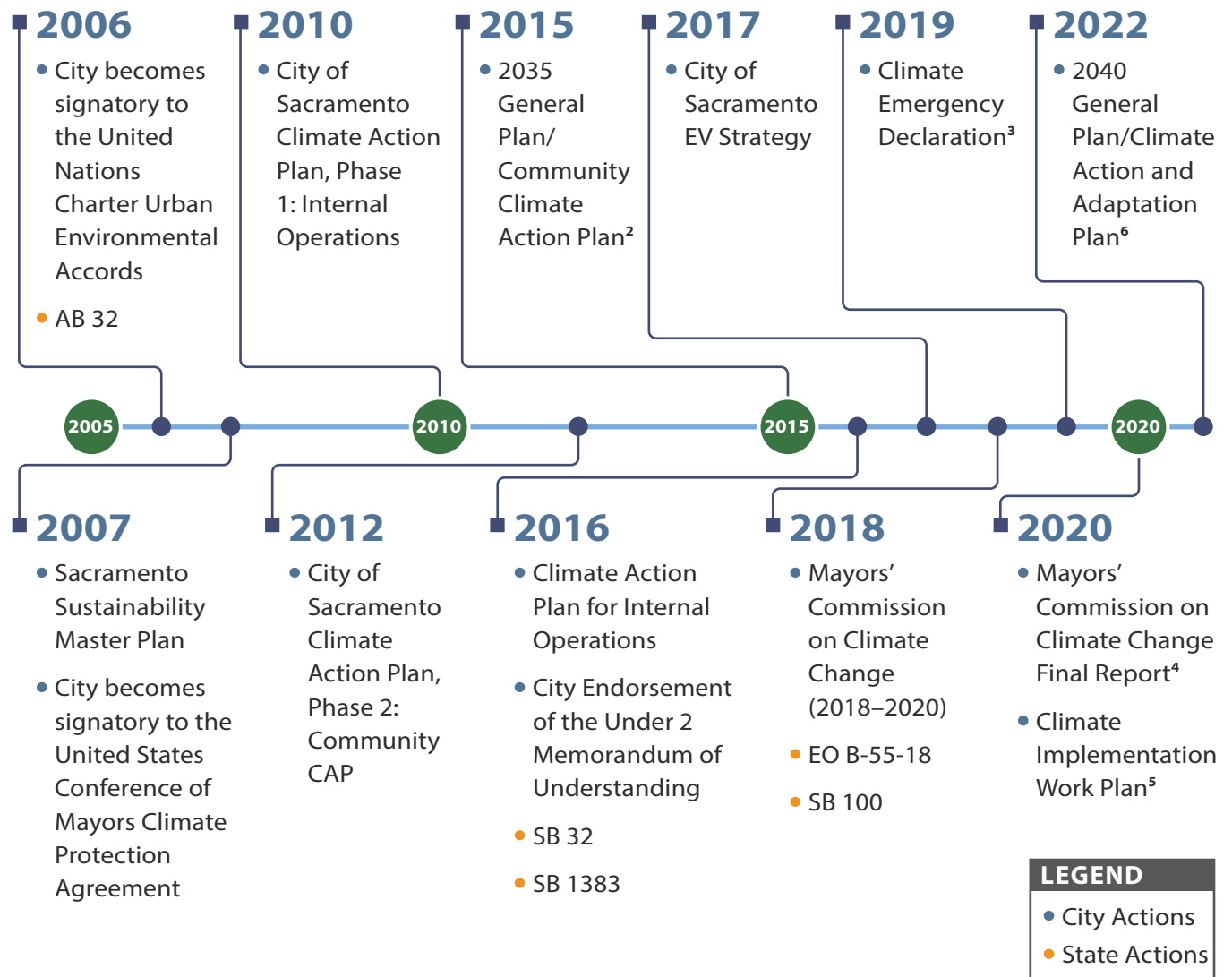


Photo by Carlos Eliason

Sacramento River at Tower Bridge



Figure 3-1. Key State and City of Sacramento Legislation



2. The Sacramento [Community] Climate Action Plan was incorporated into the 2035 General Plan and adopted by City Council on March 3, 2015. Between March 2015 and the release of this document, the [Community] Climate Action Plan did not exist as a separate document.

3. Available online: <https://www.cityofsacramento.org/-/media/Corporate/Files/CMO/Climate-Change/R2019-0465-Declaring-a-Climate-Emergency-and-Proposing-Efforts-to-Restore-a-Safe-Climate-Background.pdf?la=en>

4. Available online: lgc.org/climatecommission/

5. Available online, with links to related City documents: cityofsacramento.org/climateaction

6. 2040 General Plan/Climate Action and Adaptation Plan Update: The Climate Action and Adaption Plan includes both community GHG emissions and GHG emissions from the City's internal operations.

IPCC-Informed Targets

In addition to California’s own regulatory environment, the goal of carbon neutrality is backed by global research on climate change and the targets necessary to avoid the most serious climate change impacts. The IPCC has found that in order to limit global warming to 1.5 degrees Celsius above pre-industrial levels, the world must reach carbon neutrality by mid-century (~2050).⁷ Warming above this level is linked to catastrophic heat, drought, and impacts to ecosystems and global food production.



Sacramento’s Climate Action Targets

This CAAP establishes Sacramento’s GHG reduction target for 2030, as required by CEQA for a “qualified” GHG reduction plan and a long-term GHG reduction goal for 2045. The 2030 target and long-term 2045 goal (referred to collectively as Sacramento’s climate action targets) provide the impetus for implementation of the CAAP and its associated GHG emissions reductions. As Sacramento tracks its GHG emissions and implements the CAAP over the next 10 years, the climate action targets will provide an important point of comparison by which to measure progress and re-evaluate long-term strategies to achieve 2045 goals. Based on the current science and California’s GHG reduction legislation, Sacramento’s climate action targets are as follows:

2030 CLIMATE ACTION TARGET: Reduce Sacramento’s per capita GHG emissions to 3.63 MT CO₂e per person by 2030, equal to 63 percent below 1990 levels. In mass emissions, this equates to achieving emissions less than 2,160,128 MT CO₂e in 2030.⁸

7. Intergovernmental Panel on Climate Change. (2021). *Sixth Assessment Report*. AR6 Climate Change 2021: The Physical Science Basis. Retrieved September 20, 2021, from <https://www.ipcc.ch/report/ar6/wg1/>

8. Based on current population projections, changes to population would change the mass emissions threshold since Sacramento’s GHG reductions are based on per capita emissions. This equates to a 61 percent reduction compared to 2005 on a per capita basis.



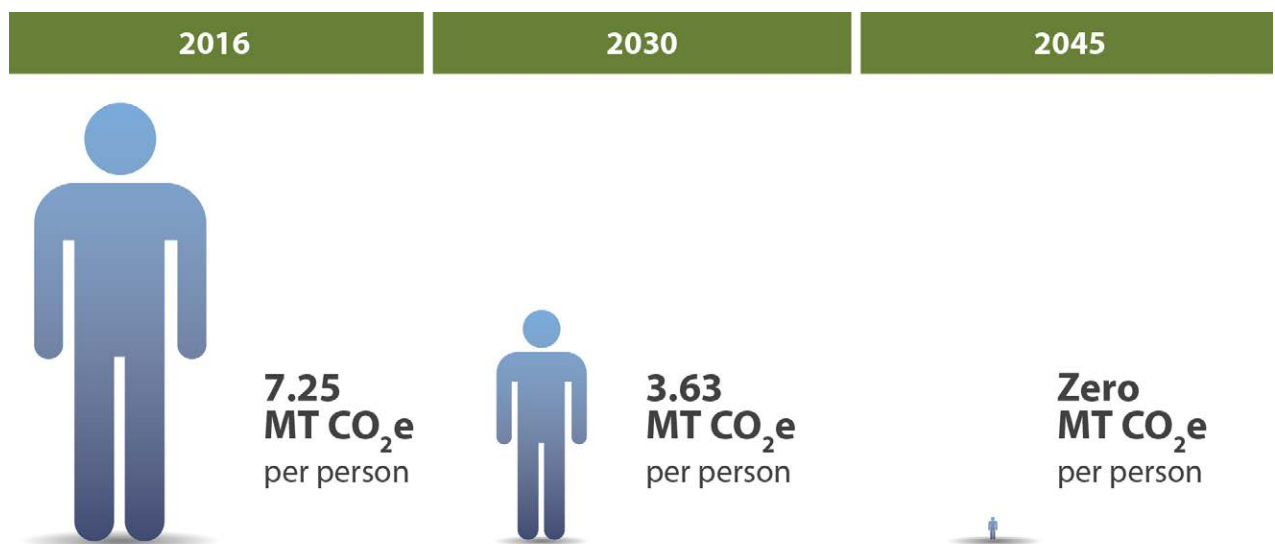
2045 CLIMATE ACTION GOAL: Reduce Sacramento’s per capita GHG emissions to net zero MT CO₂e per person by 2045, equal to 100 percent below 1990 levels.

The City of Sacramento has established a per capita target for 2030 and 2045 based on guidance provided by California’s 2017 Scoping Plan. Using a per capita emissions target means that regardless of unforeseen population changes, the City’s targets of 3.63 MT CO₂e per person and net zero MT CO₂e per person will remain unchanged. This approach allows

the City to continue to grow, while focusing on decarbonizing systems rather than limiting growth that could compromise new housing and job opportunities and potentially increase regional emissions.

Figure 3-2 shows how per capita emissions will decrease to zero by 2045. This means that even while population increases, average emissions per person will decrease due to more efficient buildings, transportation and land use, and waste management within the city.

Figure 3-2. Sacramento’s Climate Action Targets Through 2045 (per capita)

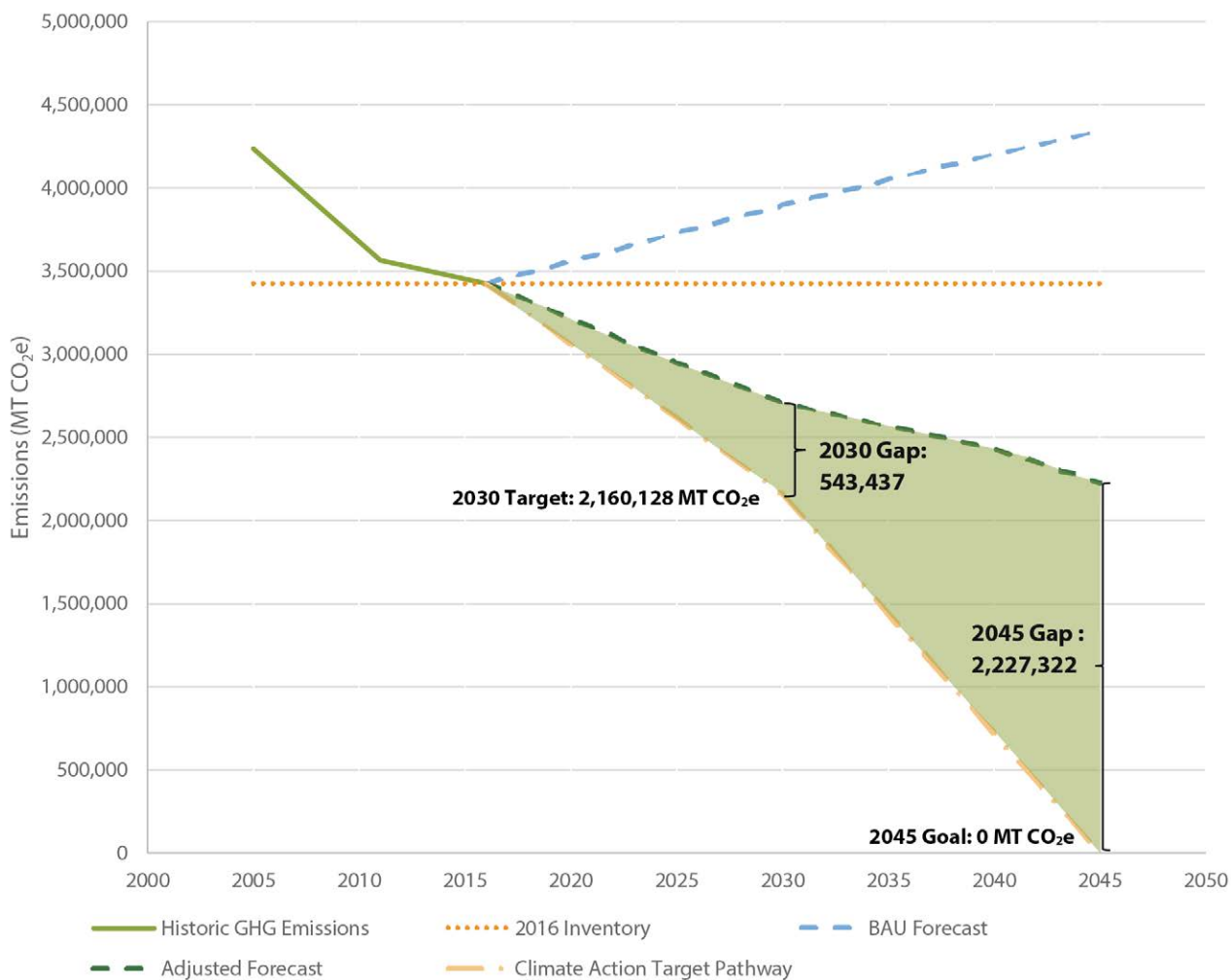


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Figure 3-3 shows Sacramento’s BAU forecast, adjusted forecast, and 2016 GHG emissions inventory, relative to the climate action targets. This figure demonstrates the estimated mass

emissions (in units of MT CO₂e) over time based on the current population projections. This trajectory may change depending on the actual growth of the city.

Figure 3-3. Sacramento’s GHG Forecast and Climate Action Targets (MT CO₂e)





As shown in [Figure 3-3](#), a gap remains between Sacramento’s projected GHG emissions in the adjusted forecast (green line) and Sacramento’s climate action targets (yellow line). The gap represents the GHG emissions to be reduced by the measures and actions contained in this CAAP, as detailed in [Chapter 6](#). Based on these projections, the City of Sacramento must close a gap of 543,437 MT CO₂e by 2030 in order to achieve its GHG reduction targets. The CAAP is

focused on achieving the 2030 target of 3.63 MT CO₂e per person (50% below 2016 per capita emissions levels) and making substantial progress toward achieving the 2045 carbon neutrality goal. While this CAAP provides a pathway to achieve the 2030 target, as presented in [Chapter 5](#), additional State legislation, new technologies, and innovative approaches will be needed to achieve carbon neutrality city-wide by 2045.



Second Saturday Dancing



COMMUNITY ENGAGEMENT



Community Informed Plan

This CAAP was driven by community input through multiple years of outreach and engagement conducted as part of the 2040 General Plan Update (2040 General Plan)/CAAP. Community engagement by the Mayors' Commission on Climate Change was conducted in a parallel process, which also helped to shape the CAAP. Community support and collaboration are key to developing a successful CAAP, as well as implementing the plan over time. Furthermore, the CAAP development process generated a large amount of community interest, because climate change is a global issue that will have direct impacts on the local

community. To help guide community input through the planning process, the goals associated with outreach and engagement were broken into four phases.

PHASE 1 - ISSUES/OPPORTUNITIES: The focus of the first phase of community outreach was on identifying and understanding the issues and opportunities that needed to be addressed in the 2040 General Plan/CAAP.

PHASE 2 - OPTIONS AND ALTERNATIVES: During the second phase of outreach, the project team engaged (mostly virtually) with the community to develop GHG reduction measures, a Draft Land Use Map, Proposed Roadway Changes, and Key Strategies that are responsive to challenges in the coming years and to implement the adopted 2040 Vision and Guiding Principles.

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PHASE 3 - DRAFT PLAN PREPARATION:

Release for public review of the Draft CAAP and Draft 2040 General Plan.

PHASE 4 - FINAL PLAN ADOPTION:

Gain decision-maker support and approval for the 2040 General Plan/CAAP.

In order to reach a wide audience from all parts of Sacramento’s diverse community, the City employed a suite of outreach and engagement strategies. These included multiple iterations of in-person workshops, pop-up events, working groups, virtual workshops (available in English, Spanish, and Chinese), and a scientific survey. The graphic below shows key engagement events which fed directly into the CAAP and General Plan.¹ Out of these many and varied events, the primary outreach events that provided feedback specific to the CAAP were the citywide workshops, youth engagement and workshops, Environmental Justice Working

Group (EJWG), interest-based focus groups, and scientific surveys. The following sections highlights the results of each of the primary outreach events and discusses how this feedback was directly reflected in the CAAP’s goals and strategies.

ESTIMATED COMMUNITY PARTICIPANTS

- **CITYWIDE WORKSHOPS:**
1,139 households
- **SCIENTIFIC SURVEY:**
504 participants
- **COMMUNITY PLAN AREA WORKSHOPS:**
236 households
- **OTHER OUTREACH:**
approximately 300 participants

Figure 4-1. Key Engagement Events for the CAAP and General Plan



1. A calendar of all outreach events can be found on the City’s website: <http://www.cityofsacramento.org/-/media/Corporate/Files/CDD/Planning/General-Plan/2040-General-Plan/Outreach-TimelineWorking-Document-PHASE-II-081120.pdf?la=en>



Citywide Workshops

Each of the four citywide workshops completed as part of Phase 1 had seven staffed stations where community members could learn about the 2040 General Plan/CAAP and provide input to guide Sacramento’s future. Several of these stations covered topics related to climate action and adaptation and provided the community with an initial opportunity to influence the direction of the plan and provide suggestions for the measures and actions that should be included by noting their interest and ideas around key GHG reduction strategies such as building electrification and EVs. Throughout the workshop, community members were able to move between the stations, ask questions, and provide feedback to the City and consultant team related to each of the station topics for review and integration into the plan.

At the climate change station, one display board introduced the concept of climate change with infographics and graphs to display information, including the city’s GHG emissions trends over time compared to the State’s GHG emission reduction goals, a graph depicting Sacramento’s GHG emissions by sector, and details about rebate programs and incentives currently available from SMUD for electrification of vehicles and homes. A second board included a map of climate change hazard risk areas, such as flooding, wildfire, drought, and extreme heat, with a brief summary of the various impacts.

Table 4-1. Citywide Workshop Demographics

Ethnicity	
Hispanic or Latino	38
Not Hispanic or Latino	81
Race	
American Indian or Alaskan Native	9
Asian	31
Black or African American	107
Native Hawaiian or Other Pacific Islander	2
White	175
Other	3
Disability	
Yes	9
No	103
Age	
Under 40	75
Over 40	97

Out of 344 total responses. Not all questions were answered by every community member.

Respondents provided answers to the climate change questions using sticky notes. Based on the results of the community input, most respondents (84 percent) support electrification if it does not increase costs and the functionality that respondents currently have is maintained ([Figure 4-2](#)). For EVs, 64 percent of respondents noted a lack of charging infrastructure as a major hurdle to ownership ([Figure 4-3](#)). This concern was recognized, and the EV strategy discussed in [Chapter 6](#) aims to increase charging infrastructure to alleviate this

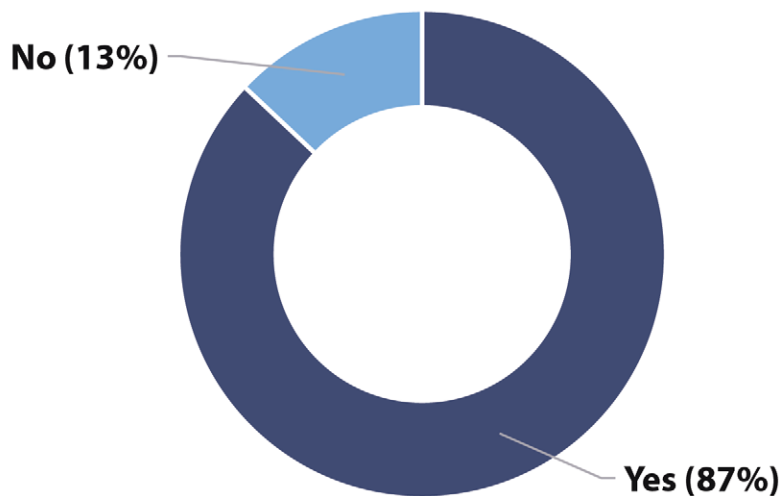
CLIMATE ACTION & ADAPTATION PLAN

hurdle. The community also provided ideas for how to protect the most vulnerable citizens in Sacramento from the climate vulnerabilities discussed in *Chapter 1* of the CAAP. Ideas such as weatherization programs for low-income and rental properties, tree planting to adapt to

extreme heat events, and rebates for improving home air filtration were provided by the community and impacted the development of the CAAP strategies, measures, and actions. The results are summarized in *Figure 4-4*.

Figure 4-2. Community Feedback on Home Electrification²

Would you consider converting your home to all-electric appliances if they don't cost you more and function as well as gas appliances?



2. This figure represents the results of a survey and is not statistically representative of the Sacramento community at-large.



Figure 4-3. Community Feedback on EVs³

What, if anything, prevents you from converting to a plug-in EV? Please select all that apply.

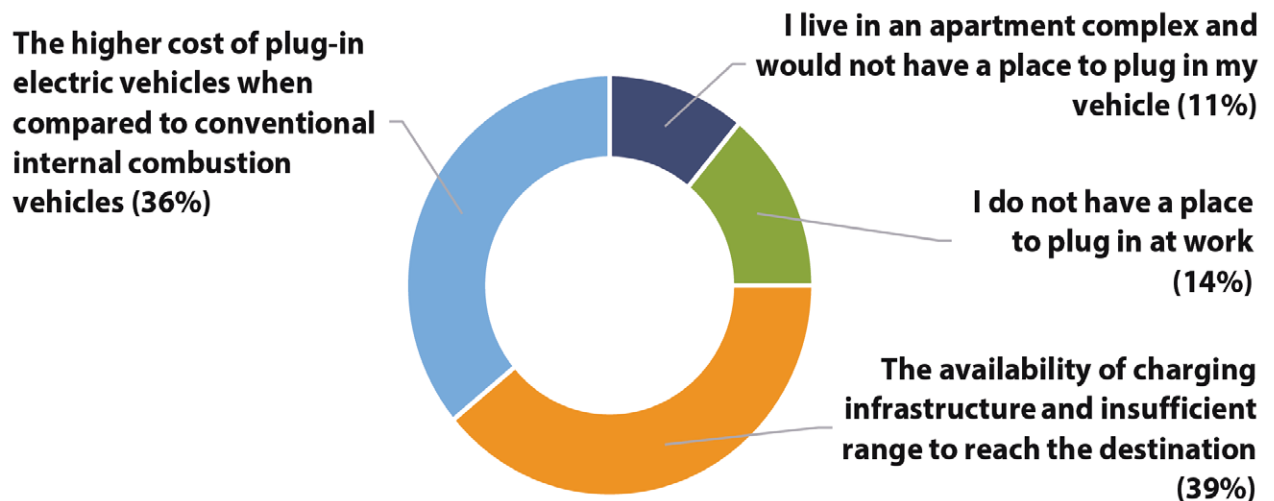
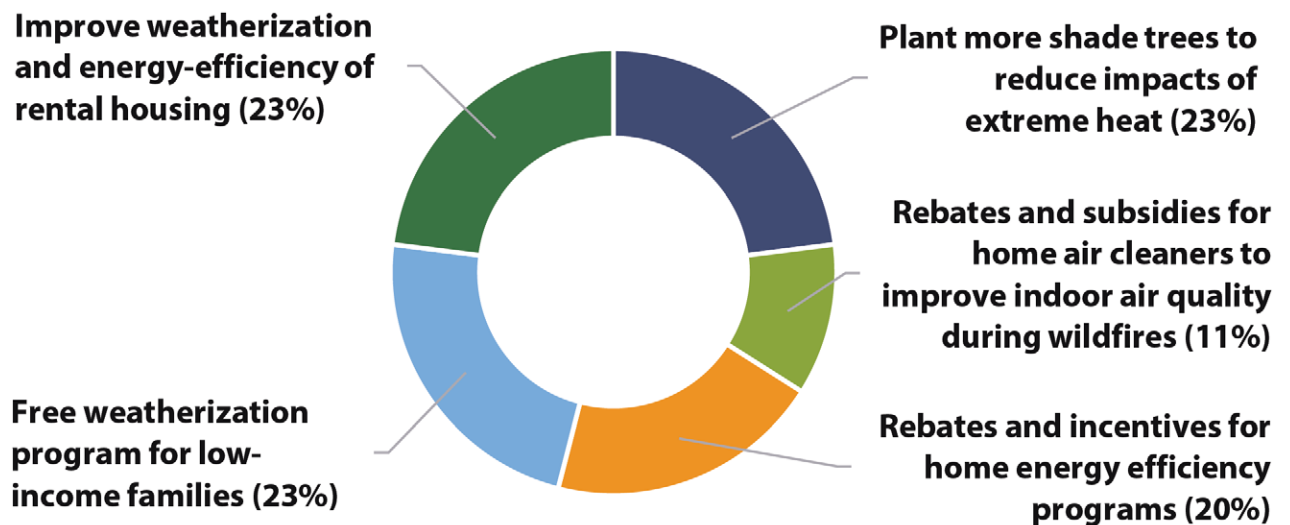


Figure 4-4. Community Feedback on Climate Change Impacts⁴

How should we respond as a community to reduce impacts of climate change on our most vulnerable citizens (elderly, disabled, children, and low-income families)?



3. This figure represents the results of a survey and is not statistically representative of the Sacramento community at-large.

4. This figure represents the results of a survey and is not statistically representative of the Sacramento community at-large.

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Climate change and sustainability-related ideas were also provided in other sections of the workshops and integrated into the CAAP development. For example, when asked what makes a community truly livable, 33 percent of participants said, “an environment that feels healthy, with clean air, clean water, and ample access to parks, trees, and other green space.” Another 31 percent said, a “community that is well-connected; walking and biking are easy because almost all key stores and services can be found within walking distance.” A word cloud developed by community members from the Pocket Community Plan Area during a plan area meeting echoes these themes. Key concepts depicting their vision for the future of their community include a more accessible (e.g.,

walkable, bikeable), sustainable (e.g., clean air, green), environmentally and socially just (e.g., diverse, cohesive, affordable), and adaptable (e.g., resilient, protected, safe, secure, and connected) neighborhood.

33%

of workshop participants indicated that “An environment that feels healthy, with clean air, clean water, and ample access to parks, trees, and other green spaces” is the key to a truly livable city.





Youth Engagement and Outreach

Through pop-up workshops, summer programs, and classroom presentations, the City encouraged the younger generation to be active members of their community by providing equitable opportunities, while also collecting valuable input that helped shape the 2040 General Plan and CAAP. To gain feedback from the youth representatives and their communities, the Sacramento 2040 General Plan Team developed and implemented a 3-month-long Summer Youth Engagement Program consisting of five youth representatives from the following Sacramento organizations:

- La Familia Counseling Center
- Green Tech Education and Employment
- Asian Resources, Inc. (ARI)

The youth representatives embarked on a mission to engage their peers in a discussion around what Sacramento can do and what

the City's CAAP can incorporate to address the evolving issues around climate change. Through development of an informational video and online questionnaire, the youth representatives helped to inform the early planning process of the 2040 General Plan and CAAP. The video was produced, shot, and edited by the youth representatives, and features seven Sacramento-elected officials and subject matter experts including:

- Mayor Darrell Steinberg | City of Sacramento
- Councilmember Jay Schenirer | City of Sacramento, District 5
- Jose Bodipo-Memba | Director of Sustainable Communities, SMUD
- Ryan Moore | Interim Director, City of Sacramento Public Works
- Jennifer Donlon Wyant | Transportation Planning Manager, City of Sacramento Public Works
- Ryan Gardener | Environmental Project Manager, Rincon Consultants
- Paul Trudeau | Program Manager, Green Tech Education and Employment



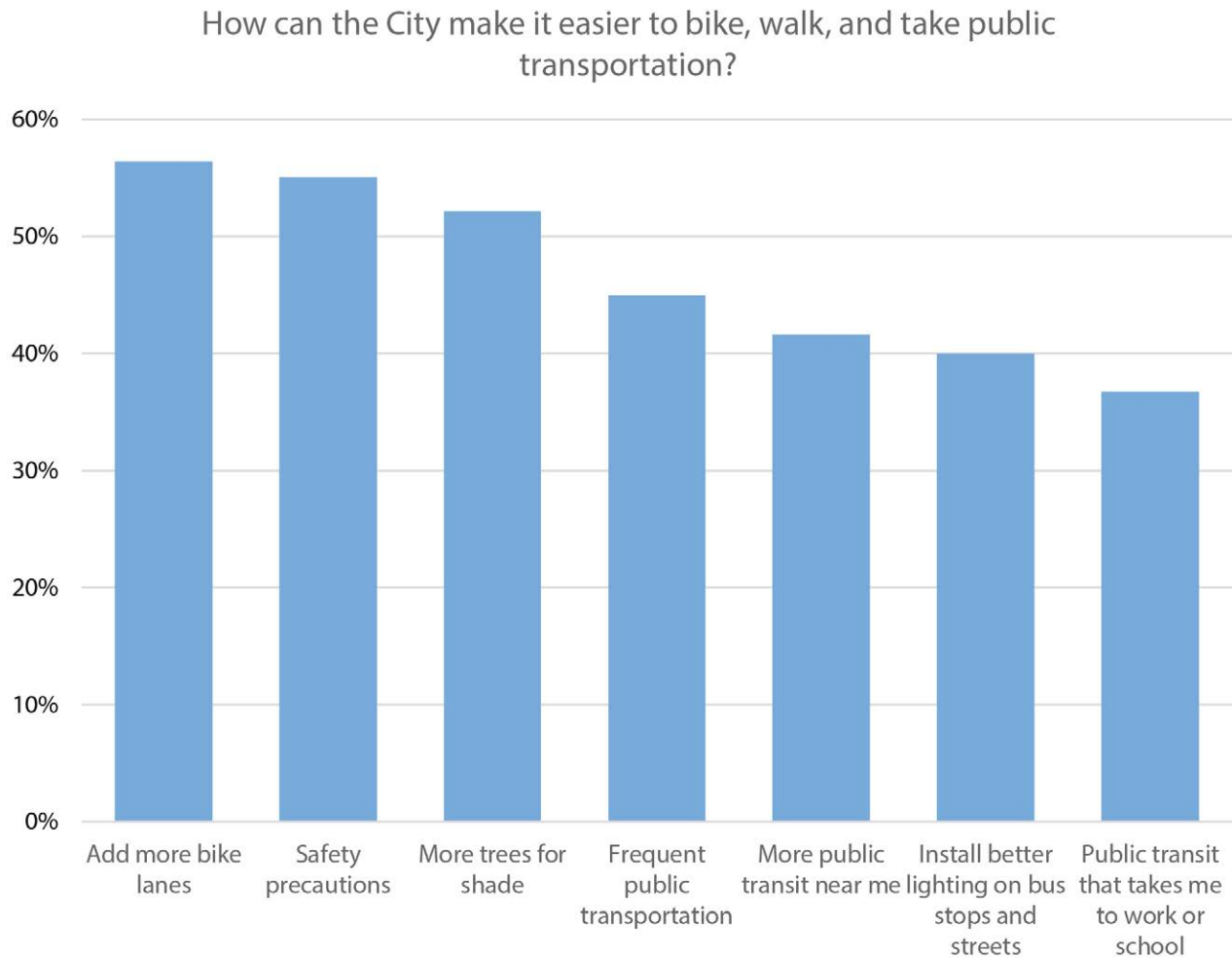
Hot Spot, South Natomas

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In addition to the video, students conducted their own surveys of family and friends to better understand the opportunities and hurdles around climate action and adaptation in the city. All together, they collected feedback from more than 300 Sacramento residents. The students provided grass-roots feedback on

topics like renewable energy, transportation, and overall sustainability. These responses were considered when developing the strategies, measures, and actions in the CAAP. The results of one of the youth survey questions on active transportation are shown in [Figure 4-5](#).

Figure 4-5. Youth Feedback on Active Transportation and Transit⁵



5. This figure represents the results of a survey and is not statistically representative of the Sacramento community at-large.



Equitable Engagement

The City of Sacramento understands that no community should be left behind nor bear a disproportionate burden as new climate action policies and programs are instituted. This applies specifically to communities in Sacramento that have been historically marginalized. These communities are not only the most vulnerable to the impacts of climate change due to below-average housing options, previous land use decisions, and other resource limitations, but also unfairly impacted by the policies and programs put in place to address climate change. The City will have equity protections in place to avoid unintended impacts from policies and programs to address climate change.

ENVIRONMENTAL JUSTICE WORKING GROUP

As part of the 2040 General Plan, the City adopted a new Environmental Justice (EJ) element to help Sacramento address community issues in equity and disproportionate exposure to environmental issues, as well as to develop and facilitate ongoing, robust community engagement to ensure that all community members are included as part of the conversation moving forward. A key EJ principle actively

involves the communities most impacted by climate change and other environmental problems in the public decision-making processes that can impact health, access to resources, and well-being. To support this effort, the City convened the EJWG comprised of community leaders, advocates, and community-based organizations (CBO) currently serving Sacramento's communities to provide feedback on the 2040 General Plan and CAAP development process, including the key strategies, measures, and actions. The following organizations were involved in the EJWG:

- WALKSacramento
- Sacramento Food Policy Council
- Sacramento Housing and Redevelopment Agency
- Sacramento Area Congregations Together
- Health Ed Council
- Sacramento Lesbian Gay Bi and Trans (LGBT) Community Center
- AB617
- CalEPA Department of Toxic Substances Control
- Mutual Assistance Network
- Sacramento County Public Health
- Twin Rivers/Mutual Assistance
- Sacramento Area Council of Governments
- United Latinos
- Department of Human Assistance
- AT Valdez Foundation/United Latinos
- Sacramento Metropolitan Air Quality Management District

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As part of this process, the EJWG reviewed a draft list of the CAAP measures and actions and convened two workshops in November and December of 2019 to provide their input and expertise in assessing the proposed measures and their potential impacts on equity. Specifically, the group was asked to aid in identifying any potential co-benefits, unintended consequences, or refinements that could mitigate those consequences. The feedback from the group was then analyzed by the CAAP team and integrated into the list of measures and actions in [Chapters 5 and 6](#). A list of key equity considerations were used to frame the discussion:



- 1. Disproportionate impacts and accountability:** Does the proposed action generate burdens (including costs), either directly or indirectly, to disadvantaged communities? If yes, are there opportunities to mitigate these impacts? Are there appropriate accountability mechanisms to ensure equitable benefits and avoidance of burdens?
- 2. Shared benefits:** Can the benefits of the proposed action be targeted in progressive ways to reduce historical or current disparities?
- 3. Accessibility:** Are the benefits of the proposed action broadly accessible to households and businesses throughout the community—particularly communities of color, low-income populations, minority, women, and emerging small businesses?
- 4. Engagement and relationship building:** Does the proposed action engage and empower disadvantaged communities in a meaningful, authentic, and culturally appropriate manner? Does the action foster building of long-term trust between communities and local government?
- 5. Capacity building and opportunity:** Does the proposed action help build capacity among disadvantaged communities through funding, an expanded knowledge base or other resources (such as workforce development, contracting opportunities, or increased diversity of program or organization staff)?
- 6. Alignment and partnership:** Does the proposed action align with and support disadvantaged community priorities, creating an opportunity to leverage resources and build collaborative partnerships?



EJWG RESULTS

The EJWG reviewed the draft measures and actions for key sectors including buildings, sequestration, and transportation during the two working group meetings. The following section outlines the primary feedback provided by the EJWG that was used to develop the final CAAP strategies. This feedback was reviewed by City staff and integrated into the

CAAP's measures and actions discussed in [Chapters 5 and 6](#). For measures that are critical to meeting the 2030 and 2045 GHG climate action targets but that could include equity impacts (such as electrification), specific additional actions were included with the measures to help mitigate impacts, such as dedicated programs for disadvantaged communities and specific direction to ensure equitable access to investments.



Community Members at Boards Station



New Del Paso Heights Sports Complex (Measure U)

Equity Concerns in City Buildings

The building sector measures predominantly focus on building electrification, energy efficiency, and carbon-free electricity to decarbonize the sector. It was recommended that any building-related measures avoid exacerbating displacement, which could occur as a result of housing-related investments. It was also suggested that opportunity exists to include health outcomes and health disparities around class and race. In addition to anti-displacement measures, racial impact assessments were discussed as tools to improve equity.

Key Equity Concerns

- Landlords might pass down expenses that arise from a building electrification ordinance for

existing buildings to tenants. Accompanying rent increase restrictions were suggested as a measure that might lessen this impact.⁶

- Low-income retrofits and assistance were mentioned as resources provided by several CBOs, some of which were partly funded by SMUD. However, the difficulty in applying for these programs was discussed, especially for lower income people who may not have enough savings to qualify or the time to physically apply and track the progress of the application.
- A question was posed on how people could be allowed to be self-sufficient and reduce reliance on energy providers. SMUD's new rules on net-energy metering surplus (excess energy) reimbursement for solar panels were also discussed as an example of how people could recoup solar investment costs.

6. An effort to develop an equitable Existing Building Electrification Strategy for the City is underway that will address these issues more directly.



Sequestration and Food Waste

Carbon sequestration measures/actions, such as tree plantings and food waste diversion measures/actions, such as edible food rescue were also discussed during the workshops. It was recommended that the City partner with existing community organizations to plant trees and that financial assistance may be needed for lower income individuals to cover the increased cost of deep-watering trees, especially during times of drought.

Key Equity Concerns

- Funding and financing strategies are needed to help protect low-income and disadvantaged communities from increased tree maintenance costs and increased waste disposal costs.
- It was noted that streets in lower income communities often do not have sufficient room to plant street trees, but that complete

streets measures may be able to help address this when certain site conditions are present.

- Reducing food waste through compost and food recovery was also discussed, in addition to tax incentives for and procurement from farmers who sequester carbon in soil. This could be an equity co-benefit if historically disadvantaged farmers or business owners were included.
- It was noted that tree planting opportunities could consider fruit trees as a way to increase food access, as well as drought tolerant/climate resilient trees.
- It was noted that tree survival rates were important to consider. It was suggested that tree maintenance and stewardship would be crucial to ensure increased canopy in lower income communities, with consideration of maintenance cost (e.g., water costs for deep watering) and who bears that cost.



Sacramento Community Garden

Transportation

Transportation was another key area where both significant opportunities and hurdles were identified. Participants noted the potential negative impacts of improved mobility and transit options, such as increased costs and displacement of disadvantaged communities as the result of a changing transportation landscape. A need to focus on historically marginalized communities for investment was identified as a key part of developing more equitable mobility in the city.

Key Equity Concerns

- The need for pairing active transportation and transit options with anti-displacement policies was mentioned as a consideration so investments do not inadvertently price-out lower income groups or renters.
- It was noted that as written, measures for mobility and active transportation do not have any sort of prioritization for historically marginalized communities. When investments are

being prioritized, it is important to address historic gaps in the transportation network that affect marginalized communities.

- There was also discussion about the co-benefits of transportation measures and impacts to schools. From an equity perspective, a student’s ability to get to school has implications for educational attainment and other important health indicators.
- The importance of storytelling was emphasized in disadvantaged communities, and it was noted that trusted ambassadors would be needed to communicate the benefits of new transportation infrastructure in a culturally competent manner.
- It was also noted that while bicycle-friendliness and new infrastructure was a citywide focus, it is still not safe to ride bikes in many communities and that existing infrastructure needs to be addressed. Additionally, the need to address active transportation in the City’s Transportation Priorities Plan rather than as a separate plan was discussed.



Active Transportation in Sacramento.



Interest-Based Focus Group

In early 2020, the City of Sacramento held an interest-based focus group meeting to discuss key draft strategies that could be the most impactful in reducing GHG emissions. The discussion topics focused on key “big and bold” GHG reduction strategies, such as electrification of new buildings, prohibition of new gas lines, elimination of parking minimums, and requirements for EV charging spaces. The focus group provided an opportunity for key interested groups and partners to provide feedback on specific measures, as well as suggestions for the City to take into account when crafting the actions that would guide implementation. This created an opportunity for the focus group to provide feedback to the City to help illuminate the tradeoffs of these key GHG reduction strategies and how they benefit or impact the community. Seventeen representatives from the following organizations were in attendance at the focus group.

FOCUS GROUP ATTENDEES

- 350 Sacramento
- Association of Sacramento Realtors
- Land Park Neighborhood Association
- North State Building Industry Association
- Sacramento EV (SacEV)
- Sacramento Regional Transit
- Sierra Curtis Neighborhood Association
- Sacramento Municipal Utility District (SMUD)
- American Planning Association
- California Air Resources Board
- Local Government Commission
- Resources for Independent Living
- Sacramento Metropolitan Air Quality Management District
- Sacramento Tree Foundation
- Upper Land Park Neighborhood Association

After a presentation on the current GHG inventory, the projected emissions forecast, and the GHG reduction targets established by the State of California and the Mayors’ Commission on Climate Change, interested group representatives were asked to provide their input on a series of questions for each proposed action:

- What do you see as potential barriers to implementing this action?
- Are there concerns about any of the actions the planning team should consider?
- Do you foresee this action impacting your industry or community? If yes, how?
- Do you have any questions about this action?

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Curtis Park Court

Several themes emerged from the discussion, particularly around potential equity impacts to lower income communities and renters, as well as development feasibility. Highlights from the energy and electrification sector discussion include the following:

- The natural gas industry could present a barrier for implementing an ordinance requiring building electrification.
- Subsidy programs would need to continue to offset the additional costs of replacing gas appliances with electric ones, especially for lower income families and renters.
- Interested groups advised the City to be mindful of potential impacts that the proposed actions could have on the real estate industry and potential home sellers.
- Opportunities should be explored to engage with the restaurant industry to help with the transition from gas to electric appliances.
- The City should ensure that all their permit requirements and processes are consistent before implementing and enforcing a permit compliance program.

During the discussion on the Mobility Element, key themes emerged focused on the following:

- Increasing Sacramento’s EV charging capacity
- Improving public transit to make it a viable option for residents
- Enhanced active transportation and transit options to help community members become less dependent on their personal vehicle
- Pricing mechanisms in employment centers as one of the most effective ways to reduce car-based commutes

The feedback gained from the focus group meeting was integral in shaping both the overall approach to these key measures, as well as the specific actions that will drive implementation over time.



Scientific Survey Results

As part of the 2040 General Plan, Goodwin Simon Strategic Research conducted a survey of Sacramento residents to identify perspectives and preferences about public policy issues that may be addressed in the City’s 2040 General Plan and CAAP. Conducting a scientific survey provided the City with a statistically significant sample of Sacramento residents from which to understand overall sentiments regarding several key issues. Over 500 surveys were completed by Sacramento residents using an address-based sampling methodology derived from a list of 7,000 randomly generated Sacramento residential mailing addresses. The survey covered a wide range of topics including overall importance of addressing climate change, as well as thoughts regarding potential GHG reduction measures, including transit and electrification. For example, over 57 percent of residents surveyed support the use of redesigning some

of Sacramento’s streets to use additional road space for bus-only lanes, bike lanes, and better pedestrian infrastructure (*Figure 4-6*). This feedback directed the City to continue to focus not only on transit-related measures in the CAAP, but also on prioritizing bike, pedestrian, and transit lanes throughout the city in the 2040 General Plan. On the topic of electrification, over 65 percent of Sacramento residents surveyed supported the electrification of all new buildings, and 63 percent supported the electrification of all existing buildings over the next 20 years (*Figure 4-7*). Based on this feedback and direction from the Mayors’ Commission on Climate Change, the City moved forward with electrification strategies that will provide the City of Sacramento with a strong foundation to achieve carbon neutrality by 2045.

53%

Number of respondents who listed addressing climate change as a very high priority.



Solano Wind Project

CLIMATE ACTION & ADAPTATION PLAN

Figure 4-6. Scientific Survey Feedback on Transit

To improve transit reliability, make walking and biking safer, and reduce reliance on private vehicles, would you support or oppose redesigning some of Sacramento's streets to use some of the road space for bus-only lanes, safer bike lanes, and better crosswalks and sidewalks?

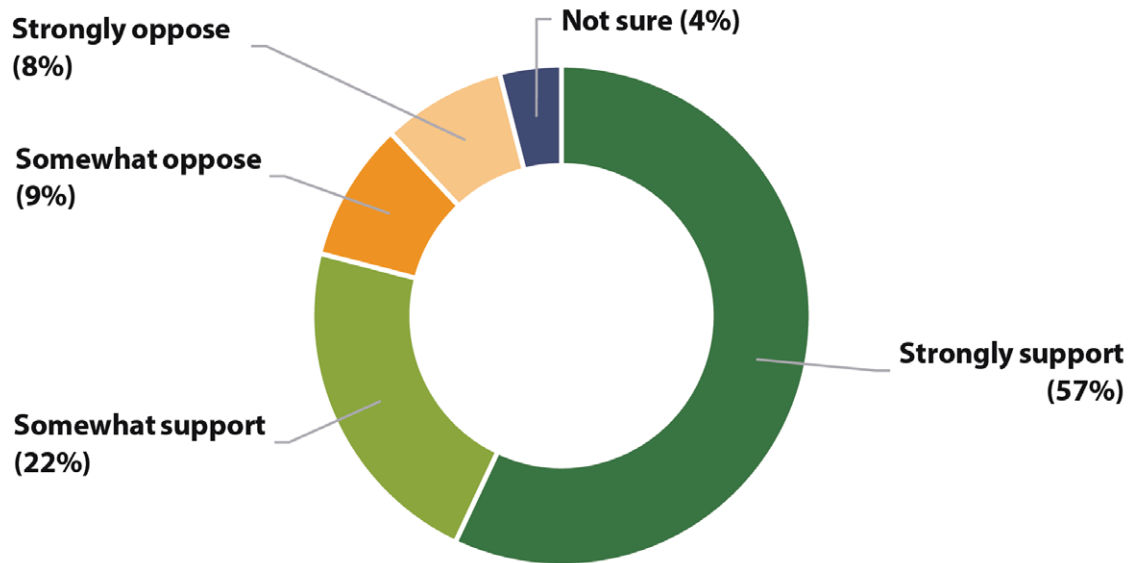
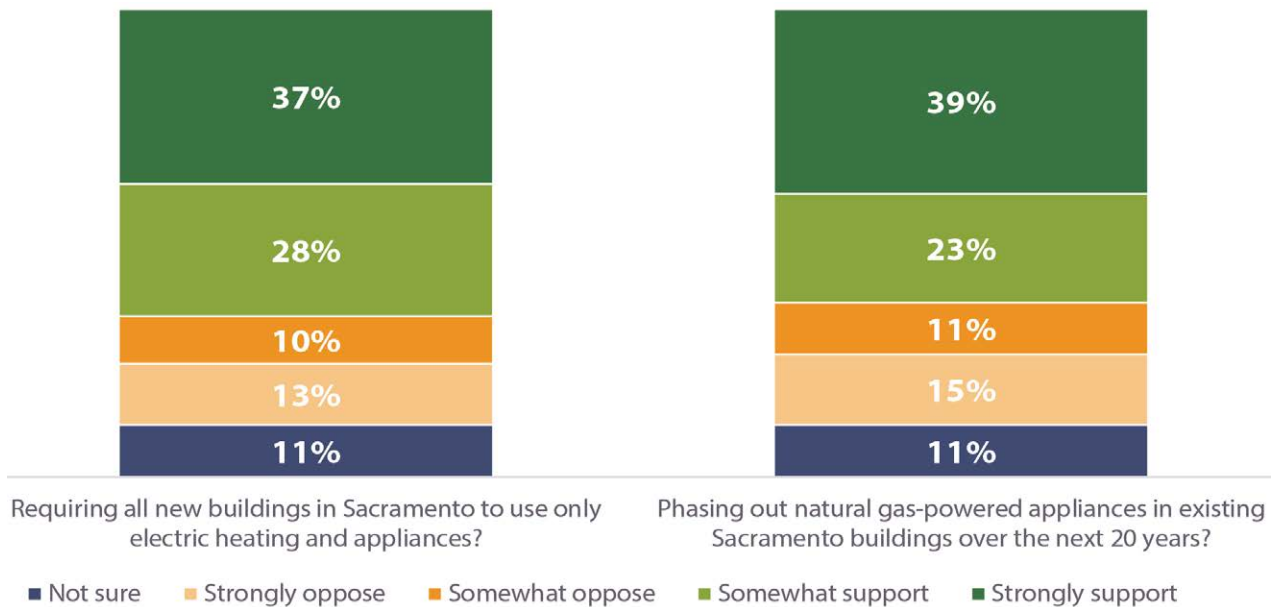


Figure 4-7. Scientific Survey Feedback on Electrification





Integrating Feedback

The extensive ideas and feedback gained throughout the outreach and engagement process has been reviewed and integrated into both the CAAP and 2040 General Plan. Policies from the Mayors' Commission on Climate Change, visions for the community from neighborhood workshops, the need for urgent action to create meaningful and tangible change, and the equity concerns highlighted by the EJWG were taken into consideration when developing the measures and actions found in [Chapters 5 and 6](#). However, these community discussions will not be the last opportunities for community members to shape the future of climate action in the city. As the CAAP is implemented and lessons are learned, updates to the CAAP will be made. New technologies, best practices, and climate impacts will continue to shape the look and feel of Sacramento and drive the implementation of the CAAP forward.

ENVIRONMENTAL JUSTICE COLLABORATIVE GOVERNANCE COMMITTEE (EJCGC): In June 2020, the Mayors' Commission on Climate Change formally recommended the establishment of the EJCGC, facilitated by the cities but led by the community to support marginalized communities, particularly communities of color and youth, in owning and shaping environmental solutions. While not convened specifically to provide input on the CAAP, the EJCGC is a community-based effort to advance EJ and build community capacity, working in partnership with the City. The EJCGC first convened in early 2021 and was involved in feedback on the Draft CAAP. The City will continue to engage the EJCGC during implementation of the Final CAAP. At the time of CAAP development, the EJCGC included 16 committee members, who provide diverse representation of Sacramento in terms of age, race, gender, and lived, personal and professional experience. Learn more at <https://www.sacej.org/>.



GHG REDUCTION STRATEGY



This CAAP contains measures and actions that together close the gap between Sacramento’s projected 2030 GHG emissions and its 2030 target and make substantial progress towards achieving the 2045 goal of carbon neutrality ([Table 5-1](#)).¹ The CAAP’s measures and actions were developed with extensive input from residents, community stakeholders, partners like SMUD and Regional Transit, and direction from the Mayors’ Commission on Climate Change, as detailed in [Chapter 4](#). Each measure was further evaluated for equity impacts by

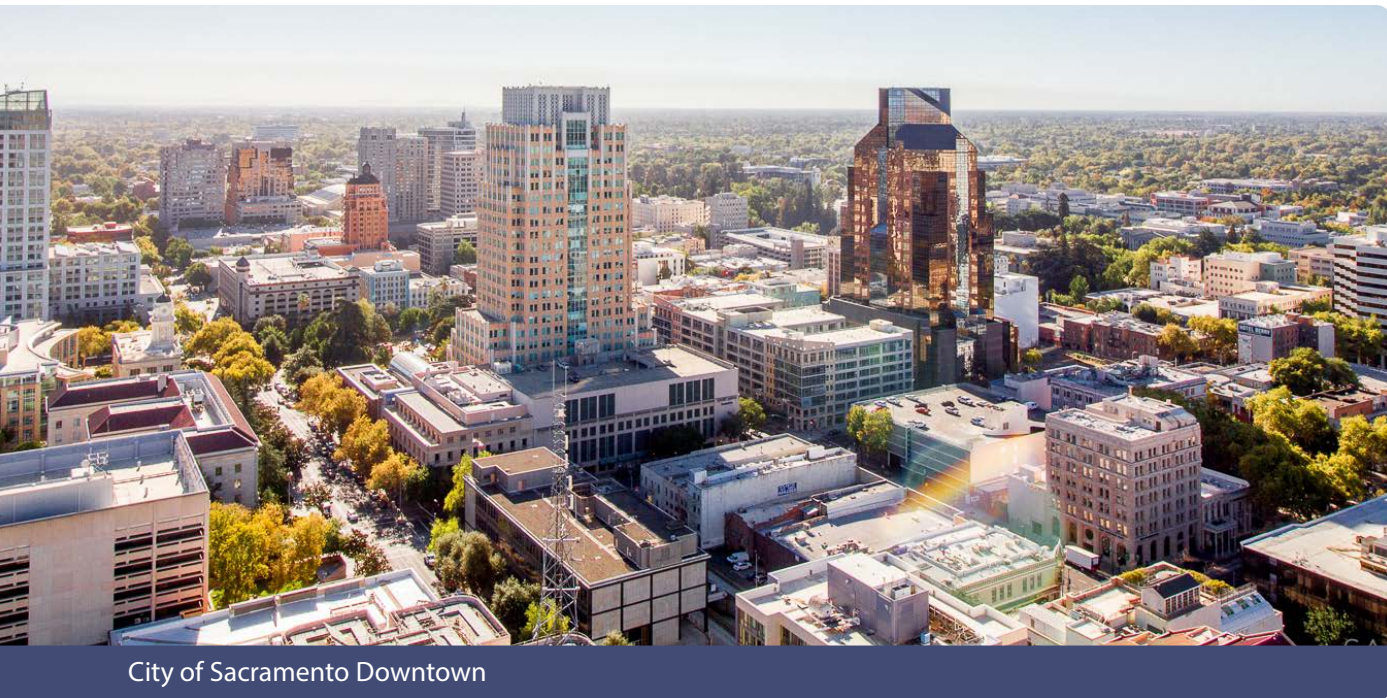
the Environmental Justice Working Group for the 2040 GPU. Based on this feedback, additional resources and programs were identified and included to support just outcomes. This chapter provides an overview of the strategic framework for the CAAP measures and actions, the related co-benefits, and how they work together to transition Sacramento to a climate neutral future. Additional details, including specific actions for each measure, can be found in [Chapter 6](#).

1. While achieving carbon neutrality by 2045 is the City’s long-term goal, getting to carbon neutral will require new technologies and legislative action from the State and federal government. Subsequent updates to this CAAP will identify additional GHG emissions reductions for the City to achieve carbon neutrality.

CLIMATE ACTION & ADAPTATION PLAN

Table 5-1. CAAP Adjusted Forecast Summary

Forecast Scenario	2030 GHG Emissions (MT CO ₂ e)	2045 GHG Emissions (MT CO ₂ e)
Adjusted Forecast	2,703,565	2,227,322
CAAP Reductions	-1,235,034	-2,060,976
Built Environment	-733,205	-537,089
Mobility	-331,995	-1,289,999
Waste	-134,991	-160,897
Water & Wastewater	-11,791	-11,517
Carbon Sequestration	-23,053	-61,474
CAAP Adjusted Forecast (Adjusted – CAAP Reductions)	1,468,531	166,345
Target Pathway	2,160,128	0
Remaining Gap to Target	-691,597	166,345





Measures and Actions Structure

Measures are specific, data-driven opportunities for reducing GHG emissions, which, when fully implemented, will allow the City to achieve its climate action targets and a variety of co-benefits. Measures were developed for each GHG emissions sector to address the specific GHG-generating activities (identified in [Chapter 2](#)) that contribute to Sacramento’s GHG emissions profile. Each measure is supported by a suite of actions, which are the implementable steps that Sacramento will take to achieve the measure goals. All actions supporting a measure, when taken together, produce a holistic approach to promoting change and achieving the metrics for success identified for each measure. The lessons learned through the development and implementation of the City’s previous CAP in 2012 have been key in developing a set of pillars that significantly improve the implementation and equity of climate action. Each action included in the CAAP was developed to support at least one of the following pillars of climate action:

- Produce measurable GHG emissions reductions
- Support information gathering for improved measure implementation (e.g., feasibility studies, pilot programs)
- Coordinate with local partners to support equitable distribution of new employment opportunities for the community in the areas of renewable energy, electrification, waste management, and new technology development and deployment
- Achieve just outcomes and avoid unintended impacts on under-resourced communities through human-centered design and engagement and the development of new resources and programs specifically for low-income communities
- Foster and equip community education, outreach, and leadership for CAAP implementation
- Partner and leverage resources to maximize impact with local organizations and agencies, with the understanding that some groups within Sacramento are better positioned than the City to implement some of the CAAP’s climate actions
- Ensure accountability through tracking, monitoring, and reporting

Measure Strategy Summary

The strategies for the CAAP measures and supporting actions vary sector by sector and in general, continue many of the themes from the previous CAP. The four top GHG reduction measures of the CAAP, however, are driven by a new over-arching strategy that leverages electricity procurement transitions by SMUD (which currently offers 70 percent carbon-free electricity to the community and is anticipated to offer 100 percent carbon-free electricity by 2030). This new strategy aims to electrify transportation and the built environment to allow clean energy to replace fossil fuel-powered appliances and vehicles over the next 24 years.

The City of Sacramento is committed to achieving carbon neutrality by 2045. The measures in this CAAP were developed to build a strong foundation for achieving carbon neutrality by the target date. The CAAP includes a specific schedule for future CAAP updates to make iterative course corrections as part of the Implementation and Monitoring Plan in [Chapter 8](#). Full implementation of the measures and action in this CAAP is expected to exceed both the State's SB 32 target and Sacramento's 2030 climate action target in 2030. However, due to the uncertainty of future technologies and legislation, this CAAP does not attempt to fully provide the specific measures and actions that will be needed over the next 24 years to achieve carbon neutrality by 2045. New technologies and legislation will provide future

opportunities for new measures and actions to be developed as a part of future CAAP updates that will leverage the most cutting-edge solutions available.

FULL IMPLEMENTATION OF THE MEASURES AND ACTION IN THIS CAAP IS EXPECTED TO EXCEED BOTH THE STATE'S SB 32 TARGET AND SACRAMENTO'S 2030 CLIMATE ACTION TARGET IN 2030.

A central tenet of the CAAP is to ensure that implementation does not result in unintended costs for under-resourced communities and that the co-benefits associated with climate action and adaptation are equitably distributed throughout the community. The strategies outlined below and expanded on in [Chapter 6](#) reflect recommendations from the Mayors' Commission on Climate Change Equity Technical Advisory Committee and the City's Environmental Justice Working Group. Climate action and adaptation has the potential to significantly improve the quality of life for the City's most vulnerable populations by lowering energy bills, improving low-cost mobility options and connectivity, increasing green space and shade in under-resourced communities, and improving air quality throughout the City. However, to ensure Sacramento's most vulnerable populations are resilient to projected climate change impacts and ensure they receive access to the many co-benefits of climate action, special care is needed. The CAAP measures prioritize under-resourced



communities to ensure an equitable transition to a carbon neutral future. Actions found under each measure help the City plan for:

- Dedicated funding and financing for under-resourced communities
- Partnerships with community organizations
- Equitable deployment of projects like tree plantings
- Continued outreach and engagement within these communities

BUILDINGS STRATEGY

GHG emissions in the buildings sector are driven primarily by electricity and natural gas usage for water heating, space heating/cooling, and to a lesser extent, cooking. Sacramento's core strategy for achieving carbon neutrality in the building sector is to leverage SMUD's plan to transition from 70 percent carbon-free electricity procurement to 100 percent carbon-free electricity procurement by 2030, by transitioning fossil fuel-powered buildings to electric-powered buildings. This process will begin with new buildings and transition to focus on existing buildings over time. The building strategy also focuses on smarter land-use to reduce vehicle-miles traveled (VMT) and to encourage smaller dwellings to improve housing affordability in Sacramento. The following measures have been developed to begin transitioning to a carbon neutral building stock:

- **E-1:** Support SMUD as it implements the 2030 Zero Carbon Plan
- **E-2:** Eliminate natural gas in new construction
- **E-3:** Transition natural gas in existing buildings to carbon-free electricity by 2045
- **E-4:** Increase the amount of electricity produced from local resources and work with SMUD to install additional local storage by 2030
- **E-5:** Support infill growth with the goal that 90% of new growth is in the established and center/corridor communities and 90% small-lot and attached homes by 2040, consistent with the regional Sustainable Communities Strategy. Project-level VMT should be 15% below (or 85% of) the regional average.

These CAAP measures directly reflect the strategies identified by the Mayors' Commission on Climate Change to electrify new construction (built-environment recommendation #1), electrify existing buildings (built-environment recommendation #3), and support sustainable land use (built-environment recommendation #1).

CLIMATE ACTION & ADAPTATION PLAN

TRANSPORTATION STRATEGY

GHG emissions from the transportation sector are the largest contributor to Sacramento's GHG emissions and are driven by on-road passenger vehicles, heavy duty vehicles and commercial vehicles. Getting to carbon neutral in this sector entails a three-tiered approach:

- Significantly increase the portion of trips completed via active transportation options like walking and biking,
- Transition the majority of remaining trips to public transit and carpools, and finally to
- Transition any remaining passenger and commercial vehicle trips to EVs.

While the City cannot require residents to ride a bike, take the bus, or buy EVs, the City and its partners can collaborate to incentivize this behavior change. The City and its partners will support these cleaner transportation options with incentives and by constructing or facilitating the construction of new transportation infrastructure such as bike lanes and pedestrian infrastructure, new public transit infrastructure, and public and private EV charging stations². Although shifting away from single-passenger vehicles has been historically difficult in Sacramento and California, the City understands the importance of setting aggressive goals in this area to spur investment and innovation. Implementation of the transportation strategy will provide substantial co-benefits to

the City and help create a future Sacramento with multiple sustainable transportation options. The CAAP transportation measures are as follows:

- **TR-1:** Improve active transportation infrastructure to achieve 6% active transportation mode share by 2030 and 12% by 2045
- **TR-2:** Support public transit improvements to achieve 11% public transit mode share by 2030 and maintain through 2045
- **TR-3:** Achieve zero-emission vehicle (ZEV) adoption rates of 28% for passenger vehicles and 22% for commercial vehicles by 2030 and 100% for all vehicles by 2045

These measures directly reflect the strategies developed by the Mayors' Commission on Climate Change to expand and enhance Sacramento's infrastructure for active transportation (mobility recommendation #1), transit and shared mobility (mobility recommendation #2), and zero-emission vehicles (mobility recommendation #3).

Active and Shared Transportation and Public Transit: Active transportation includes walking, riding a non-motorized or electric bike, scooter, or skateboard, or any other way of getting around that does not include using a fossil-fuel motorized vehicle. Shared transportation includes publicly shared vehicle networks such as bike share, or car share programs. Public transit includes any form of transportation provided by a regional transportation agency such as buses, shuttles, trains, or light rails.

2. On April 20, 2021, Sacramento City Council adopted the Electric Vehicle (EV) Charging Infrastructure Ordinance to establish parking incentives for zero-emission car sharing and EV-charging infrastructure beyond code requirements beginning in May 2021 and require higher levels of EV-charging infrastructure in new construction starting in 2023.



WASTE STRATEGY

GHG emissions in the waste sector are generated primarily by organic waste sent to the landfill. As it decays, organic waste forms landfill gas that contains methane. Although methane breaks down to carbon dioxide relatively quickly in the atmosphere, it traps 25 times more heat in the atmosphere than carbon dioxide. Reducing methane emissions is an effective strategy to slow climate change in the near term. Getting to carbon neutral in the waste sector entails diverting organic waste from the landfill and reducing or recycling all non-organic waste. The State has already established a statewide goal to reduce organic waste sent to the landfill 75 percent below 2014 levels and rescue 20 percent of currently by 2025 through SB 1383, which will be implemented and enforced by local jurisdictions. Major components of SB 1383 go into effect in 2021 and 2022, including mandatory organics recycling.

While SB 1383 is State legislation, it was not included in the City's adjusted GHG emissions forecast due to the level of implementation difficulty and need for City resources. Therefore, the CAAP establishes a pathway to achieve this goal within Sacramento through the following measure:

- **W-1:** Work to reduce organic waste disposal 75% below 2014 levels by 2025

This reflects the Mayors' Commission on Climate Change strategy to increase food security and support a regenerative food system by sourcing food locally and reducing food waste (community health and resiliency recommendation #2). While the Mayors' Commission on Climate Change suggests slightly less aggressive waste goals by 2025 than the CAAP, the CAAP was designed to comply with SB 1383 and therefore adopts the most stringent goals in line with the bill.



Managing Food Waste

CLIMATE ACTION & ADAPTATION PLAN

WATER AND WASTEWATER STRATEGY

Water and wastewater GHG emissions in Sacramento are driven by electricity usage for water conveyance and treatment for residential, commercial, and municipal buildings in the City. Getting to carbon neutral in this sector entails transitioning to carbon-free electricity while also increasing water efficiency, which has the added advantage of conserving water and reducing drought impacts to local ecosystems and water supplies. The CAAP water and wastewater measures are:

- **WW-1:** Reduce water utility emissions (in MT CO₂e per million gallon delivered) by 100% by 2030 and maintain that through 2045
- **WW-2:** Reduce wastewater emissions by 22% by 2030 and 40% by 2045

While the Mayors' Commission on Climate Change does not make recommendations related to water and wastewater, the City recognizes the important role that water and wastewater play as part of the GHG emissions landscape in California and has included these measures as an effort for Sacramento to do its part in reducing water use and water-related GHG emissions.

CARBON SEQUESTRATION STRATEGY

Carbon neutrality is defined as no net gain of GHG emissions in the atmosphere or when GHG emissions are equal to the GHGs removed from the atmosphere. Realistically, Sacramento will likely have some GHG emissions associated with its activities in 2045, regardless of how well GHG emissions can be reduced in each of the City's GHG-generating sectors. To offset remaining future GHG emissions, the City will invest in carbon sequestration methods that will move net GHG emissions back towards zero. The CAAP's carbon sequestration measure is:

- **CS-1:** Increase urban tree canopy cover to 25% by 2030 and 35% by 2045.

A focus on carbon sequestration has the added benefit of increasing greenspace for more robust local habitats, reducing urban heat island effects, and beautifying Sacramento, especially in historically underserved communities. This CAAP measure is consistent with the Mayors' Commission on Climate Change strategy to expand green infrastructure to ensure that all neighborhoods, starting with historically under-resourced communities and neighborhoods with low canopy cover, have access to greenspace and tree canopy shade (community health and resiliency recommendation #1).



GHG Reductions by the Numbers

Together, Sacramento’s CAAP measures have the potential to reduce GHG emissions well beyond the 2030 target. [Table 5-1](#) shows the GHG emissions that will be saved in 2030 and 2045 with implementation of each measure.³ As shown below in [Table 5-1](#), Sacramento’s GHG emissions reduction measures have the potential to exceed the 2030 target with full implementation.⁴ For more information on how these reductions were calculated please see [Chapter 6](#) and [Appendix C](#).

The breakdown of anticipated GHG emissions reductions by measure is shown in [Figure 5-1](#). Some measures have no associated GHG emissions reductions and are instead marked as “Supportive.” These measures could not be

quantified due to lack of data or existing case studies, but are still instrumental to successful CAAP implementation. As shown in the figure, measures E-1, E-2, E-3, and TR-3 provide some of the largest GHG emissions reductions and rely on SMUD’s 2030 decarbonization plan to provide the maximum possible reduction. While these ambitious reductions substantially exceed the State’s 2030 target, they fall short of achieving carbon neutrality by 2045 ([Figure 5-2](#)). Remaining emissions in 2045 include wastewater process emissions, some natural gas end uses like stoves and dryers, and emissions from waste. Future CAAP updates will need to further address these sectors and adopt new and innovative strategies for all sectors as new technologies and regulations are drafted. As the 2045 target is codified by the State, an updated statewide scoping plan will also reveal the long-term strategy for statewide carbon neutrality.

3. GHG emissions savings were calculated relative to the adjusted forecast. For example, the GHG emissions total for Sacramento in 2030 with measure implementation can be calculated as the adjusted forecast GHG emissions in 2030 minus the GHG emissions savings in 2030 from the measures.

4. Note that without full implementation of the VMT reduction strategies (TR-1 through TR-3), which are the most capital-intensive measures in the CAAP and are contingent on funding, the City still exceeds the 2030 target. This is discussed in more detail in [Appendix C](#).

CLIMATE ACTION & ADAPTATION PLAN

Table 5-2. GHG Reduction Potential by Sector and Measure

Measure Number	Measure Name	GHG Emissions Saved in 2030 (MT CO ₂ e)	GHG Emissions Saved in 2045 (MT CO ₂ e)
Built Environment (Energy and Electrification)			
E-1	Support SMUD as it implements the 2030 Zero Carbon Plan	576,225	0 ¹
E-2	Eliminate natural gas in new construction	37,692	134,621
E-3	Transition natural gas in existing buildings to carbon-free electricity by 2045	119,289	402,468
E-4	Increase the amount of electricity produced from local resources and work with SMUD to install additional local storage by 2030	Supportive	Supportive
E-5	Support infill growth with the goal that 90% of new growth is in the established and center/corridor communities and 90% small-lot and attached homes by 2040, consistent with the regional Sustainable Communities Strategy. Project-level VMT should be 15% below (or 85% of) the regional average.	Supportive	Supportive
Mobility			
TR-1	Improve active transportation infrastructure to achieve 6% active transportation mode share by 2030 and 12% by 2045	13,509	30,557
TR-2	Support public transit improvements to achieve 11% public transit mode share by 2030 and maintain through 2045	106,035	122,371
TR-3	Achieve zero-emission vehicle (ZEV) adoption rates of 28% for passenger vehicles and 22% for commercial vehicles by 2030 and 100% for all vehicles by 2045	212,451	1,137,071
Waste			
W-1	Work to reduce organic waste disposal 75% below 2014 levels by 2025	134,991	160,897



Measure Number	Measure Name	GHG Emissions Saved in 2030 (MT CO ₂ e)	GHG Emissions Saved in 2045 (MT CO ₂ e)
Water and Wastewater			
WW-1	Reduce water utility emissions (in MT CO ₂ e per million gallon delivered) by 100% by 2030 and maintain that through 2045	6,296	0 ¹
WW-2	Reduce wastewater emissions by 22% by 2030 and 40% by 2045	5,495	11,517
Carbon Sequestration			
CS-1	Increase urban tree canopy cover to 25% by 2030 and 35% by 2045.	23,053	61,474
GHG Emissions Reduction Summary			
Estimated Reductions Achieved from Full Measure Implementation		1,235,034	2,060,976
Total Reduction Needed to Meet Climate Action Targets		543,437	2,227,322
Gap to Target		-691,597	166,345

1. GHG emissions reductions associated with Measure E-1 and WW-1 are zero in 2045 because the State has required all electricity providers to procure 100% carbon-free electricity by 2045. While SMUD has created a plan to achieve this goal by 2030, GHG emissions reductions in 2045 are already captured in the adjusted forecast for Sacramento.

CLIMATE ACTION & ADAPTATION PLAN

Figure 5-1. GHG Emissions Reductions Breakdown by Measure (2030)

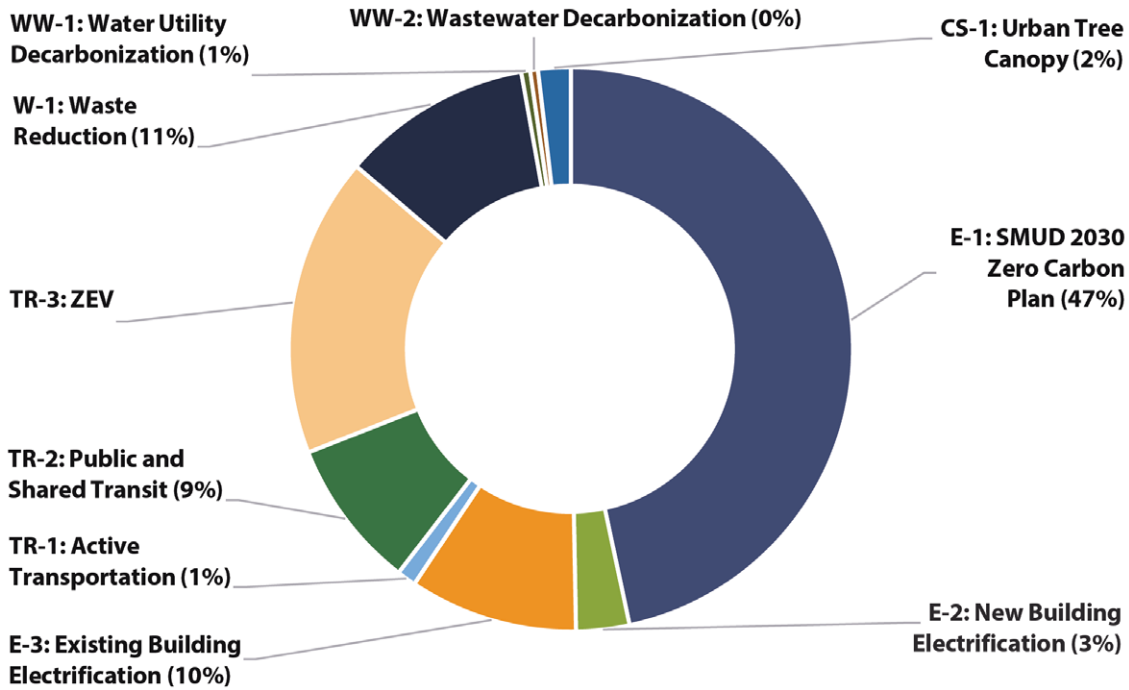
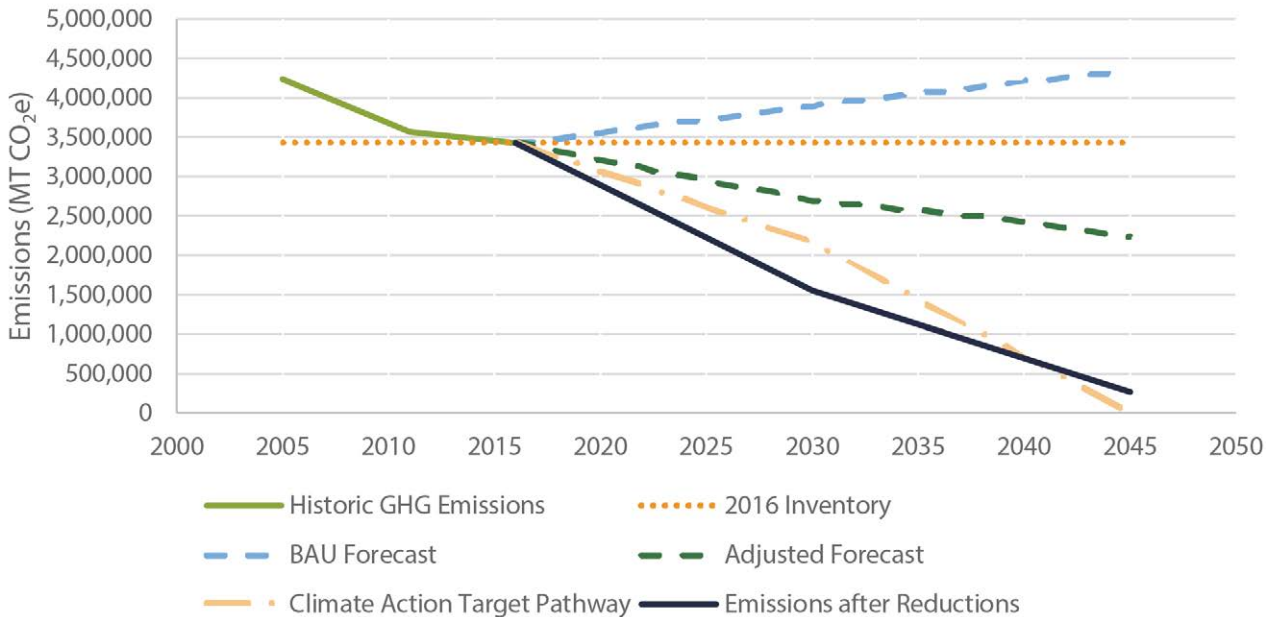


Figure 5-2. Sacramento’s Climate Action Targets and Reduction Pathway (MT CO₂e)





CONSIDERATIONS FOR ACHIEVING CARBON NEUTRALITY

The City of Sacramento is committed to achieving carbon neutrality as soon as possible. While the measures and actions detailed in this report do not achieve carbon neutrality by 2045, they do form a realistic and implementable foundation on which to decarbonize the City, achieve GHG reductions in 2030 consistent with the State's goals, and meet CEQA criteria for a "qualified" GHG reduction plan, as discussed in [Chapter 1](#). The measures and actions in this CAAP are the next steps in a long history of progress on climate in Sacramento. This iteration of the CAAP does not include measures and actions that will achieve carbon neutrality due to three main reasons:

Timeframe

This plan has a timeline of between five and ten years and the measures and actions included here are meant for implementation in the short term. This plan, if fully implemented, will put the City on a trajectory to achieve carbon neutrality by 2045. However, future CAAP updates will need to take into consideration the new conditions within the City, the State and beyond. While the City could simply include highly aggressive measures to be implemented 15 or even 20 years from now, doing so would be highly speculative and would not increase the rate of reductions today. Future CAAP updates will reevaluate the progress the City has made, increase the implementation of the strategies included in this CAAP, and develop new strategies as needed.

Equity

Sacramento's under-resourced communities are likely to face the greatest impacts from climate change (increased heat, fewer trees, poor air quality, rising costs of living) and are Sacramento's communities with the fewest resources in terms of ability to harness technology for adaptation. Addressing climate change will require financial investment such as purchasing new EVs, electrifying buildings, installing solar and battery storage, and other actions. While reducing GHG emissions is necessary, the City must have a strategy that is equitable. Therefore, before aggressive actions are considered, the costs and benefits must first be fully understood and policies to mitigate equity impacts must be in place. The Urban Sustainability Directors Network (USDN) defines three equity objectives or dimensions to for incorporation into sustainability planning processes:

Procedural

- Create processes that are transparent, fair, and inclusive in developing and implementing any program, plan, or policy.
- Ensure that all people are treated openly and fairly.
- Increase the civic engagement opportunities of communities that are disproportionately impacted by climate change.

Distributional

- Fairly distribute resources, benefits, and burdens.
- Prioritize resources for communities that experience the greatest inequities, disproportionate impacts, and have the greatest unmet needs.

CLIMATE ACTION & ADAPTATION PLAN

Structural

- Make a commitment to correct past harms and prevent future unintended consequences.
- Address the underlying and institutional systems that are the root causes of social and racial inequities.

These equity objectives will be important for the City to work towards during implementation of the CAAP measures and actions. The CAAP establishes new requirements and incentives for the community, which have the potential, if not implemented effectively, to exacerbate existing inequities as described above. By developing implementation procedures to address procedural, distributional, and structural equity, the City will aim to avoid causing further harm to underserved communities.

Technology

The pace of technological change has been and will likely continue to be rapid, especially when it comes to addressing climate change. While the City could plan through 2045 using today's technology, by the time the CAAP is updated in 2030 a new suite of solutions will be available. Therefore, this CAAP focuses on the next 5 years with an expected CAAP update in 2026 and a CAAP revision in 2030. These updates will ensure the City achieves carbon neutrality using the most cost effective and efficient solutions including the use of cutting edge technologies.



Electric Heat Pump HVAC Unit Installation



Measure Co-Benefits

In addition to GHG emissions reductions, the CAAP measures and actions will produce many other co-benefits for the community. Co-benefits refer to the positive effects that a climate action policy will have on other community objectives, as defined by the United National Intergovernmental Panel on Climate Change (IPCC).⁵ For example, co-benefits stemming from building electrification include lower energy costs for residents and improved local air quality.

Another co-benefit of CAAP adoption will be facilitation of local development, because the CAAP itself will be used to streamline the CEQA

process for new development projects. A key priority throughout the CAAP development process has been the promotion of thoughtful development in Sacramento that will support the local economy, provide for infrastructure upgrades, and ensure affordable housing needs are met in alignment with City and State goals. The CAAP provides a clear pathway for new development to align with State climate action requirements and supports local development and investment. The sector strategies are a key component of a CEQA-qualified GHG-reduction plan, which will allow new development projects in Sacramento to “tier off” of the CAAP, significantly reducing the required CEQA review that is required for new development.

The co-benefits of successful implementation of measures in this CAAP are discussed in more detail below and paired with relevant measures throughout [Chapter 6](#).



**Public
Health**



**Community
Cost Savings**



Adaptation



**Job
Creation**



**Environmental
Quality**

5. IPCC,2007; IPCC,2014a; IPCC,2014b.

PUBLIC HEALTH



Climate action can improve a variety of health and safety conditions, including risk of heat-related and other illness from air quality or heatwaves, physical fitness levels, and mental wellbeing. Air monitoring data show that over 90 percent of Californians breathe unhealthy levels of one or more air pollutants during some part of the year, primarily due to the combustion of fossil fuels.⁶ Sacramento is listed as one of the most polluted cities in the United States for unhealthy ozone days, unhealthy spikes in particle pollution, and for annual particle pollution levels.⁷ Exposure to these pollutants can increase the risk of cardiovascular disease, chronic and acute respiratory illnesses, cancer, and pre-term births. Climate actions aimed at reducing traffic congestion, taking vehicles off the road, and electrifying fossil-fueled equipment will lessen the potential for health risks for Sacramento's communities. Prioritizing underserved communities for actions that

improve air quality is also important for ensuring those community members who are most vulnerable will have access to these health co-benefits.

Heat-related illness is another significant health risk that is expected to increase with climate change. As described in [Chapter 1](#), increasing temperatures from climate change are causing more intense and frequent heat waves in Sacramento. More than 600 people in the United States are killed by extreme heat events every year, making extreme heat one of the deadliest types of weather-related hazards.⁸ Climate actions like planting more trees for increased canopy cover and contributing to GHG emissions reductions can help reduce the risk of increased heat-related illness in Sacramento. Climate action can also help make residents more active. Actions like building more bikeways, crosswalks and sidewalks encourage active modes of transportation such as biking and walking and can reduce obesity and non-communicable disease risk, diminish public health service costs, and improve mental health.⁹

6. California Air Resources Board. *ARB Fact Sheet: Air Pollution and Health*. Retrieved September 20, 2021, from <https://ww3.arb.ca.gov/research/health/fs/fs1/fs1.html>.

7. American Lung Association. (2021, April 21). *Lung Association Report finds Californian's Health at Risk Due to Air Pollution and Climate Change Impacts*. Retrieved September 20, 2021, from <https://www.lung.org/media/press-releases/sota21-california>.

8. Centers for Disease Control and Prevention. (n.d.). *Natural Disasters and Severe Weather: Extreme Heat*. Retrieved September 20, 2021, from <https://www.cdc.gov/disasters/extremeheat/index.html>.

9. Litman, Todd and Victoria Transport Policy Institute. (2021, September 1). *Evaluating Active Transport Benefits and Costs*. Retrieved September 20, 2021, from <https://www.vtpi.org/nmt-tdm.pdf>.



COMMUNITY COST SAVINGS



Investments in climate action can save community members money both up front and over time. For example, investments in walking, biking, and public transit infrastructure can improve community usage of these transportation options and act as a less expensive alternative to driving for shorter trips within a city. EVs also represent an opportunity for cost savings for owners. Studies have shown that EVs have 50 to 75 percent of the average maintenance cost of a conventional vehicle and EVs cost about half as much to fuel as traditional fossil fuel vehicles.^{10,11} For low-income residents in California, who spend between 17 and 36 percent of their total household budget on transportation, obtaining the up-front capital to purchase an EV through low-income programs can contribute significantly to reducing this cost burden.¹²

Incorporating energy reduction initiatives into buildings can result in on-going cost savings for property owners. For example, using trees

to shade buildings can save money on air conditioning costs. One study of a shade-tree planting project reported energy savings from cooling ranging from 7 to 47 percent due to passive solar shading.¹³ Additionally, research has concluded that most all-electric buildings are cheaper to build and cheaper to operate over time when compared to traditional buildings with both gas and electricity.¹⁴ Natural gas is also getting more expensive. Without a transition plan, the bill for running a gas furnace could increase 500 percent by 2050, due to increasing natural gas infrastructure costs coupled with a naturally declining demand for gas as appliances become more energy efficient.¹⁵ Many of these saved dollars are spent in the local economy where they have economic multiplier effects. Residents have more money to spend on daily needs, education, medical care, and leisure activities, all of which feed into local economic growth. Measures that have the community cost savings co-benefit have been found to save the community money either up front, or over time.

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10. Delucchi, Mark, Quanlu, Wang, and Daniel, Sperlin. *Electric vehicles: performance, life-cycle costs, emissions, and recharging requirements*. Transportation Research Part A 23A (February 1989): 255-78.
 11. US Department of Energy. (n.d.). Retrieved September 20, 2021 from <https://www.energy.gov/eere/electricvehicles/saving-fuel-and-vehicle-costs>.
 12. California Air Resources Board. (2018, February 2021). *Low-Income Barriers Study Part B: Overcoming Barriers to Clean Transportation Access for Low-income Residents*. Retrieved September 30, 2021 from https://ww2.arb.ca.gov/sites/default/files/2018-08/sb350_final_guidance_document_022118.pdf.
 13. U.S. Environmental Protection Agency. (2008). *Reducing Urban Heat Islands: Compendium of Strategies*. Heat Island Reduction Activities. Retrieved September 21, 2021, from https://www.epa.gov/sites/default/files/2017-05/documents/reducing_urban_heat_islands_ch_6.pdf.
 14. California Energy Codes and Standards. (n.d.). *Statewide Reach Codes Program*. Retrieved September 20, 2021, from <https://localenergycodes.com/content/2019-local-energy-ordinances/>.
 15. Gridworks. (2020.) *California's Gas System in Transition*. Retrieved September 21, 2021, from <https://gridworks.org/initiatives/cagas-system-transition/>.

ADAPTATION



While the CAAP has a dedicated adaptation section ([Chapter 7](#)) many climate mitigation actions can also bolster the ability of Sacramento residents and businesses to adapt to climate change and recover quickly from climate hazards such as extreme heat days or localized flooding. For example, planting trees for carbon sequestration and increasing tree canopy cover can help keep streets and neighborhoods cooler especially in disadvantaged communities that have lower tree cover on average. Studies have shown that shading 40 percent of a city street can counteract the warming effects from asphalt.¹⁶ The value of canopy cover and cooler streets will continue to be important for Sacramento as average citywide temperatures rise. Increasing tree canopy cover to provide cooling and carbon sequestration is one example of increased resilience.

Electrification through the use of heat pumps will significantly reduce GHG emissions associated with buildings but also provide efficient

cooling for homes that may not have air conditioning, an important adaptation strategy especially for vulnerable populations. Developing building electrification programs with equity in mind, such as SMUD's low income retrofit programs, could help improve the adaptive capacity of Sacramento's most vulnerable populations in the face of increasing temperatures.¹⁷

Climate actions can also enhance community cohesion—the networks of formal and informal relationships among neighbors that foster a mutually supporting human environment.¹⁸ One study found that even small amounts of greenery helped inner city residents have safer, less violent domestic environments.¹⁹ A survey measuring the social capital of residents in a wide range of neighborhood types found a positive relationship between neighborhood walkability and knowing neighbors, participating politically, trusting others, and being socially engaged.²⁰ A socially engaged community is one in which people are more willing to look out for each other and support each other in time of need.²¹

16. Chodosh, S. (2019, March 25). Popular Science. Here's how many trees are required to cool a city street; An equation for throwing shade. Retrieved September 20, 2021, from <https://www.popsci.com/shade-city-streets-trees-cooling/>.

17. Sacramento Municipal Utilities District. (n.d.). *Low-income assistance and nonprofits*. Retrieved September 20, 2021, from <https://www.smud.org/en/Rate-Information/Low-income-and-nonprofits>.

18. Dale, A., Newell, R., and Roseland, M. (2018, October). The International Journal of Climate Change Impacts and Responses. *Climate Action Co-benefits and Integrated Community Planning*. Uncovering the Synergies and Trade-Offs. Retrieved September 21, 2021. From https://www.researchgate.net/publication/328539965_Climate_Action_Cobenefits_and_Integrated_Community_Planning_Uncovering_the_Synergies_and_Trade-Offs.

19. Kuo, F.E. and Sullivan, W.C. (2001). *Aggression and violence in the inner city: Impacts of environment via mental fatigue*. Environment & Behavior. 33(4): 543-571.

20. Leyden, K. M. (2003). American Journal of Public Health. *Social Capital and the Built Environment: The Importance of Walkable Neighborhoods*.

21. Wells, K.B. et al. (2013, July 3). US National Library of Medicine. National Institutes of Health. Community Engagement in Disaster Preparedness and Recovery: A Tale of Two Cities - Los Angeles and New Orleans. Retrieved September 20, 2021, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3780560/>.



JOB CREATION



In many cases, climate action means financial investment. These investments can boost Sacramento's economy through promoting the development of local projects, programs, and jobs. Successful implementation of the CAAP will also solidify Sacramento's position as a leader in next generation technologies and economic sectors. Investments in construction, manufacturing, clean technology, green infrastructure, and civil engineering sectors provide businesses with opportunities for growth and create skilled, well-paying "green" jobs for the community. Many of the jobs in the renewable energy and energy efficiency sector are associated with installation, maintenance, and construction—making them inherently local and influential to the local economy. Studies have shown that energy efficiency investments create more jobs than those in fossil fuel industries. It is estimated that approximately eight green jobs are generated per \$1 million invested, compared to approximately three jobs per \$1 million in fossil-fuel industries.²² A University of California, Berkeley study found that the solar industry creates 0.87 job-years (years of work) per gigawatt hours and energy efficiency creates 0.38 job years per gigawatt

hours.²³ Measures with the job creation co-benefit are expected to increase the number of jobs especially in the green economy, helping to ensure Sacramento's economy is ready for the future.

ENVIRONMENTAL QUALITY



Climate change will have significant impacts on the ecosystems that support both human and environmental health. Air quality, water quality and availability, plants, and animals will all be stressed by a rapidly changing climate. Measures with the environmental quality co-benefits will help improve these areas and ensure these environmental systems continue to function. Measures like increasing the tree canopy will provide more habitat and keep temperatures cooler while building and vehicle electrification will improve air quality. Residential buildings in California have been found to produce upwards of 82 tons of NO_x on a daily basis, more than seven times what California's power plants produce. This NO_x is a precursor to smog (ozone) which impacts the health of people and the environment, including impacting airways and even plant growth.²⁴

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22. Environmental Defense Fund. (n.d.). Climate Corps. Now Hiring: The Growth of America's Clean Energy and Sustainability Jobs. Retrieved from http://edfclimatecorps.org/sites/edfclimatecorps.org/files/the_growth_of_americas_clean_energy_and_sustainability_jobs.pdf.
23. UC-Berkeley. (n.d.). Center for Resource Efficient Communities. Methods to Assess Co-Benefits of California Climate Investments. Retrieved September 20, 2021, from https://ww3.arb.ca.gov/cc/capandtrade/auctionproceeds/ucb_lit_rev_on_jobs.pdf?_ga=2.164452799.1014054594.1562085485-1467300981.1559153156.
24. US Environmental Protection Agency. (n.d.). *Ground-level Ozone Basics*. Retrieved September 20, 2021, from <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics>.



GHG-REDUCTION MEASURES AND ACTIONS



This chapter provides a detailed overview of each CAAP measure and its associated actions, key performance indicators, expected GHG emissions reductions and co-benefits.¹ Each measure also includes an explanation of its alignment with the Mayors' Commission on Climate Change and how the measure and related actions contribute to a carbon-neutral Sacramento. The CAAP actions define the specific policies, programs, and steps the City and its partners will implement to achieve the measure goals and the climate action targets.



1. For a complete description of the assumptions and calculations supporting each quantified GHG reduction, see [Appendix C](#).

CLIMATE ACTION & ADAPTATION PLAN

This chapter also identifies the implementation leads, performance indicators for implementation tracking, and implementation phase associated with each action. The City of Sacramento has established three phases for implementation:

- **Phase 1** actions will begin implementation at CAAP adoption or before. These actions have been prioritized due to their importance, cost-effectiveness, or the availability of resources for implementation.
- **Phase 2** actions will begin implementation between 2023 and 2025. These actions may require additional resources such as staff time, funding and financing, or there may need to be additional education and outreach conducted prior to implementation.
- **Phase 3** actions will begin implementation after 2025. These actions may be less critical in the short term, or simply require more significant resources to implement.



Photo by Carlos Eliason

Bicycle and Pedestrian Infrastructure in Sacramento



BUILT ENVIRONMENT



MEASURE E-1: Support SMUD as it Implements the 2030 Zero Carbon Plan

To support Sacramento’s climate action targets and achieve their own sustainability goals, SMUD developed a 2030 Zero Carbon Plan, which provides a roadmap for SMUD to eliminate GHG emissions from their power supply by 2030.² SMUD’s 2030 Zero Carbon Plan also provides a roadmap to ensure that the customers and communities they serve will reap the greatest benefits from the elimination of natural gas from their buildings. Utilizing carbon-free electricity is a central element of Sacramento’s plan to achieve its 2030 target and 2045 carbon neutrality goal, particularly in relation to measures E-2, E-3, and TR-3, which work to electrify the majority of buildings and vehicles in Sacramento by 2045. While this measure primarily falls on SMUD to implement, there may be opportunities for the City to provide support through the possible permitting of new projects, coordination of land use and energy efficiency projects, as well as public support of the plan and its benefits. The City is committed to continuing its close collaboration with SMUD through the next decade. SMUD has also identified the positive equity benefits of the 2030 Zero Carbon Plan, including alleviation of air pollution from the combustion of natural gas within buildings, and increased investment in underserved community partnerships and

programs that provide equitable access to SMUD jobs, rebate and incentive programs, and low-income programs. While this measure provides a significant GHG reduction in 2030, the impacts decrease towards zero by 2045 due to implementation of the California Renewable Portfolio Standard and SB 100, a State law requiring 100 percent renewable electricity in California already included in the forecast.

Alignment with Mayors’ Commission on Climate Change

In June 2020, the Mayors’ Commission on Climate Change provided recommendations for electrification of new construction, electrification of existing buildings, and electrification of fossil-fuel vehicles. Measure E-1 maximizes the GHG reduction benefits of these actions and supports building community trust around the electrification process. Recommendations also include allocation of resources that address historical and current inequities, inclusion of under-resourced communities historically excluded from the policymaking process, and expansion of partnerships and support for community-based organizations. Measure E-1 will support SMUD’s efforts in these areas, particularly in increased investment in low-income programs.

2. SMUD. *2030 Zero Carbon Plan*. Retrieved on November 4, 2021 from <https://www.smud.org/-/media/Documents/Corporate/Environmental-Leadership/ZeroCarbon/2030-Zero-Carbon-Plan-Executive-Summary.ashx>



Key Performance Indicators

A. 100% renewable electricity citywide by 2030

Expected GHG Reductions

- **2030:** 576,225 MT CO₂e
- **2045:** 0 MT CO₂e³

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
E-1.1: Support SMUD in the implementation of the 2030 Zero Carbon Plan.	<ul style="list-style-type: none"> • SMUD 	<ul style="list-style-type: none"> • Office of Climate Action & Sustainability 	Phase 1	100% renewable electricity citywide by 2030

3. The GHG-reduction value of this measure goes to zero by 2045 due to the impacts of SB 100 which are already accounted for in the forecast. Because of SB 100, all electricity will be renewable by 2045, and, therefore, the difference between SMUD electricity and baseline will be zero.

MEASURE E-2: Eliminate Natural Gas in New Construction

For Sacramento to achieve carbon neutrality by 2045, the majority of buildings in the City will need to be powered by carbon-free energy rather than natural gas (a fossil fuel). This measure enables new buildings to take advantage of renewable electricity from SMUD by eliminating natural gas in new construction. The implementing action is the adoption of a “reach code” that requires newly constructed buildings to be all-electric (See Action E-2.1). An important co-benefit of all-electric buildings is improved indoor and outdoor air quality. In addition, construction costs for all-electric buildings are lower for most building types.⁴ Constructing new buildings as all-electric eliminates the high level of investment that would be needed to retrofit new buildings in the future in order to achieve carbon neutrality. All-electric buildings are also generally less expensive to live in due to high efficiency appliances⁵ and low electricity prices from SMUD. The City of Sacramento adopted the new building electrification ordinance in spring of 2021, achieving the goals of this measure before CAAP adoption.

Alignment with Mayors’ Commission on Climate Change

The final report from the Mayors’ Commission on Climate Change recommends that Sacramento mandate all-electric construction to eliminate fossil-fuel use in new low-rise (under 4 stories) buildings by 2023 and all buildings by 2026. This mandate is contained in Action E-2.1.

Key Performance Indicators

- A. Adoption of a new construction electrification ordinance by 2023 (adopted June 1, 2021)

Expected GHG Reductions

- **2030:** 37,692 MT CO₂e
- **2045:** 134,621 MT CO₂e

4. Local Energy Codes. *Cost Effectiveness Explorer*. Retrieved on November 4, 2021 from <https://explorer.localenergycodes.com/sacramento-city/summary>

5. Natural Resources Defense Council (NRDC). *Electricity a Smarter Choice than Low-Carbon Gas in CA Homes*. Retrieved on November 4, 2021 from <https://www.nrdc.org/experts/merrian-borgeson/new-study-electricity-trounces-low-carbon-gas-buildings>



Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
E-2.1: Develop and adopt an electrification ordinance that requires all new construction under four stories to be all-electric by 2023 and all construction to be all-electric by 2026.	<ul style="list-style-type: none"> Community Development Department 	<ul style="list-style-type: none"> Office of Climate Action & Sustainability SMUD 	Complete	None (completed)

IMPLEMENTATION SUCCESS:

Due to its considerable impact on GHG reductions, co-benefits, and direction from the Mayors' Commission on Climate Change, the City of Sacramento worked to implement Measure E-2 before the CAAP was adopted. City Council adopted the ordinance following a comprehensive stakeholder engagement effort, an educational webinar series, and collaboration to use the ordinance to drive just transition and equity outcomes. Each of the measures included in the CAAP strive to identify specific actions that will allow for comprehensive implementation of the identified measure. To fully implement measure E-2, the City will conduct relevant community notification efforts prior to effectiveness in 2023, as required by the State.

MEASURE E-3: Transition Natural Gas in Existing Buildings to Carbon-free Electricity by 2045

While Measure E-2 focuses on achieving carbon neutrality for new construction by building all-electric, Measure E-3 focuses on achieving carbon neutrality for existing buildings through electrification of existing fossil fuel-powered equipment. The highest-emitting appliances in existing buildings, particularly homes, are space heaters and hot water heaters.⁶ Measure E-3 creates a phased approach to electrifying these appliances, including limiting natural gas infrastructure expansion and eventually requiring new appliance installations to be all-electric through the permit process (Action E-3.1). Electrification of existing buildings is expected to occur incrementally as old gas appliances wear out and need to be replaced. However, up-front investments may be needed, especially for older buildings, which can include the need for added panel capacity and additional labor and equipment costs for all-electric equipment versus natural gas-powered equipment. While existing building electrification is likely to have a long-term payback, additional resources are needed to facilitate the transition and ensure the equitable distribution of benefits and costs. On June 1, 2021, City Council approved a Resolution (2021-0166) that included direction for the City to establish a framework for the electrification of existing buildings (Action E-3.1). This framework is anticipated to be considered by City Council in Fall/Winter 2022. Measure E-3 includes a

support structure of information gathering, financial incentives, rebates, and educational programs to help residents and businesses replace their space and hot water heaters with electric alternatives and improve energy efficiency in the home through heat pumps, insulation, and air sealing (Actions E-3.2 through E-3.6). Incentives, rebates, and education programs will be coordinated through SMUD and focused on low-income community groups to reduce unintended costs to under-resourced communities (Actions E-3.3, E-3.5, and E-3.6).

Alignment with Mayors' Commission on Climate Change

The final report from the Mayors' Commission on Climate Change recommends that Sacramento transition 25 percent of existing residential and small commercial buildings to all-electric by 2030 and establish a comprehensive electrification and energy-efficiency program. Measure E-3 mirrors this goal by establishing a target of reducing natural gas usage by 28 percent through building electrification by 2030 and 74 percent by 2045. Measure E-3 also incorporates equity recommendations to operationalize equity considerations and expand the capacities of cultural brokers by establishing a commitment to electrification education and outreach programs for low-income community groups and working with existing agencies and community-based

6. U.S. Energy Information Administration (EIA). *Natural Gas Explained*. Retrieved on November 4, 2021 from <https://www.eia.gov/energyexplained/natural-gas/use-of-natural-gas.php>



organizations (e.g., SMUD, EJCGC, Community Resource Project (CRP), and GRID Alternatives) that have already established engagement efforts around this issue. A number of financing programs are available for property owners, including the State-led Go Green Financing program, property-assessed clean energy programs (PACE), and SMUD financing options.

Key Performance Indicators

- A.** Achieve natural gas usage rates of 124 therms per person or less by 2030
- B.** Achieve natural gas usage rates of 38 therms per person or less by 2045

Expected GHG Reductions

- **2030:** 119,289 MT CO₂e
- **2045:** 402,468 MT CO₂e

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
E-3.1: Develop a comprehensive existing building electrification strategy that identifies associated costs and addresses potential equity impacts prior to implementation of mandatory requirements.	<ul style="list-style-type: none"> • Community Development Department 	<ul style="list-style-type: none"> • Office of Climate Action & Sustainability • SMUD • Public Works 	Phase 1	Complete an existing building electrification study

CLIMATE ACTION & ADAPTATION PLAN

Action	Lead	Support	Phase	Performance Indicator
<p>E-3.2: Develop an electrification ordinance for existing buildings/ construction that will be implemented through the building permit process to transition fossil fuels to electric by attrition following adoption of Measure E3.1. The existing construction buildings ordinance would be implemented in phases as follows:</p> <ul style="list-style-type: none"> • Phase 1: No new expansions of gas appliances or gas lines at existing buildings/construction (2023). • Phase 2: Require HVAC system replacements, new hot water heaters, and other appliances to be all-electric or utilize other low-carbon technologies as the market evolves. (2026). • Phase 3: Provide enforcement with a permit compliance program. 	<ul style="list-style-type: none"> • Community Development Department 	<ul style="list-style-type: none"> • SMUD • Office of Climate Action & Sustainability 	Phase 2	Development and adoption of ordinance
<p>E-3.3: Work with SMUD to expand existing low-income programs within the City to weatherize and retrofit/ electrify existing buildings, with the goal of reducing energy consumption, decreasing utility bills, and converting to carbon-free energy use by 2040.</p>	<ul style="list-style-type: none"> • SMUD 	<ul style="list-style-type: none"> • Community Development Department • Community Resources Project, Inc. • Sacramento Housing and Redevelopment Agency 	Phase 2	Number of low-income homes retrofit
<p>E-3.4: Promote and educate the community about existing programs and expand electrification retrofit incentives for space and water heating to support the electrification ordinances.</p>	<ul style="list-style-type: none"> • SMUD 	<ul style="list-style-type: none"> • Community Development Department 	Phase 2	None



Action	Lead	Support	Phase	Performance Indicator
<p>E-3.5: Provide electrification retrofit incentives for space and water heating and investigate the development of programs like financing programs or metered energy efficiency.</p>	<ul style="list-style-type: none"> • SMUD 	<ul style="list-style-type: none"> • Community Development Department 	Phase 1	New electrification retrofit incentives established
<p>E-3.6: Continue to promote and incentivize electrification supportive energy efficiency in existing buildings including lighting, insulation, and air sealing upgrades through programs and financing mechanisms.</p>	<ul style="list-style-type: none"> • Private PACE Financing programs 	<ul style="list-style-type: none"> • Community Development Department 	Phase 1	None
<p>E-3.7: Work with community partners to include voluntary energy efficiency and/or GHG emissions scores at time of sale and to post results on Multiple Listing Service (MLS) or other real estate app.</p>	<ul style="list-style-type: none"> • Community Development Department 	<ul style="list-style-type: none"> • Sacramento Association of Realtors or Metrolist Services Inc. 	Phase 2	Community partners identified and increased voluntary GHG emissions scores reporting

MEASURE E-4: Increase the Amount of Electricity Produced from Local Resources and Work with SMUD to Install Additional Local Storage by 2030

Measures E-2, E-3, and TR-3 will increase the electricity demand in Sacramento, but building electrification is not expected to overburden the existing grid. This is because peak demand is during the summer, and the primary increase in electricity demand from building electrification will be in the winter from the addition of electric space heating appliances. The existing grid can comfortably support⁷ this increase with some modifications. Adding renewable energy resources and storage within the City of Sacramento (Actions E-4.1 through E-4.4) will contribute to the carbon-free electricity goals in Measure E-1. Adding local renewable electricity resources and storage helps SMUD balance the grid while generating more renewable electricity and harnessing the benefits of distributed battery storage. Advancing local clean power also stimulates job growth in green industries and creates a more resilient electrical grid, all while contributing to Sacramento's carbon neutrality goal. While SMUD will be the primary implementer of Measure E-4, the City will support SMUD's efforts by finding locations for renewables and storage, installing this

equipment at City facilities, convening stakeholders, or by other means. By helping SMUD transition away from fossil fuel-generated electricity, this measure also alleviates existing air pollution impacts to improve public health in Sacramento.

Alignment with Mayors' Commission on Climate Change

The final report from the Mayors' Commission on Climate Change recommends identifying climate adaptation strategies as part of the CAAP with a focus on early pilot projects. Measure E-4 will enhance Sacramento's electrical grid infrastructure for greater resiliency to the changing climate, while Action E-4.4 specifically commits to a community solar and storage pilot project.

Key Performance Indicators

- A. Pilot a local renewable energy project of at least 1MW by 2030

Expected GHG Reductions

- Supportive

7. Natural Resources Defense Council (NRDC). *California's Grid is Ready for All-Electric Buildings* (April 16, 2020). Retrieved on November 4, 2021 from <https://www.nrdc.org/experts/merrian-borgeson/californias-grid-ready-all-electric-buildings>



Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
E-4.1: Continue to promote and support local energy generation and storage resources.	<ul style="list-style-type: none"> • SMUD 	<ul style="list-style-type: none"> • City's Office of Climate Action & Sustainability • Community Development Department 	Phase 1	Monitor and implement the anticipated Building Standards Commission's anticipated requirement the 2022 California Building Code for certain new construction to include onsite battery storage for solar power generation
E-4.2: Work with SMUD to site storage and renewable generation at locations in the City which would best support overall grid functionality while electrifying the building stock and maximizing the utilization of existing electrical infrastructure.	<ul style="list-style-type: none"> • SMUD 	<ul style="list-style-type: none"> • Community Development Department • Public Works • City's Office of Climate Action & Sustainability • Office of Emergency Management Services 	Phase 2	Plan developed and implementation begun

CLIMATE ACTION & ADAPTATION PLAN

Action	Lead	Support	Phase	Performance Indicator
E-4.3: Work alongside SMUD to promote and further incentivize battery storage and on-site solar as a means to maximize electrification benefits and improve resiliency.	<ul style="list-style-type: none"> • SMUD 	<ul style="list-style-type: none"> • Community Development Department/ Building Division 	Phase 1	Incentives created
E-4.4: Develop a community solar and storage project of at least 1 MW as a pilot project collaboration between SMUD and the City with SMUD leading project development and the City supporting by providing a location and permitting support.	<ul style="list-style-type: none"> • SMUD 	<ul style="list-style-type: none"> • City's Office of Climate Action & Sustainability • Public Works • Community Development Department 	Phase 2	Pilot completed



MEASURE E-5: Support Infill Growth with the goal that 90% of new Growth is in the Established and Center/Corridor Communities and 90% Small-lot and Attached Homes by 2040, Consistent with the Regional Sustainable Communities Strategy. Project-level VMT Should be 15% Below (or 85% of) the Regional Average

This measure prioritizes infill development in the City of Sacramento. Infill development is the process of developing vacant or under-used lots within existing urban areas that are already largely developed. Infill development reduces VMT and supports a carbon-neutral future by situating new development in urban areas within shorter distances of jobs and services. Denser and more efficient development also decreases per capita energy use by the built environment.⁸ Public transit-oriented development, especially when paired with public transit improvements and parking maximums for new development projects, further incentivizes public transit over single-occupancy vehicles and reduces VMT. This measure prioritizes affordable housing in infill areas (Action E-5.1) and sets a target to facilitate the development of 8,700 affordable by design⁹ units within 0.25 mile of public transit (i.e., bus stop or light rail station) in conjunction with anti-displacement policies and programs (Action E-5.3).

Alignment with Mayors' Commission on Climate Change

The final report from the Mayors' Commission on Climate Change recommends supporting infill growth consistent with the regional Sustainable Communities Strategy so that 90 percent of the City's growth is in the established and center/corridor communities¹⁰ and is 90 percent small-lot¹¹ and attached homes by 2040, and project-level VMT is 15 percent below (or 85 percent of) the regional average, exactly in line with Measure E-5. Action E-5.1 aligns with the recommendation to support equity to address historical and current disparities by coupling anti-displacement policies and programs with a commitment to transit-accessible affordable homes.

8. Joint Center for Housing Studies of Harvard University. *U.S. Households are Using Less Energy* (July 11, 2018). Retrieved on November 4, 2021 from <https://www.jchs.harvard.edu/blog/us-households-are-using-less-energy>**Error! Hyperlink reference not valid.**
9. Affordable by design means a dwelling unit that is affordable to residents making less than 120% of area median income by virtue of its design rather than government subsidy. Affordable by design dwelling units include accessory dwelling units (ADUs) and small dwelling units, either attached or detached.
10. A map of Sacramento's established and center/corridor communities can be accessed here: [chrome-https://www.sacog.org/sites/main/files/file-attachments/2020_mtp-scs_final_draft_for_web.pdf](https://www.sacog.org/sites/main/files/file-attachments/2020_mtp-scs_final_draft_for_web.pdf)**Error! Hyperlink reference not valid.**
11. Small-lot homes are equal to or less than 5,200 square feet for interior lots and 6,200 square feet for corner lots.

CLIMATE ACTION & ADAPTATION PLAN

Key Performance Indicators

A. 90% of infill growth occurs in established and center/corridor communities and 90% small lot and attached homes by 2040

B. 30% of region’s new living-wage jobs and 30% of region’s new housing units accommodated by 2040

Expected GHG Reductions

- Supportive

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator ¹²
<p>E-5.1: Adopt General Plan policies, land use designations, and implementing actions which:</p> <ul style="list-style-type: none"> • Accommodate 30% of the region's new living-wage jobs and 30% of the region's new housing units by 2040. • Focus 90% of the city's infill growth into established and center/corridor communities with the goal of achieving 90% small-lot single family and attached homes by 2040. • Prioritize construction of lower-cost workforce and affordable housing through modifications of land-use designations and zoning, offering ministerial/staff-level review of infill housing and continue to reduce fees and the time and expense of planning approval and building permit processes. • Include anti-displacement policies and programs. 	<ul style="list-style-type: none"> • Community Development Department 	<ul style="list-style-type: none"> • None 	Phase 1	30% of region’s jobs and 30% of region’s new housing units accommodated by 2040 90% of city’s infill growth in center/corridor communities by 2040

12. Progress on E-5 actions will be reported every 5 years as a part of General Plan and CAAP updates.



Action	Lead	Support	Phase	Performance Indicator ¹²
<p>E-5.2: Enable development of 29,000 new high density/intensity (i.e., 30 dwelling units per net acre), and public transit accessible residences (i.e., within 0.5 mile of public transit) by 2040 through the continuation of the City’s ministerial/staff-level review of infill housing, reduced fees, and identification of local funding sources.</p>	<ul style="list-style-type: none"> Community Development Department 	<ul style="list-style-type: none"> None 	Phase 3	29,000 new high density, transit accessible residences by 2040
<p>E-5.3: Enable the development of 8,700 new affordable by design units by 2040 within 0.25 mile of public transit by updating the City Code to allow multi-unit housing alternative housing types (such as dormitories and smaller units) and streamlining the permit process. Couple with anti-displacement policies and programs.</p>	<ul style="list-style-type: none"> Community Development Department 	<ul style="list-style-type: none"> None 	Phase 3	8,700 new affordable by design units within 0.25 mile of transit by 2040
<p>E-5.4: Permit a greater array of housing types in existing single-family neighborhoods citywide by allowing missing middle housing types such duplexes, triplexes, and fourplexes, and bungalow courts in single-family and duplex dwelling zones. Develop tools, resources and educational materials to promote and facilitate the development of ADUs in neighborhoods throughout the City.¹³</p>	<ul style="list-style-type: none"> Community Development Department 	<ul style="list-style-type: none"> None 	Phase 2	Permit additional neighborhood-scale housing single-family neighborhoods

13. See the land use policy and implementation program for the key strategy of “permitting a greater array of housing types in single-unit zones,” 2040 General Plan, Land Use Element.

TRANSPORTATION





MEASURE TR-1: Improve Active Transportation Infrastructure to Achieve 6% Active Transportation Mode Share by 2030 and 12% by 2045

Getting to carbon-neutral will require reducing the number of miles driven by fossil fuel-powered vehicles. This CAAP prioritizes reducing VMT first through transitioning VMT to active transportation like biking and walking. To do this, the CAAP helps prioritize the development of low-stress, safe, and convenient active transportation infrastructure that will support higher rates of biking and walking. Infrastructure needs include bikeway and sidewalk improvements and expansions in all areas of the City, primarily enabled through Actions TR-1.1 and TR-1.2. Actions TR-1.3 through TR-1.5 support better, more informed implementation of TR-1.1 and TR-1.2. Actions TR-1.2, TR-1.4, and TR-1.5 have been designed to maximize the benefits of improved active transportation infrastructure by focusing on projects in historically under-resourced communities.

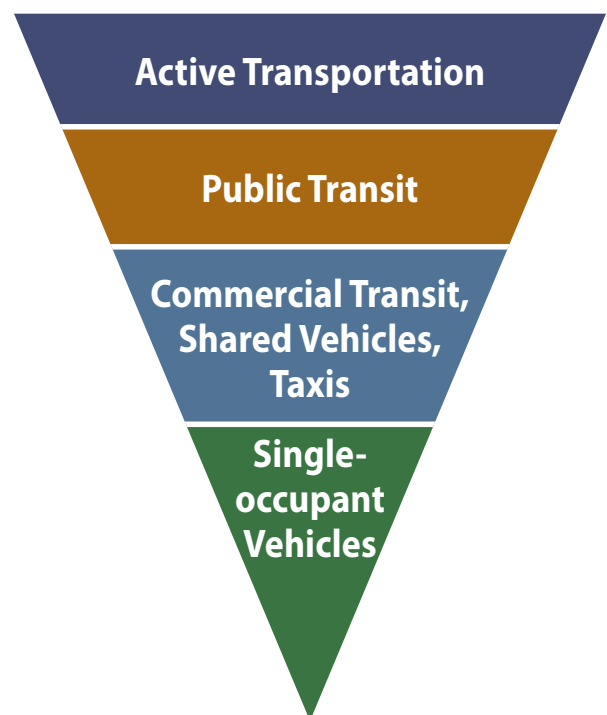
TR-1 will work in concert with TR-2, which encourages improvement of public transportation infrastructure, to achieve collective VMT reductions by 2030 and 2045. These reductions are captured by the City's goal to reduce VMT from 8,471 miles per person per year to:

- 6,393 miles per person per year by 2030 (a 25 percent reduction from 2016 levels); and
- 5,625 miles per person per year by 2045 (a 34 percent reduction from 2016 levels)

The City chose to track the combined effect of TR-1 and TR-2 on VMT, in addition to the individual mode share metrics for active

transportation and public transit, as an additional way to verify that the CAAP is properly implemented. The City also notes that substantial financial resources are needed to implement and achieve the goals of TR-1 and TR-2.

Figure 6-1. Sustainable Transportation Hierarchy



Alignment with Mayors' Commission on Climate Change

The final report from the Mayors' Commission on Climate Change recommends prioritizing active transportation infrastructure for walking and rolling in a new "modal hierarchy" that

CLIMATE ACTION & ADAPTATION PLAN

places people and shared trips over single-occupant vehicles. Prioritizing active transportation is the first step to reducing transportation emissions in Sacramento, aligning with measure TR-1. Recommendations include transitioning 30 percent of all trips to active transportation by 2030 and 40 percent by 2045. Because the CAAP must quantify the GHG reductions associated with its actions, the CAAP cannot use trips as a metric for this measure, because a trip does not have a defined distance or quantity of GHG emissions. However, in 2016 approximately 10 percent of trips were taken by bike or walking according to the SACSIM model and the mode share for active transportation and public transit in this year was approximately 2 percent. The CAAP calls for increasing active transportation mode share to 6 percent by 2030, approximately a three-fold increase from 2016. This level of active transportation mode share by 2030 is consistent with outcomes of comparable case studies and peer-reviewed literature and anticipated level of investment through 2030, all of which are necessary factors to consider for quantifying evidence-based reductions for a qualified GHG reduction plan. Action TR-1.3 also acts as a first step in aligning with the recommendation to

conduct a comprehensive neighborhood-level audit to identify deficient active transportation infrastructure.

Key Performance Indicators

- A.** Achieve 6% active transportation mode share by 2030 and 12% by 2045
- B.** Deploy 30 miles of new bikeways by 2030
- C.** Deploy 20,000 feet of new/repaired pedestrian infrastructure by 2030
- D.** Install or improve at least 70 new pedestrian crossings by 2030
- E.** Implement the 2016 Bicycle Master Plan by constructing 40 miles of bike lanes, 48 miles of bike routes, 40 miles of buffered bike lanes, 18 miles of separated bikeways, and 127 miles of shared-use paths, by 2045
- F.** Construct the pedestrian network in the 2006 Pedestrian Master Plan by 2045
- G.** Collectively reduce VMT to 6,393 miles per person per year in 2030 (25% below 2016 per capita VMT levels) and to 5,625 miles per person per year in 2045 (34% below 2016 per capita VMT levels) between measure TR-1 and TR-2

Expected GHG Reductions

- **2030:** 13,509 MT CO₂e
- **2045:** 30,557 MT CO₂e

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality



Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
TR-1.1: Implement the 2016 Bicycle Master Plan by constructing a comprehensive, connected network of safe and accessible (low-stress) bikeways, on- and off-street, within and across neighborhoods totaling 40 miles of bike lanes, 48 miles of bike routes, 40 miles of buffered bike lanes, 18 miles of separated bikeways, and 127 miles of shared-used paths.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> None 	Phase 1-2	273 collective miles of active transportation lanes/paths constructed
TR-1.2: Implement the improvements in the 2006 Pedestrian Master Plan by providing a connected, safe and accessible (low-stress) pedestrian network, prioritized based on High Injury Network (crash data), school access, equity and community needs. Low-stress pedestrian network includes crossings, sidewalks, and other paths.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> None 	Phase 1	Pedestrian Master Plan improvements implemented
TR-1.3: Conduct a study to identify the physical barriers to active transportation by 2025 and remove them by 2030 to support local partners and community groups.	<ul style="list-style-type: none"> Public Works - Transportation 	<ul style="list-style-type: none"> Public Works - Engineering Services 	Phase 2	Active transportation barriers removed and documented
TR-1.4: Conduct a study to identify educational barriers and provide education and outreach to the community on active transportation options in the City including a travel training program and incentivize a spectrum of transportation options that includes public and private shared and active services.	<ul style="list-style-type: none"> Public Works - Transportation 	<ul style="list-style-type: none"> None 	Phase 2	Education and outreach conducted and documented
TR-1.5: Identify and secure ongoing funding for and then implement active transportation programs (open streets, pilot projects, classes, etc.).	<ul style="list-style-type: none"> Public Works - Transportation 	<ul style="list-style-type: none"> None 	Phase 1	Funding identified

MEASURE TR-2: Support Public Transit Improvements to Achieve 11% Public Transit Mode Share by 2030 and Maintain Through 2045

Moving trips from single-occupancy vehicles to public transit (trains and buses) is the CAAP's second priority method for reducing VMT and getting to carbon-neutral. To do this, the City will work with its partners, including the Sacramento Regional Transportation District (SacRT) to expand service lines and increase the convenience of public transit by reducing the time it takes to reach a destination via public transit as well as reducing wait times (headways) for public transit. The City of Sacramento's role does not involve providing transit services, so many of the actions to implement this measure involve supporting SacRT. The City can work collaboratively with SacRT to develop the infrastructure needed to support public transit including dedicated public transit lanes, signal timing equipment, and more. The City notes that substantial financial resources are needed to implement and achieve the goals of TR-2. Obtaining funding for this measure will be a priority for the City under this CAAP. This measure also prioritizes setting parking maximums and managing curb space more effectively to reduce single-occupancy vehicles and prioritize public transit, as well as continuing to support other shared transportation services like electric car sharing and shared bikes and scooters.

Alignment with Mayors' Commission on Climate Change

The final report from the Mayors' Commission on Climate Change recommends prioritizing the expansion and improvement of public transit and shared transportation services as the second step to reducing transportation emissions in Sacramento, aligning with measure TR-2. Recommendations include shifting 30 percent of all trips to public transit and shared transportation by 2030 and 50 percent by 2045. As a qualified GHG reduction plan, this CAAP must provide evidence that measures are achievable and supported by evidence, including reports, case studies, and peer-reviewed research. Planning for at least an 11 percent transit mode share by 2030 is an evidence-based goal that the City considers achievable given current understanding of transit behaviors in Sacramento and comparable case studies, given that sufficient funding can be obtained to implement the necessary infrastructure.¹⁴ Changes in public transit technology and new programs over the next 10 to 20 years will provide new opportunities and resources. Recommendations from The Mayors' Commission on Climate Change Final Report also include making active transportation and public transit more accessible, affordable, timely, and attractive to help shift behavior. These specific improvements

14. See [Appendix C](#) for more information on case studies and other substantial evidence.



align with actions TR-2.3, TR-2.4, TR-2.8, and TR-2.11. Action TR-2.6 also aligns directly with the Mayors’ Commission recommendation to expand free or affordable ZEV carshare programs, such as Our Community CarShare. Over time, new technologies, State legislation, and funding will allow Sacramento to continue to push towards higher rates of public transit and shared transportation.

Key Performance Indicators

A. Implement new parking minimums and maximums by 2022

- B.** Collaborate with SacRT to achieve an 11% transit mode share by 2030 and maintain this through 2045
- C.** Continue to achieve at least 2 million miles taken by shared transportation
- D.** Collectively reduce passenger VMT to 6,393 miles per person per year in 2030 (25% below 2016 per capita VMT levels) and to 5,625 miles per person per year in 2045 (34% below 2016 per capita VMT levels) between measure TR-1 and TR-2

Expected GHG Reductions

- **2030:**106,035 MT CO₂e
- **2045:**122,371 MT CO₂e

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

CLIMATE ACTION & ADAPTATION PLAN

Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
TR-2.1: Update and implement the City’s Transportation System Management Plan (TSMP) ordinance to shift travel behavior away from the single-occupancy vehicle.	<ul style="list-style-type: none"> Public Works - Transportation 	<ul style="list-style-type: none"> None 	Phase 2	TSMP ordinance updated and implemented
TR-2.2: Eliminate parking minimums Citywide, develop parking maximums and require parking management and transportation demand management plans for all areas of the City based on available transportation options, travel patterns, and land use.	<ul style="list-style-type: none"> Community Development Department Public Works - Parking 	<ul style="list-style-type: none"> Public Works - Transportation 	Phase 2	Parking maximums developed and implemented
TR-2.3: Encourage SacRT to provide frequent, reliable transit in the City’s priority corridors to reduce VMT and support SacRT in implementing priority transit corridors. Coordinate transit priority corridors with consideration of transportation needs as well as land use planning to provide transit-supportive land uses. Encourage the expansion of frequent, reliable transit services throughout the City.	<ul style="list-style-type: none"> Public Works - Transportation SacRT 	<ul style="list-style-type: none"> Community Development - Planning 	Phase 1	Transit headways and VMT reduced
TR-2.4: Collaborate with SacRT in planning and implementing increased transit services with reduced headways and expanded service lines to support an 11% public transit mode share by 2030.	<ul style="list-style-type: none"> Public Works - Transportation SacRT 	<ul style="list-style-type: none"> Community Development - Planning 	Phase 1	11% public transportation mode share by 2030
TR-2.5: Work with SacRT to identify changes to signals and other technological enhancements for transit prioritization and faster transit travel times.	<ul style="list-style-type: none"> Public Works - Transportation 	<ul style="list-style-type: none"> SacRT 	Phase 2	New technology implemented



Action	Lead	Support	Phase	Performance Indicator
TR-2.6: Continue to support electric car sharing options to offset at least 1 million VMT per year in the City of Sacramento through 2030.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> Community Development - Planning 	Phase 1	Electric car share programs expanded
TR-2.7: Continue to support shared rideables (bikes and scooters) to enable a reduction of 1 million VMT per year.	<ul style="list-style-type: none"> Public Works - Transportation 	<ul style="list-style-type: none"> None 	Phase 1	Shared rideable programs expanded
TR-2.8: Support SacRT efforts to secure funding to support improved service/communications such as interactive service maps, app payments, and real time arrival info.	<ul style="list-style-type: none"> Public Works - Transportation SacRT 	<ul style="list-style-type: none"> None 	Phase 1	New technology implemented
TR-2.9: Continue to implement and improve curbside management strategies to better manage and price curb space, manage transportation network companies (TNC) and prepare for autonomous vehicles.	<ul style="list-style-type: none"> Public Works - Parking Services 	<ul style="list-style-type: none"> Public Works - Transportation 	Phase 1	VMT reduced
TR-2.10: Remove barriers to access transit stops and stations (provide low-stress connectivity) and provide enhanced, comfortable stops and stations.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> SacRT 	Phase 1	VMT reduced
TR-2.11: Implement the City's adopted plans including modal/Citywide plans and corridor/area plans (such as the Bicycle Master Plan, Broadway Complete Streets, and 65th Street Area Plan).	<ul style="list-style-type: none"> Public Works - Transportation, Engineering Services, and Entitlements 	<ul style="list-style-type: none"> None 	Phase 1	% of each plan's infrastructure built out

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Action	Lead	Support	Phase	Performance Indicator
TR-2.12: Identify an Employee Transportation Coordinator and establish an employee commute program for City staff that includes provisions for telecommuting and encourage other public and private agencies located within the City to do the same using requirements and/or incentives.	<ul style="list-style-type: none"> Human Resources 	<ul style="list-style-type: none"> None 	Phase 1	Employee commute program with telecommuting options established
TR-2.13: Investigate and lobby for the development of a TNC user tax which would put a small fee on the use of Uber, Lyft, and others and generate funds to pay for transit and transportation infrastructure and related programs.	<ul style="list-style-type: none"> Public Works - Transportation City Manager's Office 	<ul style="list-style-type: none"> None 	Phase 1	User tax or fee investigation completed



MEASURE TR-3: Achieve Zero-Emission Vehicle (ZEV) Adoption Rates of 28% for Passenger Vehicles and 22% for Commercial Vehicles by 2030 and 100% for all Vehicles by 2045

Getting to carbon-neutral requires reducing GHG emissions from remaining car trips while achieving mode shifts to active transportation, shared transportation, and public transit. EVs are proven technology for reducing on-road emissions and, when coupled with carbon-free electricity (i.e., Measure E-1), can reduce these vehicle emissions to zero. The City also sees hydrogen fuel-cell vehicles and plug-in hybrids as potential alternatives to EVs and therefore refers to zero-emissions vehicles (ZEV) in this CAAP. California has a goal of putting 5 million ZEVs on the road by 2030, approximately one-third of the State's vehicles. Sacramento's goals align with the State's and measure TR-3 provides the necessary infrastructure to support a 28 percent ZEV registration rate by 2030, with a long-term target of 100 percent ZEV-registration rate by 2045. A preliminary analysis by City staff shows that currently 3.3 percent of new vehicle sales in Sacramento are ZEVs. While the City cannot require residents to buy and use ZEVs, the City will take actions to incentivize this behavioral change and support this level of ZEV adoption through added ZEV infrastructure, engagement, and programs. The City's primary target to achieve this measure is to provide one public EV charger for every 20 EVs and to continue to remain one of the nation's leading cities for provision of public charging infrastructure, achieved primarily through Actions TR-3.1, TR-3.2, and TR-3.3. The

need for charging infrastructure may change over time depending on new technologies such as smart chargers, battery technology, and trends in personal ZEV adoption. Actions like TR-3.6, TR-3.7, TR-3.9, and TR-3.10 lower existing barriers to ZEV adoption by streamlining associated permit processes, establishing use fees to improve turnover rates at public City chargers, working with employers to improve at-work charging opportunities across the City, and educating the public about ZEV benefits and costs. The City will continue to monitor the most recent research on EV infrastructure needs and update long-term goals as necessary (Action TR-3.12). Measure, and actions TR-3.4, TR-3.5, TR-3.11 will provide low-income communities with more equitable access to and education about ZEV programs and chargers by expanding car share and charger infrastructure in low income and under-resourced communities.

Alignment with Mayors' Commission on Climate Change

The final report from the Mayors' Commission on Climate Change prioritizes development of a comprehensive package of incentives, disincentives, and policies to promote the adoption of ZEVs as the third step to reducing transportation emissions in Sacramento, aligning with measure TR-3. Recommendations include shifting 70 percent of new vehicle

CLIMATE ACTION & ADAPTATION PLAN

registrations to ZEVs by 2030, and electrifying all public, private, and shared fleets by 2045. This CAAP recognizes that while these ambitious goals may be supported by advances in technologies over the next 10 to 20 years, planning for at least 28 percent ZEV registration by 2030 is an evidence-based goal that the City considers achievable given current levels of ZEV adoption in Sacramento. This phasing is also consistent with the Governor Newsom’s Executive Order N-79-20, establishing the State’s goal for 100 percent of in-state new car sales to be zero-emission by 2035 and 100 percent of medium- and heavy-duty vehicles by 2045.¹⁵ While measure TR-3 does not include a goal to electrify all public, private, and shared fleets by 2045, Actions TR-3.9 and TR-3.11 begin to address this recommendation,

while information gathered and further State action during implementation of the CAAP is expected to facilitate more aggressive goals in this direction. Action TR-3.4 also aligns directly with the recommendation to expand free or affordable ZEV carshare programs such as Our Community CarShare.

Key Performance Indicators

- A. 11% ZEV registration rate and 3,230 public EV chargers in Sacramento by 2025¹⁶
- B. 28% ZEV registration rate and 8,150 public EV chargers in Sacramento by 2030
- C. 100% ZEV registration rate by 2045

Expected GHG Reductions

- **2030:** 212,451 MT CO₂e
- **2045:** 1,137,071 MT CO₂e

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

15. Executive Department State of California. *Executive Order N-79-20*. Retrieved on November 4, 2021 from <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>

16. Note that the number of installed public EV chargers established as a key performance indicator in 2030 and 2045 for this measure was calculated based on forecasted population and car registration data in 2030 and 2045 and may not reflect the actual number of chargers needed to establish the City’s goal of one EV charger to every 20 ZEVs in Sacramento.



Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
TR-3.1: Amend City Building Code to require at least 20% EV-capable charging spaces and at least one installed, operational Level II EV charger in new multifamily and nonresidential development. Amend the Planning and Development Code to incentivize charging in both existing and new developments.	<ul style="list-style-type: none"> Community Development - Planning and Code Compliance 	<ul style="list-style-type: none"> None 	Complete	City Building Code amended
TR-3.2: Continue to support a variety of public and public/private partnerships to provide more publicly accessible chargers throughout the City. Examples include public/private partnerships on private property (Electrify America), public/private partnerships on public property (EVgo), and public investment (SMUD).	<ul style="list-style-type: none"> Public Works 	None	Phase 1	EV chargers installed
TR-3.3: Continue to install and provide EV charger access at City-owned facilities and parking garages.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> Community Development Department Electrify America EVgo SMUD 	Phase 1	EV chargers installed
TR-3.4: Pursue affordable, zero-emission car share expansions to serve affordable housing, such as the Sacramento Metropolitan Air District's Our Community Carshare program to more locations, contingent on funding.	<ul style="list-style-type: none"> Public Works Sacramento Metropolitan Air Quality District Our Community Carshare 	<ul style="list-style-type: none"> None 	Phase 1	Electric car share programs expanded

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Action	Lead	Support	Phase	Performance Indicator
TR-3.5: Collaborate on e-mobility hub pilot efforts, in partnership with other agencies and local groups, with special consideration for proximity to low-income/disadvantaged communities and multifamily housing.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> UC Davis Green Tech Private developers of large multifamily housing 	Phase 1	E-mobility hub piloted
TR-3.6: Continue to maintain a highly streamlined EV infrastructure permit process.	<ul style="list-style-type: none"> Community Development Department - Building Division 	<ul style="list-style-type: none"> None 	Phase 1	Streamlined EV infrastructure permit process
TR-3.7: Develop and implement a fee for use of City-owned parking facilities and EV chargers to promote more efficient use and turnover and increase EV availability for people who really need it, including those without access to home charging.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> None 	Phase 1	Use fee implemented
TR-3.8: Continue to implement and improve curbside management strategy to better manage and price curb space, manage TNC, and prepare for autonomous vehicles.	<ul style="list-style-type: none"> Public Works - Transportation and Parking Services 	<ul style="list-style-type: none"> None 	Phase 1	VMT reduced
TR-3.9: Work and collaborate with major employers including the State of California and Sacramento County to promote ZEV adoption, programs, and improvements to ZEV infrastructure.	<ul style="list-style-type: none"> Public Works State of California Sacramento County 	<ul style="list-style-type: none"> None 	Phase 1	ZEV registration increase and Electric Vehicle Supply Equipment (EVSE) utilization
TR-3.10: Continue to provide information and education about currently available incentives for expansion of Level II chargers on private property.	<ul style="list-style-type: none"> Community Development - Planning 	<ul style="list-style-type: none"> None 	Phase 1	Information or materials provided



Action	Lead	Support	Phase	Performance Indicator
<p>TR-3.11: Coordinate with community-based organizations, agencies, and non-profits to conduct EV education events with would include information on costs/ benefits of owning EVs, steps on how to receive incentives for EV chargers, as well as other benefits. Events will be equitably distributed across the City, focusing on disadvantaged communities.</p>	<ul style="list-style-type: none"> • Public Works • Community Development - Planning 	<ul style="list-style-type: none"> • None 	Phase 1	EV education events conducted
<p>TR-3.12: Because zero-emission technology is improving/ changing at a rapid pace, continue to monitor, test, and adapt to new and emerging zero-emission technologies and solutions.</p>	<ul style="list-style-type: none"> • Public Works • Community Development – Planning 	<ul style="list-style-type: none"> • Office of Climate Action & Sustainability 	Phase 1	CAAP and ZEV adoption progress report and recommendations to City Council

WASTE





MEASURE W-1: Work to Reduce Organic Waste Disposal 75% Below 2014 Levels by 2025

Carbon neutrality will require the elimination of methane process emissions from landfilled waste. The majority of these GHG emissions result from organic waste in the landfill that could be otherwise composted, otherwise diverted,¹⁷ or recovered¹⁸ for reduced emissions. To drive these reductions in Sacramento, the City plans to align its waste reduction efforts with SB 1383. In 2016, the State of California adopted SB 1383, a landmark waste mandate that requires the State to reduce organic waste disposal 75 percent below 2014 levels by 2025, or by about 20 million tons annually. The law also requires the State to increase edible food recovery 20 percent by 2025. CalRecycle describes the requirements¹⁹ for local governments in meeting these targets as follows:

- Provide organic waste collection to all residents and businesses
- Establish an edible food recovery program that recovers edible food from the waste stream

- Conduct outreach and education to affected parties, including generators, haulers, facilities, edible food recovery organizations, and city/county departments
- Conduct capacity planning and evaluate City's readiness to implement SB 1383
- Procure recycled organic waste products like compost, mulch, and renewable natural gas (RNG)
- Inspect and enforce compliance with SB 1383
- Maintain accurate and timely records of SB 1383 compliance

Actions W-1.1 through W-1.10 establish city-wide programs, capacity planning, education and outreach programs, and food recovery programs. As the measure is implemented and more information becomes available through Actions W-1.2 and W-1.3, the City will establish additional plans and strategies for achieving SB 1383.

17. Waste diversion consists of sending waste through a regenerative process, such as recycling or composting, so that it does not end up in the landfill.

18. Food recovery consists of capturing edible food before it enters the waste stream and instead sending it to local community organizations, like food banks, so that it is used and eaten instead of being thrown away.

19 See <https://calrecycle.ca.gov/organics/slcp/jurisdictions/>

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LOCAL FOOD PLANNING:

In June 2021, Sacramento was identified as one of 13 communities selected to participate in Local Foods, Local Places (LFLP), which supports Sacramento and its partners – Alchemist Community Development Corporation, Planting Justice, and the Sacramento Food Policy Council – in developing *Food Anchored Resiliency Hubs* in disadvantaged neighborhoods. The hubs will provide training to prepare and sell locally-sourced food, demonstrate sustainable materials, and provide training, employment, and entrepreneurship opportunities. An additional \$2 million dollars was obtained to support the *City Tree Nursery Food Anchored Resiliency Hub* in Mangan Park.

Alignment with Mayors’ Commission on Climate Change

The final report from the Mayors’ Commission on Climate Change recommends supporting a regenerative food system by sourcing 25 percent of food locally within a 200-mile radius by 2030 and 40 percent by 2045 and reducing 50 percent of aggregate food waste by 2025 and 75 percent by 2030. While the City has limited jurisdiction over food system sourcing and has not addressed this directly in the CAAP, measure W-1 exceeds the goals to reduce food waste in 2025 and 2030, to demonstrate consistency with SB 1383. Recommendations also include establishing a food recovery to food security network with restaurants, catering

companies, banks, grocery stores, local food banks, and community food hubs, which aligns directly with Action W-1.8.

Key Performance Indicators

- A. Compliance with SB 1383 requirements by 2025
- B. Compost or otherwise divert at least 75% of organic waste in 2025 relative to 2014
- C. Recover 20% of edible food by 2025
- D. Maintain or improve these metrics through 2030

Expected GHG Reductions

- **2030:** 134,991 MT CO₂e
- **2045:** 160,897 MT CO₂e

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality



Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
<p>W-1.1: Implement the requirements of SB 1383 to compost or otherwise divert 75% of organic waste compared to 2014 levels by:</p> <ul style="list-style-type: none"> • Providing organic waste collection to all residents and businesses. • Establishing an edible food recovery program that recovers edible food from the waste stream and redistributes the food to local community organizations to be used or eaten. • Conducting outreach and education to affected parties, including generators, haulers, facilities, edible food recovery organizations, and city/county departments. • Conducting capacity planning and evaluate your jurisdiction's readiness to implement SB 1383. • -Procuring organic waste products like compost, mulch, and RNG. • Inspecting and enforcing compliance with SB 1383. 	<ul style="list-style-type: none"> • Public Works - Recycling and Solid Waste • Finance - Procurement 	<ul style="list-style-type: none"> • None 	Phase 3	75% organic waste reduction by 2025 compared to 2014
<p>W-1.2: Work with regional partners (other municipalities) and the private sector to assess the feasibility of siting long term organics processing facilities in or near Sacramento County</p>	<ul style="list-style-type: none"> • Public Works - Recycling and Solid Waste • Sacramento County 	<ul style="list-style-type: none"> • None 	Phase 1	Feasibility assessment complete and recommendations or plan developed
<p>W-1.3: Continue to provide backyard compost education and reduced-cost compost bins as well as kitchen-top food waste containers to participating residents.</p>	<ul style="list-style-type: none"> • Public Works - Recycling and Solid Waste 	<ul style="list-style-type: none"> • None 	Phase 1	Backyard compost education events conducted

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Action	Lead	Support	Phase	Performance Indicator
W-1.4: Implement a food waste diversion program for single-family residential customers by 2022.	<ul style="list-style-type: none"> Public Works - Recycling and Solid Waste 	<ul style="list-style-type: none"> None 	Phase 1	Food waste diversion program
W-1.5: Enforce new commercial waste code which requires businesses to subscribe to organics recycling collection service through the City's franchised commercial haulers starting July 1, 2021.	<ul style="list-style-type: none"> Public Works - Recycling and Solid Waste 	<ul style="list-style-type: none"> None 	Phase 2	Ordinance effective March 3, 2021, with July 1, 2021, starting date; businesses with 2 cubic yards or more must comply by July 1, 2021; all businesses must comply by January 1, 2022
W-1.6: Serve as a regional partner in the development and implementation of an edible food recovery program which connects commercial edible food generators with local food banks, to recover at least 20% of the edible food that is currently disposed of for human consumption, consistent with SB 1383.	<ul style="list-style-type: none"> Public Works - Recycling and Solid Waste 	<ul style="list-style-type: none"> None 	Phase 1	20% edible food recovery by 2025
W-1.7: Explore the feasibility of capital improvement projects for reducing organics in the waste stream, such as organics extraction presses and anaerobic digesters.	<ul style="list-style-type: none"> Public Works - Recycling and Solid Waste 	<ul style="list-style-type: none"> None 	Phase 1	Feasibility assessment conducted and recommendations made
W-1.8: Consider adopting, if needed, an ordinance that aligns with AB 827, the state law that requires most restaurants to have front-of-house composting.	<ul style="list-style-type: none"> Public Works - Recycling and Solid Waste 	<ul style="list-style-type: none"> None 	Phase 2	Feasibility assessment conducted and recommendations made



WATER AND WASTEWATER



MEASURE WW-1: Reduce Water Utility Emissions (in MT CO₂e per Million Gallon Delivered) by 100% by 2030 and Maintain that Through 2045

Emissions from water use are 100 percent attributable to electricity usage to convey and treat the water. The primary way to reduce these emissions and achieve carbon neutrality in the water sector is to reduce the emissions associated with the electricity used. By 2030, the water utility will procure 100 percent carbon-free electricity and reduce GHG emissions on a per acre-foot basis to zero (Action WW-1.1). Additional supportive measures such as water conservation, greywater, and storm-water management will further this goal and reduce the amount of electricity needed by reducing overall water demand as the City continues to grow.²⁰

Alignment with Mayors’ Commission on Climate Change

The final report from the Mayors’ Commission on Climate Change does not provide recommendations for the water or wastewater sector. However, measure WW-1 aligns with the recommendation to improve adaptation and resiliency in Sacramento by working to reduce overall water demand, lessening potential future impacts and severity of drought in the region and protecting local water resources in the longer term.

Key Performance Indicators

- A. Utilize carbon-free power for 100 percent of water utility electricity demands by 2030

Expected GHG Reductions

- **2030:** 6,296 MT CO₂e
- **2045:** 0 MT CO₂e

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

20. Although the SMUD 2030 Plan will aim to provide 100% carbon-free electricity by 2030, the reductions associated with water were not included in measure E-1’s GHG reduction quantification and are instead attributed here for consistency with the inventory and forecast’s categorization of GHG emissions.



Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
WW-1.1: Reduce GHG emissions associated with the water utility by procuring 100% carbon-free electricity by 2030.	<ul style="list-style-type: none"> • Utilities 	<ul style="list-style-type: none"> • None 	Phase 2	Achieve 100% carbon-free electricity for water utility use
WW-1.2: Investigate the feasibility of allowing on-site non potable treatment and distributed water resources in new development.	<ul style="list-style-type: none"> • Utilities 	<ul style="list-style-type: none"> • Community Development 	Phase 1	Completion of Feasibility study for a potential dual plumbing reach-code
WW-1.3: Continue to implement the Model Water Efficient Landscape Ordinance each year.	<ul style="list-style-type: none"> • CDD • Utilities • YPCE 	<ul style="list-style-type: none"> • None 	Phase 1	None
WW-1.4: Continue to require the use of low impact development (LID) strategies for new construction and development.	<ul style="list-style-type: none"> • Utilities 	<ul style="list-style-type: none"> • None 	Phase 1	Track the area incorporating LID strategies
WW-1.5: Continue to investigate the landscaping/irrigation use of non-potable reclaimed water from regional sanitation at parks.	<ul style="list-style-type: none"> • Utilities 	<ul style="list-style-type: none"> • YPCE 	Phase 1	Conduct a pilot and pursue funding for implementation
WW-1.6: Increase the use of renewable energy and storage to reduce GHG emissions and increase resiliency for critical infrastructure.	<ul style="list-style-type: none"> • Utilities 	<ul style="list-style-type: none"> • None 	Phase 2	MWh of renewable energy and MWh of installed storage
WW-1.7: Continue to encourage efficient water use by residents and businesses through expanded education, incentives and assistance services in compliance with Assembly Bill 1668 and SB 606, which help reduce the City’s water demand and related energy use.	<ul style="list-style-type: none"> • Utilities 	<ul style="list-style-type: none"> • None 	Phase 1	Per capita water use

MEASURE WW-2: Reduce Wastewater Emissions 22% by 2030 and 40% by 2045

Although GHG emissions from wastewater, including wastewater treatment and stormwater management, are generated by the Sacramento community, operational control of the wastewater treatment facility is covered by the Sacramento Regional Sanitation District (Regional San). This means the City of Sacramento has no direct jurisdiction over these emissions and limited capacity to align activities in this sector with carbon neutrality. However, since the GHG emissions associated with wastewater are included in the GHG emissions inventory, several of Regional San's GHG-reducing activities are included here. The GHG reductions associated with this measure are the result of methane capture projects being undertaken at Regional San facilities, as well as new solar arrays which were not taken into account in the forecast.²¹ The City of Sacramento and SMUD will continue to support Regional San in these and future partnerships to further reduce emissions from the wastewater sector.

Alignment with Mayors' Commission on Climate Change

The final report from the Mayors' Commission on Climate Change does not provide recommendations for the water or wastewater sector. However, measure WW-2 aligns with the recommendation to improve adaptation and resiliency in Sacramento by working to provide new sources of energy through biogas recovery (WW-2.1) and added solar (WW-2.3).

Key Performance Indicators

- None – projects to reduce wastewater emissions were completed before release of the CAAP

Expected GHG Reductions

- **2030:** 5,495 MT CO₂e
- **2045:** 11,517 MT CO₂e

21. RegionalSan. *Sustainability & Innovation: Projects and green programs*. Retrieved on November 4, 2021 from <https://www.regionalsan.com/sustainability-innovation>



Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
WW-2.1: Regional San implements biogas recovery and improvement projects.	• Regional San	• None	Complete	None (completed)
WW-2.2: GHG Emissions Reductions from SB 100 implementation by Regional San.	• Regional San	• None	Complete	None (completed)
WW-2.3: Regional San implements solar PV generation project.	• Regional San	• None	Complete	None (completed)

CARBON SEQUESTRATION



Photo by Carlos Eliason



MEASURE CS-1: Increase Urban Tree Canopy Cover to 25% by 2030 and 35% by 2045

Carbon sequestration is the process by which carbon is taken out of the atmosphere and sequestered in soil, vegetation, or man-made structures. This measure provides GHG reduction through the carbon sequestration achieved by the urban canopy. A City's tree canopy can capture carbon through photosynthesis, whereby trees and other green plants pull CO₂ out of the atmosphere, use the carbon to grow, and release oxygen. Currently, tree canopy covers 19 percent of Sacramento's land surface area. Increasing this to 25 percent by 2030 will increase the carbon sequestration potential of the City, contribute to Sacramento's carbon neutrality goals, reduce the urban heat island effect, decrease water runoff, improve water and soil quality, and improve the City's livability.

About 10 percent of trees in the city are in public parks and along streets, the remaining 90 percent of the trees in the City are located on private property or on property owned by other agencies (e.g., state-owned land.). The costs for maintenance and drought concerns are potential barriers to tree planting, particularly for those with lower incomes. In addition, preserving and incorporating shade trees in connection with higher density development will be necessary to achieve this goal.

Additional funding, land use regulations, and new incentive programs will be needed to reach these targets.

Alignment with Mayors' Commission on Climate Change

The final report from the Mayors' Commission on Climate Change recommends expanding green infrastructure to ensure that all neighborhoods have access to green space within 0.25 mile by 2030 and a baseline canopy of 25 percent by 2030 and 35 percent by 2045. While this measure does not address access to green space (this is instead addressed in the General Plan Update), measure CS-1 meets the recommended canopy cover goals. This measure also contributes to increased resilience in Sacramento by increasing the shade potential during heat waves and lowering the energy needs of houses to stay cool, another recommendation from the Mayors' Commission on Climate Change Final Report.

Key Performance Indicators

- A.** Achieve 25% urban tree canopy cover by 2030 consistent with the Urban Forestry Master Plan
- B.** Achieve 35% urban tree canopy cover by 2045

Expected GHG Offsets

- **2030:** 23,053 MT CO₂e (sequestered)
- **2045:** 61,474 MT CO₂e (sequestered)

CLIMATE ACTION & ADAPTATION PLAN

Co-Benefits



Public Health



Community Cost Savings



Adaptation



Job Creation



Environmental Quality

Actions and Implementation

Action	Lead	Support	Phase	Performance Indicator
CS-1.1: Implement the Urban Forest Master Plan with a goal to achieve 25% urban canopy cover by 2030 and 35% by 2045. Prioritize tree planting in areas with the lowest average tree canopy cover and explore strategies to reduce barriers to tree planting in disadvantaged areas and improve tree health.	<ul style="list-style-type: none"> Public Works - Urban Forestry 	<ul style="list-style-type: none"> Community Development YPCE 	Phase 2	25% urban tree canopy cover by 2030 and 35% by 2045
CS-1.2: Utilize compost and mulch for application to City-owned trees and planters to increase the carbon sequestration potential of tree plantings.	<ul style="list-style-type: none"> Public Works - Urban Forestry YPCE 	<ul style="list-style-type: none"> None 	Phase 1	Compost and mulch procured and applied to City-owned trees and planters
CS-1.3: Develop online educational materials about tree species that are adapted to Sacramento’s climate and resilient to drought and climate change.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> None 	Phase 1	Develop flier/ education material
CS-1.4: Continue to support the SMUD/ Sacramento Tree Foundation program which provides free shade trees for residents and businesses and support increased plantings on private property in areas that are under-canopied through new partnerships and programs.	<ul style="list-style-type: none"> Public Works 	<ul style="list-style-type: none"> None 	Phase 1	Develop flier/ education material





SECTION

07.

CHAPTER SEVEN

(TO BE AVAILABLE FALL 2022)



Chapter 7, the climate adaptation and vulnerability assessment portions of the CAAP
to be available Fall 2022

CLIMATE ACTION & ADAPTATION PLAN

Chapter 7, the climate adaptation and vulnerability assessment portions of the CAAP
to be available Fall 2022



Chapter 7, the climate adaptation and vulnerability assessment portions of the CAAP
to be available Fall 2022



IMPLEMENTATION AND MONITORING



Sacramento's CAAP identifies measures and actions that have been designed to achieve GHG emissions reductions consistent with the City's 2030 climate action target and make substantial progress towards achieving the 2045 goal of carbon neutrality. As a qualified GHG reduction plan (explained in [Chapter 1](#)), Sacramento's CAAP is required to specify performance standards for measures and actions, establish a mechanism to monitor the plan's progress towards achieving its climate action targets, and include the requirement for amendment if the plan does not demonstrate achievement of its climate action targets.¹



Photo by Carlos Eliason

Sacramento Sidewalk

1. CEQA Guidelines § 15183.5, paragraphs (b)(D)-(E)

CLIMATE ACTION & ADAPTATION PLAN

While the measures and the supportive evidence presented in [Appendix C](#) scientifically demonstrate that the CAAP's actions can yield the necessary GHG emissions reductions to achieve the 2030 climate action target, achievement of the targets also requires action from City staff and the community to ensure that the CAAP is being implemented, progress and lessons learned are being tracked, and the CAAP is being updated on a regular basis. Implementation progress will be monitored via two pathways:

1. Evaluation of the implementation progress of each action and measure metric; and
2. Calculation of future GHG emissions utilizing activity data obtained from Sacramento's utility providers, City databases, and comparison of the results to Sacramento's climate action targets.

This chapter details Sacramento's approach to implementing and monitoring the CAAP to ensure actual GHG reductions are achieved in line with the City's climate action targets and demonstrates alignment with the CAAP for CEQA streamlining of future development projects.

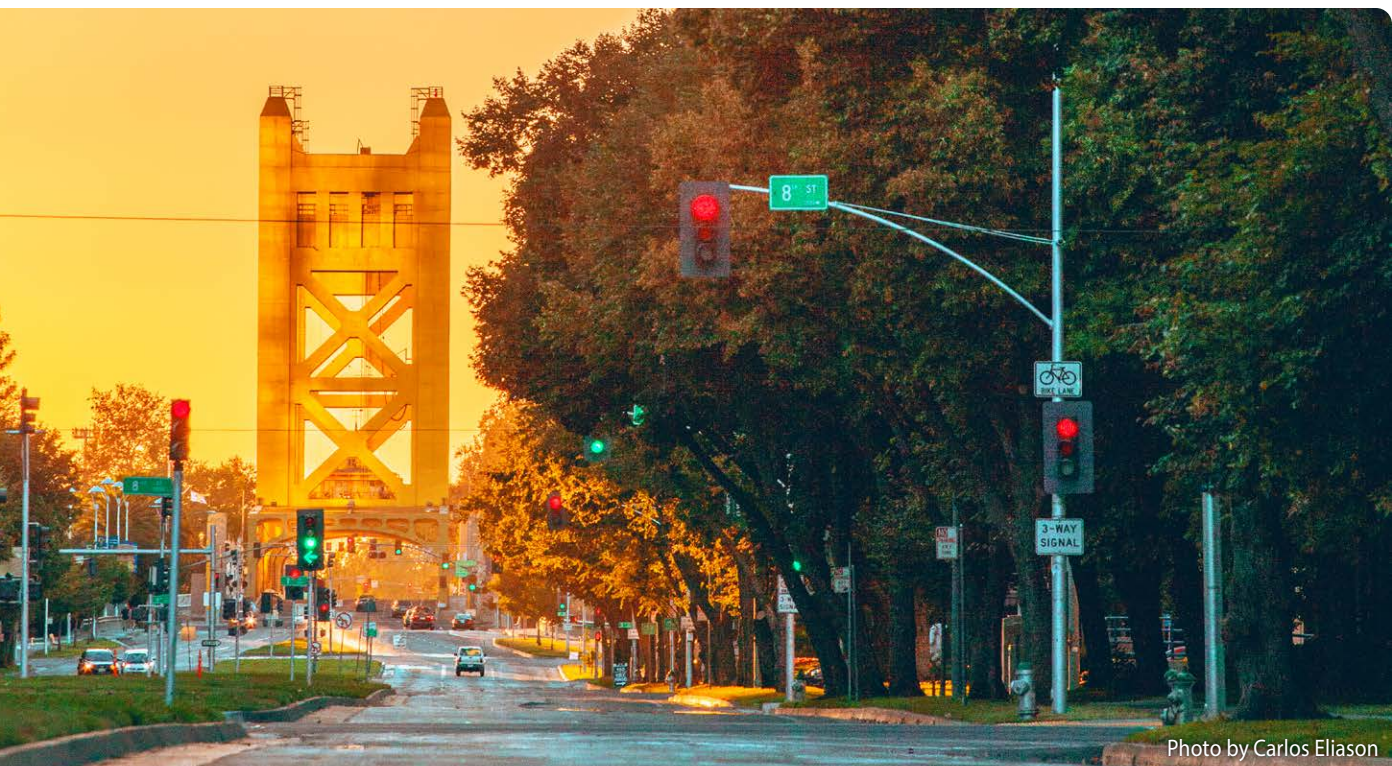


Photo by Carlos Eliason

Tower Bridge at Sunset



Implementation Approach

The City's Community Development Department Planning Division will lead the monitoring effort among various City departments and the CAAP's partners (e.g., SMUD, SacRT), in coordination with the City Manager's Office of Climate Action & Sustainability, to drive implementation of each CAAP action over the next 10 years. Implementation will also occur through alignment of future development projects with the measures and actions contained in the CAAP, primarily through the CEQA "tiering" process explained in [Chapter 1](#). Each CAAP action was vetted via a comprehensive feedback process that involved relevant City departments, community stakeholders, and Sacramento business owners and residents, as described in [Chapter 4](#). Strategies also build on the recommendations of the Mayors' Commission on Climate Change. This process has well positioned the City to implement each of the actions in the CAAP, in partnership with the necessary partners and community groups. Implementation will be results-driven and informed by regular monitoring, reporting, and learning, so that the City can adjust the implementation approach if Sacramento does not see demonstrated and steady progress towards measure goals and the City's climate action targets. The roles and responsibilities of the City, its partners, and the Sacramento community are identified below.

IMPLEMENTATION ROLES AND RESPONSIBILITIES

While CAAP implementation will be coordinated and driven primarily by the City and its partners (as identified for each action in [Chapters 6 and 7](#)), the community, local businesses, and residents also have roles to play in maximizing the CAAP's effectiveness.

City Role

The City is directly responsible for updating and administering building codes, City services, and programs, developing ordinances, fostering partnerships, securing funding, such as grants, for applicable projects, maintaining and expanding public infrastructure, and implementing a number of infrastructure improvements (e.g., publicly accessible EV charging infrastructure, bicycle, and pedestrian infrastructure) associated with the CAAP measures and actions. As policies and programs are developed and infrastructure is constructed in alignment with the CAAP, City staff will engage the Sacramento community on associated opportunities, programs, or requirements. As part of its CAAP outreach commitment, the City will also continue to engage communities, particularly low-income and historically under-resourced communities, to avoid unintended impacts and ensure that CAAP implementation supports a more equitable city. A summary of each City department's measure implementation responsibilities is shown in [Table 8-1](#).

CLIMATE ACTION & ADAPTATION PLAN

Table 8-1. Primary City Department Measure Implementation Responsibilities

Community Development Department	Public Works Department	Utilities
Measure E-2: Eliminate natural gas in new construction.	Measure TR-1: Improve active transportation infrastructure to achieve 6% active transportation mode share by 2030 and 12% by 2045.	Measure E-1: Support SMUD as it implements the 2030 Zero Carbon Plan
Measure E-3: Transition natural gas in existing buildings to carbon-free electricity by 2045.	Measure TR-2: Support public transit improvements to achieve 11% public transit mode share by 2030 and maintain through 2045.	Measure WW-1: Reduce water utility emissions (in MT CO ₂ e per million gallon delivered) by 100% by 2030 and maintain that through 2045.
Measure E-4: Increase the amount of electricity produced from local resources and work with SMUD to install additional local storage by 2030.	Measure TR-3: Achieve zero-emission vehicle (ZEV) adoption rates of 28% for passenger vehicles and 22% for commercial vehicles by 2030 and 100% for all vehicles by 2045.	Measure WW-2: Reduce wastewater emissions by 22% by 2030 and 40% by 2045.
	Measure W-1: Work to reduce organic waste disposal 75% below 2014 levels by 2025.	
	Measure CS-1: Increase urban tree canopy cover to 25% by 2030 and 35% by 2045.	

This table provides a summary of the primary City Department in charge of measure implementation; City Departments with supportive roles (e.g., City of Sacramento Department of Youth, Parks, & Community Enrichment and City Manager's Office of Innovation & Economic Development (OIED)) are detailed in [Chapter 6](#), GHG Reduction Actions.



Photo by Carlos Eliason

Children Recreating

Partner Role

While the City holds the primary responsibility for driving implementation of the CAAP, local partners, including local utilities, special districts, regional jurisdictions, businesses, community-based organizations and other local groups, and the community at large, are in many cases better positioned to implement CAAP actions. For example, SacRT has responsibility for public transit in Sacramento and is best positioned to improve transit. Similarly, SMUD has responsibility as the public utility for electricity service and already has a suite of established rebate programs and other funding options for electrification and efficiency projects. While the City's Urban Forestry Division in Public Works is responsible for street trees, the Sacramento Tree Foundation is already doing work to increase canopy cover in the City outside of the public right-of-way. Through the partnerships fostered by the City, key CAAP partners will take the lead on implementing

measures and actions in their realm of responsibility and expertise. They may conduct outreach to the community, develop incentives and rebates, or even fund community infrastructure or improvements. The following provides a summary of primary partners, with specific information provided on the role of businesses, community-based organizations, and residents.

- Sacramento Municipal Utility District (SMUD)
- Sacramento Metropolitan Air Quality Management District (SMAQMD)
- Sacramento Regional Transit (SacRT)
- Sacramento County
- Sacramento Regional Sanitation District (Regional San)
- Sacramento Regional Water Authority (RWA)
- Private industry and third-party operators (e.g., EV charging network companies, shared rideable operators, and other zero-emission mobility program operators like car share companies)

CLIMATE ACTION & ADAPTATION PLAN

Business Role

Businesses in Sacramento will need to build new services and update skills to address new technologies supported by the CAAP like electric appliances and cars. Businesses, including the development community, will also need to adopt these technologies themselves and utilize programs and incentives to upgrade their buildings and equipment as they become available. The CAAP additionally represents opportunities for workforce development in Sacramento, associated with electric technologies. Some of the highest priority actions businesses can take to support implementation of the CAAP are included in [Chapter 9](#).

Community-Based Organizations

Community-based organizations (CBO) are essential to a successful climate action implementation process, because they aim to make real change in the community's overall health and well-being and provide an avenue of trust that invites diverse members of the community to the table, allowing their voices to be heard. In general, CBOs are public or private nonprofit organizations that are representative of a community or significant segments of a community that provides educational or related services to individuals in the community.² The primary role of CBOs is to advocate for the diverse needs of the community, proactively and thoughtfully share information, and actively work to provide boots on the ground support for various initiatives that are important to the specific community that they represent. Multiple local CBOs

were involved in the development of this CAAP, and those involved in CAAP implementation are shown in the tables in [Chapter 6](#).

Resident Role

Residents of Sacramento can enjoy the benefits of the CAAP by utilizing new infrastructure, programs, and incentives to adopt new technologies and behaviors. The CAAP does not establish many requirements for residents, but instead provides behavioral incentives for residents to adopt lower GHG-emissions activities, like biking instead of driving, or composting instead of sending organic waste to the landfill. It will be up to the residents of Sacramento to adopt these new behaviors once the City and its partners have removed cost and stress barriers. More information on key actions the community can take to support implementation of the CAAP are found in [Chapter 9](#).



2. Cornell Law School. (n.d.). *Definition: Community-based organization from 20 USC § 7801(5)*. LII / Legal Information Institute. Legal Information Institute. Retrieved September 20, 2021, from: <https://www.law.cornell.edu/uscode/text/20/7801#5>



Funding and Financing Plan

Implementation of the CAAP to achieve Sacramento’s ambitious climate action targets is contingent on completion of a number of actions, many of which will require significant up-front costs, even if they provide long term cost savings and other benefits. This is especially true for capital-intensive actions related to modernization and infrastructure improvements. However, this CAAP focused on identifying cost-effective measures and actions available to Sacramento. While some measures and actions carry significant costs, other funding sources or strategies, such as grants or low interest financing, may be available to reduce or avoid incremental costs (as defined below) to the City and the community.

COST CONSIDERATIONS

As part of the climate action planning process, it is essential to consider the various costs associated with implementing climate action measures and also recognize that there is a very high cost of not implementing a CAAP (see the Cost of Doing Nothing below). There are many components to consider when it comes to the cost of implementing various measures. For example, costs may refer to the costs to individuals, or to the City. Additionally, there are up-front costs and lifecycle costs that range significantly depending on the specific measure or action and proposed implementation timeframe. Furthermore, it is understood that there is a general cost of doing business, and

therefore understanding the incremental costs of changing the status quo are also important to recognize to build a foundation of thoughtful decision making. To offset some of the costs, there are a variety of funding opportunities that aim to reduce the up-front financial burden of a jurisdiction for projects that reduce emissions and/or increase resilience. These specific funding considerations, including financing opportunities, are discussed below in further detail.

Costs to the Individual versus City

The measures contained in this CAAP come with both individual and City costs. For example, electrifying vehicles brings costs to the individual to buy an EV, and costs to the City to install EV chargers. The cost to improve public transit infrastructure is a cost to the City and SacRT but may save individuals money. Who bears the cost, and what funding mechanisms are available to offset those costs, were therefore carefully considered as part of the development of this CAAP.

Up-front versus Lifecycle Costs

When discussing how much a measure or action costs it is important to differentiate between up-front costs (e.g., the cost of an LED light bulb) and lifecycle costs (e.g., 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 over time.

Incremental Costs

When discussing costs, it is important to specify the difference between how much a measure or action costs overall and what the incremental cost is. The incremental cost is the difference in cost between the new action and the old or standard action. For example, purchasing a new EV could cost \$30,000 up-front,³ which should be considered a high cost. However, the incremental cost of purchasing an EV versus purchasing a new internal combustion vehicle may be zero or near zero because of up-front incentives and 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 costs are for each measure by keeping in mind what the alternative costs are. In many cases, the difference is negligible.⁴

Financing

One of the major financial tools available to make large investments into infrastructure, vehicles, or buildings is public and private financing. Financing solutions allow for leveraging the time value of money and putting future expected money flows to use today. For example, a solar array may cost \$20,000 and result in an energy bill that is \$200 less per month. The up-front cost of the solar array

could be considered high. However, the loan for the solar array requires a monthly payment of \$150 dollars (inclusive of energy costs), which would still offer a net monthly savings of \$50 dollars. Under this scenario the solar array does not carry a high cost; rather, it provides overall savings. The ability to finance can make seemingly high-cost investments low to no cost. Additionally, there are grants and federal rebates available to help offset the entire cost of solar arrays.

Understanding the ranges of cost savings and revenue streams, and how those costs and revenues accrue over time into a payback or return on investment (ROI) calculation, are prudent factors to structuring partnerships, engaging stakeholders, and making optimal financial decisions. For example, energy efficiency retrofits can generate cost savings of more than 30 percent for 15 to 20 years.⁵ If external partners are involved, such as with an energy savings performance contract (ESPC), cities may not need to provide any up-front capital, but the project's cost savings would accrue with a private third party and be lost by the city. A city must consider the estimated ROI, how project costs and revenues balance out over the useful life of the project, and whether they are willing to forego long-term cost savings or revenue generation capacity by partnering with a private third party.

3 Inside EVs. 2022. *US Electric Car Prices: Cheapest to Most Expensive*. Retrieved from <https://insideevs.com/news/565883/electric-car-prices-us-20220207/>

4 Massachusetts Institute of Technology Trancik Lab. 2016. CarbonCounter.com. Retrieved from <https://www.carboncounter.com/>

5 Office of Energy Efficiency & Renewable Energy. 2021. *Why Energy Efficiency Upgrades*, from: <https://www.energy.gov/eere/why-energy-efficiency-upgrades>



The Cost of Doing Nothing

Finally, doing nothing to prepare for and slow down climate change will also carry a cost. Research published in the journal *Nature* predicts the cost of not decreasing emissions to carbon neutrality by mid-century could range between \$149.78 trillion to \$791.98 trillion globally by the end of the century.⁶ That same study found that if climate change is slowed and carbon neutrality is achieved by mid-century, the world could see a \$127 to \$616 trillion economic benefit after considering the costs associated with taking action. 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 due to climate change costing \$20 billion per year.⁷ 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 there are \$2 to \$10 dollars' worth of benefits.

Taking action to reduce GHG emissions and adapt to climate change now allows the City to use resources effectively and lessen future damages. One immediate example is the cost to install conduit and panel capacity for EV chargers for all new construction. While this action increases up-front 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 EVs, the cost of not installing EV infrastructure today could cost the community significantly more in the future. In a similar vein, adaptation measures will cost the city and the community today. Planting trees, installing microgrids, and setting up cooling centers all have up-front costs. However, it's imperative that these costs be weighed against the costs of a future without these adaptive measures given what is known about the projected climate impacts on the Sacramento region.

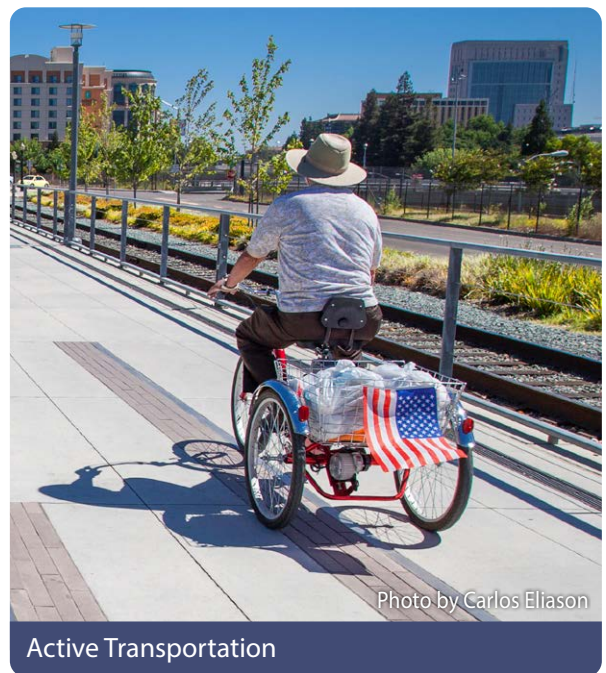


Photo by Carlos Eliason

Active Transportation

6. Wei, Yi-Ming et al. *Nature Communications*. 2020. *Self-preservation strategy for approaching global warming targets in the post-Paris Agreement era*, from <https://www.nature.com/articles/s41467-020-15453-z>.
7. 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*. Retrieved June 9, 2021, from <https://reliefweb.int/report/world/cost-doing-nothing-humanitarian-price-climate-change-and-how-it-can-be-avoided>.

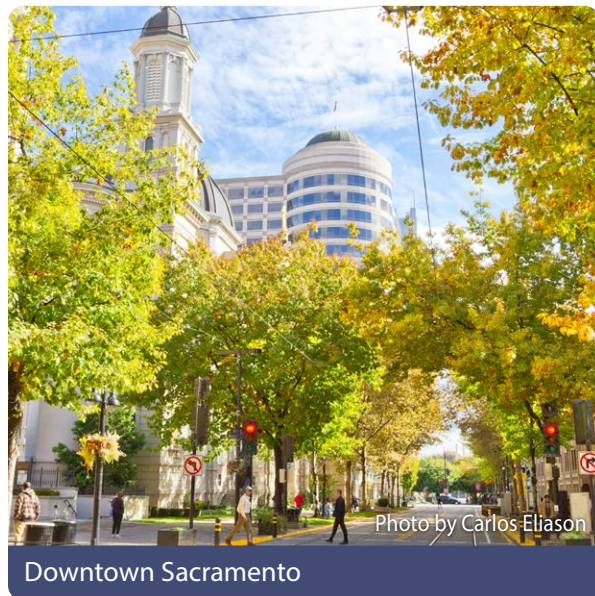
CLIMATE ACTION & ADAPTATION PLAN

Funding and Financing Plan

In order to develop transparency around the prioritization of the CAAP measures and actions the City has developed a high-level funding and financing plan which can be found in [Appendix D](#). While many of the CAAP measures will need more detail on the specific project before a detailed cost and funding or financing approach can be taken, the funding and financing plan provides the estimated cost to the City associated with the implementation of many of the City’s most impactful measures and provides a funding and financing plan to allow the City to begin implementation of these major projects. The funding and financing plan arranges the CAAP measures into three cost segments which include:

- **Low-Cost:** Measures associated with relatively low up-front costs. These actions are assumed to be handled through existing resources or through smaller low-cost changes to staffing/ operations, e.g., policies and ordinance.
- **Moderate-Cost:** These measures will require additional funding or increase short term costs to the City and community, e.g., EV charging infrastructure and program development.
- **High-Cost:** longer term projects requiring substantial investments over time to reduce emissions, e.g., new infrastructure and transit. These measures will require significant investment that cannot be paid for by the City alone. Funding and financing will be key to the implementation of these measures.

The funding and financing strategy focuses on the high- and moderate-cost measures which will need the greatest level of support. The funding and financing strategy is only a snapshot, however. The State supports local climate action in part by providing limited funding that is typically available in the form of competitive grants. The City has recognized that ambitious climate action targets invite resources for identified actions and projects and placed Sacramento in a competitive position to pursue additional funding to support these aggressive actions and goals, particularly in the transportation sector. In particular, additional significant sources of funding will need to be identified to achieve the transportation infrastructure improvements outlined in this CAAP. The strategies in the funding and financing plan represent a well-researched starting point for the City and its partners to obtain the funding and financing necessary to begin implementing the CAAP.





Monitoring the CAAP

The City will monitor progress implementing the CAAP actions and measures. The City will also develop GHG emissions inventories annually to monitor progress in achieving Sacramento's climate action targets. The City will coordinate with its partners to conduct regular monitoring and reporting and City staff will also provide progress reports to City Council annually starting in 2023. As there are many different ways to determine CAAP implementation progress both qualitatively and quantitatively, the City has defined three monitoring levels that will occur simultaneously throughout the life of the CAAP. All monitoring activity will be conducted transparently for the community's reference through CAPDash, an online CAP tool tailored for monitoring Sacramento's CAAP.

CAAP MONITORING LEVELS

Action Monitoring (Annual)

Tracking implementation status involves qualitative tracking of the metrics developed for each action annually. For example, for action E-2.1, the City would track whether or not the ordinance was developed and adopted;

for action TR-1.1, the City would track what portion of new transportation lanes/paths have been built.

Measure Monitoring (Every Two Years)

Tracking measure performance metrics involves determining to what extent the CAAP actions are achieving the measure goals. This involves quantitative tracking of the performance metrics associated with each measure every two years. For example, measure TR-3 contains the goal to achieve ZEV adoption rates within Sacramento of 28 percent for passenger vehicles and 22 percent for commercial vehicles by 2030; the City would therefore track ZEV adoption rates relative to these goals.

GHG Emissions Monitoring (Every Two Years)

GHG emissions would be monitored by conducting regular (every two years) GHG emissions inventories to evaluate Sacramento's progress against its climate action targets and the 2025 GHG emissions milestone.⁸ This involves quantitatively inventorying Sacramento's community-wide GHG emissions on an annual basis, to determine to what extent GHG emissions are actually being reduced in the City. The City would conduct ongoing GHG emissions inventories using methods similar to those used for this CAAP's inventory (see [Appendix A](#) for method details).

8. For the purposes of monitoring CAAP implementation, the 2025 GHG emissions milestone as an important mid-way point to thoroughly measure progress to the 2030 target. See [Appendix A](#) for details about the 2025 milestone.

Reporting on Progress

The City will provide a report with information on the implementation status and monitoring results to City Council on an annual basis. The report will include a qualitative discussion of barriers to implementation for each measure and the results of the annual GHG emissions inventory. Every two years, the report will quantitatively analyze whether the City is on track to reach its 2030 target, or if changes or additional measures and actions are needed. If the City is unable to achieve the 2025 GHG emissions milestone by 2025, the City will work to develop additional measures and actions beyond those identified here as part of a CAAP update for Sacramento to stay on track to meet the 2030 target. Based on progress towards the CAAP climate action targets, Sacramento may opt to conduct an update to the CAAP after the milestone year of 2025 to ensure the 2030 target is met.

Updating the CAAP

The City is committed to routine tracking and evaluation of the CAAP. In addition to annual progress reporting, a CAAP update will be completed every 5 years, including reporting on progress of supportive measures. The interim CAAP update will revisit and update the approach for reducing GHG emissions in Sacramento outlined in this CAAP and establish new strategies, measures, and actions, based on State legislation at that time and progress made towards the 2030 target. Finally, a complete CAAP update for post-2030 climate action targets will be required to consider new technological and political conditions that may warrant new approaches. It is anticipated that new technologies and legislation will facilitate GHG emissions reductions beyond what is currently possible and allow the City to continue towards its long-term goal of carbon neutrality by 2045.



Sacramento in the Fall



Table 8-2. Implementation Timeline

Phase	Year	Implementation Actions
1	2022	<ul style="list-style-type: none"> • Adopt CAAP • Begin Phase 1 Implementation
	2023	<ul style="list-style-type: none"> • GHG Inventory and Forecast Update • Year 1 Progress Report – qualitative analysis of implementation actions • Begin Phase 2 Implementation
2	2024	<ul style="list-style-type: none"> • GHG Inventory and Forecast Update • Year 2 Progress Report – quantitative analysis of implementation actions
	2025	<ul style="list-style-type: none"> • GHG Inventory and Forecast Update • Year 3 Progress Report– qualitative analysis of implementation actions • Begin CAAP Evaluation and Update
	2026	<ul style="list-style-type: none"> • GHG Inventory and Forecast Update • Year 4 Progress Report – quantitative analysis of implementation actions • Finalize 2025 CAAP Update
	2027	<ul style="list-style-type: none"> • GHG Inventory and Forecast Update • Adopt 2025 CAAP Update • Year 5 Progress Report – qualitative analysis of implementation actions
3	2028	<ul style="list-style-type: none"> • GHG Inventory and Forecast Update • Year 6 Progress Report – quantitative analysis of implementation actions
	2029	<ul style="list-style-type: none"> • GHG Inventory and Forecast Update • Begin CAAP Update • Year 7 Progress Report– qualitative analysis of implementation actions
	2030	<ul style="list-style-type: none"> • GHG Inventory and Forecast Update • Year 8 Progress Report – quantitative analysis of implementation actions • SB 32 Target Year
	2031	<ul style="list-style-type: none"> • Year 9 Progress Report– qualitative analysis of implementation actions • Adopt new CAAP

Chapter 6 provides detailed information on the implementation phase associated with each action. As outlined in Chapter 6, the City of Sacramento has established three phases for implementation. Phase 1 actions will begin implementation at CAAP adoption or before. These actions have been prioritized due to their importance, cost effectiveness, or the availability of resources for implementation. Phase 2 actions will begin implementation between 2022 and 2025. These actions may require additional resources such as staff time, funding and financing, or there may need to be additional education and outreach conducted prior to implementation. Phase 3 actions will begin implementation after 2025. These actions may be less critical in the short term, or simply require more significant resources to implement.



COMMUNITY ACTION AND SUSTAINABILITY



Many of the measures and actions in the CAAP will support community members in adopting new technologies, services, and behaviors like electrifying their homes and cars, driving less, or composting organic waste. While the City and its partners are responsible for leading this effort by developing programs and infrastructure, the community will need to utilize the opportunities created by the City and adopt new technologies and behaviors. Community members or groups that embrace these opportunities will directly experience many of the co-benefits identified in [Chapter 5](#), such as cleaner air in their homes and businesses, healthier lifestyles, and long-term decreased cost of living in many cases.

For example, [Measure TR-3](#) creates a holistic framework to achieve increased ZEV-adoption rates for passenger and commercial vehicles by amending the City's Building Code to require increased EV capability and amending the Planning and Development Code to incentivize charging in both existing and new developments, continuing to install and provide EV charger access at City-owned facilities and parking garages, continuing to support and collaborate with community partners, pursuing affordable, zero-emission car-share expansions to serve affordable housing, developing and implementing a fee for use of City-owned parking facilities and EV chargers to encourage and promote more efficient use and turnover

CLIMATE ACTION & ADAPTATION PLAN

and increase EV availability, continuing to maintain a highly streamlined EV-infrastructure permit process, and engaging with the community and providing educational information in an ongoing manner.¹ This framework creates various strong incentives and support structures for ZEV adoption and use, but it will still be up to community members to transition from gas-powered vehicles to electric-powered vehicles using the approach and funding mechanisms provided.

This chapter is intentionally incorporated in this CAAP to provide a clear pathway for community members to make direct change and includes resources and community-level

actions that can be taken to support the CAAP and help create a more sustainable Sacramento. These actions provide a roadmap for voluntary action by the community and are not required to ensure that the CAAP is a qualified GHG emissions reduction plan. However, providing a clear route for community involvement is critical to developing an implementable plan. The community-level actions are divided into sections for different segments of the community: residents, homeowners and property owners, businesses and employers, and developers. Readers of the CAAP can explore this section and discover opportunities for contributing to GHG reductions, resiliency, and sustainability in the City of Sacramento.

¹ See [Chapter 6](#) for a full list of the actions that support implementation of [Measure TR-3](#).



Electric Vehicle Chargers



Community Action Guide

This community action guide includes actions that can be taken at the community level by residents, homeowners and property owners, businesses and employers, and developers to support Sacramento’s GHG emission reduction goals, improve sustainability, and help mitigate the impacts of climate change. This section also includes resources specific to Sacramento that make taking these actions possible. These actions focus on Sacramento’s most important GHG reduction measures. Together, the City of Sacramento and the community can improve sustainability within the City and meet the science-based climate action targets developed for 2030 and 2045.

RESIDENTS

Residents play a big role in helping Sacramento achieve its climate action targets. This section includes information and resources related to actions residents can take that will make the biggest impacts towards reducing GHG emissions.

Bike, Walk, Skateboard, Scooter, Take Transit, Carpool, or Telecommute when Possible

Impact: Moderate to high. Finding alternative transportation options to single-occupancy vehicles is key to reducing your transportation footprint. Biking, walking, skateboarding, scootering, taking the bus or light rail, and carpooling are all good alternative transportation options and support Sacramento’s efforts to increase active and shared transportation and public transit (*Measures TR-1 and TR-2*).

Cost: Low to none. Walking, biking, skateboarding, and scootering are great low- and no-cost alternatives to driving and can help improve resident’s health and wellness. Taking the bus or carpooling can also help save on transportation costs. In Sacramento, remember that students ride free on transit!

Links to Resources:

- ▶ [Explore Sacramento’s expanding bikeways](#)
- ▶ [Learn more about shared rideables in Sacramento](#)
- ▶ [Find transit routes and schedules](#)
- ▶ [Students ride free!](#)

Buy, Lease, or Borrow an EV when it's Time for a New Car or to Make a Trip Around Town

Impact: High. Transportation is the largest contributor to Sacramento's GHG emissions, and a vast majority of those emissions come from passenger vehicles. Sacramento's transportation strategy includes electrifying car trips to the greatest extent possible (*Measure TR-3*). Buying an EV will directly support this strategy and may provide life cycle cost savings in the long run. Sacramento is one of the best places in California to own an EV with low electricity rates and over 600 public chargers with more on the way!

Cost: High. Costs for residents who choose EVs are highly dependent on vehicle choice. Many EVs are comparable in cost to gasoline-powered vehicles and can be comparatively less expensive over the full life of the car.² Costs can also be associated with installing an EV charger at home. Level 1 chargers can cost between \$300 to \$600 to install.³ Sometimes electrical upgrades may be required for older homes. However, the ongoing maintenance and operation costs of owning or leasing an EV have been shown to be significantly lower than internal combustion vehicles.

Links to Resources:

- [Evaluate the GHG footprint and lifecycle costs of different cars](#)
- [Explore a list of affordable electric cars on the market](#)
- [Check the costs of charging an EV versus gas prices](#)
- [Find more information and ask questions at SacEV](#)



Electric Vehicle Charging

² CarbonCounter. *Cars evaluated against climate targets*. Retrieved November 4, 2021, from <https://www.carboncounter.com/#!/explore>.

³ Carvana. 2022. *How Much Does it Cost to Install an EV Charger?* Retrieved from <https://blog.carvana.com/2021/07/how-much-does-it-cost-to-install-an-ev-charger/>



Compost Your Yard and Food Waste

Impact: *Low to moderate.* Sacramento has adopted a strategy to increase the diversion of organic waste from the landfill by adding food collection and composting programs in the City (*Measure W-1*). You can support this work by doing your own composting and recycling now. It's low cost and has the added benefit of reducing strain on local landfills. Furthermore, compost, when added to the soil, increases the rate of carbon sequestration by the soil microbes for years after the compost is applied.⁴

Cost: *Low to none*

Links to Resources:

- ▶ [Compost at home](#)
- ▶ [Compost with ReSoilSac](#)
- ▶ [Get involved at a community garden near you](#)
- ▶ [Curbside composting program starting in 2022](#)



⁴ University of California - Davis. (2019, August 14). *Compost key to sequestering carbon in the soil: Study dug deep to uncover which agricultural systems store the most carbon.* ScienceDaily. Retrieved September 21, 2021, from www.sciencedaily.com/releases/2019/08/190814161818.htm

Track Your Water Usage and Check for Leaks

Impact: High. Saving water in Sacramento is also part of reducing our environmental impact and begins at the individual level. Tracking your home's usage and detecting leaks is now easier than ever with advanced technology and the City's Water Conservation Team. Toilets are very common sources of leaks and often exceed 400 gallons per day.

Cost: Free. Residents can access water wise services through the City's website, including a free house call to determine water efficiency, leak repair assistance, and rebates for low-water appliances.

Links to Resources:

- [Error! Hyperlink reference not valid. Residential Water Wise Services](#)
- [Report water misuse using the 311 app](#)



Leaking Faucet



Use an Induction Burner Instead of Your Gas Stove

Impact: Moderate. In Sacramento, natural gas use equates to approximately 14 percent of the City's emissions and reducing these emissions is essential to reaching the long-term goal of carbon neutrality. One opportunity to reduce natural gas usage in homes is by switching from a gas-powered stove to an induction burner, which also improves indoor air quality and could make your home healthier. According to CARB, natural gas and propane stoves can release carbon monoxide, formaldehyde, and other harmful pollutants into the air, which can be toxic to people and pets.⁵ Furthermore, a 2020 report from Rocky Mountain Institute⁶ found that peak indoor air pollution from gas stoves can reach levels as much as five times higher than the legal outdoor limit.

Cost: Low. Induction cook tops generally range in price from approximately \$50 to \$75 and can be set on the countertop to be powered by electricity. By transitioning appliances in buildings from the consumption of natural gas to electricity, emissions from this source can be reduced. This reduction will become greater over time through SB 100 requirements which requires utilities to provide increased renewable electricity. A variety of studies have found that electrification of buildings,

combined with renewable power generation, is a potential path towards reaching carbon neutrality.⁷ Additionally, indoor air quality would be improved.

Links to Resources:

- ▶ [The Best Portable Induction Cooktops](#)
- ▶ [Check out an induction burner from the Sacramento Public Library](#)
- ▶ [Get a SMUD rebate for an induction cooktop/range](#)
- ▶ [Lean more about switching to electric appliances](#)



Induction Cooktop

5 California Air Resources Board (CARB). *Cooking can contaminate the indoor air with harmful pollutants, but range hoods can effectively remove them*. Retrieved November 4, 2021, from <https://ww2.arb.ca.gov/resources/documents/indoor-air-pollution-cooking>

6 Rocky Mountain Institute. *Gas Stoves: Health and Air Quality Impacts and Solutions*. Retrieved on November 4, 2021 from <https://rmi.org/insight/gas-stoves-pollution-health>

7 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).

CLIMATE ACTION & ADAPTATION PLAN

Upgrade to Clean Energy from SMUD

Impact: High. In Sacramento, approximately 24 percent of GHG emissions are generated by electricity use. Increasing the rate of renewable and carbon-free energy would decrease the emissions generated from electricity use and would help support the long-term goal of carbon neutrality.

Cost: Low. SMUD offers two low-cost options for residents to purchase clean energy through the Greenergy program. For \$4 a month (\$48/year), SMUD will provide residents with 50 percent clean energy sources and for \$8 a month (\$96/year), SMUD will provide residents with 100 percent clean energy, which is a mix of renewable and carbon-free resources like wind, solar, and hydroelectric power. There is also an option for businesses to purchase 100 percent clean energy.

Links to Resources:

- ▶ [SMUD's Greenergy options and sign-up page](#)



Renewable Energy Options



Talk to Your Landlord or Property Manager and Ask for Sustainability Upgrades

Impact: *Moderate to high.* As mentioned above, a majority of the City’s housing units were built prior to 2005 and may not include the most current energy efficient appliances, fixtures, and fittings. Likewise, these units may not include the necessary infrastructure to charge EVs. Replacing antiquated equipment with current equivalents would likely result in significant emissions reductions. Likewise, providing safe, convenient EV charging infrastructure would encourage residents to investigate alternative vehicles options at the time of purchase.

Cost: *Low or free.* The primary cost associated with this initiative would be the time associated with completing a personal review and then reaching out to landlords or property managers, as applicable. However, there may be reduced costs for tenants that would be achieved through installation or implementation of energy efficient design. As noted by the EPA in *Successes in Sustainability: Landlords and Tenants Team Up to Improve Energy Efficiency*,⁸ working together to create green, efficient space not only offers environmental and financial benefits but also creates opportunities for a strong landlord-tenant relationship. Although the conclusions included in the EPA’s paper are based on commercial landlords and tenants, there is a direct connection

to residential uses, and these lessons learned can be applied. Three of the key initiatives that are discussed include the value of retrofitting leased space as green space, measuring and sharing energy data to enable efficiency, and engaging tenants around sustainability.

Links to Resources:

- [U.S. EPA – Successes in Sustainability: Landlords and Tenants Team Up to Improve Energy Efficiency](#)



Induction Stove Installation

8 United States Environmental Protection Agency. *Successes in Sustainability: Landlords and Tenant Team Up to Improve Energy Efficiency*. Retrieved on November 4, 2021 from https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/EPA_ES_Tenant_Report_508.pdf

HOMEOWNERS AND PROPERTY OWNERS

Homeowners and property owners have power over how their property uses resources like energy for heating and cooling and water for washing and landscaping. If you're a homeowner or property owner in Sacramento, this section includes a list of suggested actions for reducing the energy and water usage of your property while maintaining comfort in a cost-effective way.

Install Solar Panels and/or Battery Storage

Impact: Moderate to high. Installing solar with batteries on your property reduces your electricity emissions and increases Sacramento's electrical grid resilience. These are key aspects of Sacramento's energy strategy (see [Measures E-2 and E-4](#)). Battery storage takes this one step further by allowing you to store solar energy for use at night, decreasing your emissions footprint even further at the time when the grid is supplying the most carbon intensive electricity. Battery storage can also increase your property's resiliency by providing electricity during power outages or disasters.

Cost: Up-front cost for installing solar panels and batteries on your home can be high (currently anywhere from \$5,000 to \$17,000 after tax breaks for solar and \$11,000 to \$18,000 for batteries), but on-bill cost savings start right away and can pay off the installation in 7 to 20 years for solar and 6 to 12 years for battery storage. Average savings for solar after

20 years is \$20,000 on average. SMUD and other programs provide financing options for installing solar.

Links to Resources:

- ▶ [Learn about batteries and rebates from SMUD](#)
- ▶ [Use SMUDs solar calculator tool to estimate your solar savings potential](#)
- ▶ [Learn about solar permits from the City online](#)
- ▶ [Explore opportunities to get free solar installed on your home through Grid Alternatives Energy for All Program for families with limited or fixed incomes](#)
- ▶ [Explore the Low Income Home Energy Assistance Program \(LIHEAP\)](#)



Solar PV Being Installed



Install an Electric Water Heater, Heat Pump HVAC, and/or Stovetop

Impact: High. Support the effort to electrify existing buildings (*Measure E-3*) by installing electric appliances instead of gas appliances which depend on fossil fuels. The electricity provided by SMUD today is already approximately 72 percent carbon-free. SMUD has a goal to provide 100 percent carbon-free electricity by 2030 (*Measure E-2*). In addition to significant reductions in GHG emissions, due to SMUD's low electricity rates, electric appliances can save you money on your energy bills and reduce indoor air pollution from natural gas combustion. Time of replacement (when your old appliance breaks or is no longer working efficiently) is the best time to make the switch, but you may need additional upgrades like an electric panel so make sure to start looking into electric replacements now. Be sure to check out the resources linked here, since SMUD has some of the best electric appliance rebates in California.

Cost: Moderate. In general, electric induction models are more expensive than natural gas fueled⁹ counterparts upfront but provide long-term on-bill savings. Current marginal costs (the cost increase compared to replacement with a natural gas appliance) after rebates for a heat pump HVAC (which also provides cooling) is about \$3,600 to \$8,200 before incentives. However, if a household expects to replace both an air conditioner and a furnace, a single

heat pump unit provides the same heating and cooling at a lower upfront cost. Heat pump hot water heaters represent a marginal cost between \$1,700 and \$2,600 before incentives and offers significant cost savings over time.¹⁰ SMUD offers rebates that can reduce to zero the marginal cost of switching to all-electric.

Links to Resources:

- ▶ [Explore SMUD's electrification rebates](#)
- ▶ [Learn more about installing electric appliances from The Switch is On](#)
- ▶ [Search SMUD's Contractor Network for going Electric](#)



Heat Pump HVAC

⁹ On average, traditional electric coil cook tops are approximately the same price as natural gas-powered cook tops.

¹⁰ E3 Residential Building Electrification in CA 2019

Upgrade to Water-wise Landscaping and Water-efficient Fixtures

Impact: High. With Sacramento’s hot and arid climate, water is a precious commodity to the City. The City’s Water Conservation Team provides many rebates on indoor fixtures and outdoor irrigation fixtures.

Cost: Moderate to high. Take advantage of rebates available to help you upgrade a lawn to a beautiful and drought-tolerant landscape, upgrade irrigation sprinklers and smart controllers, purchase a rain barrel, or design a laundry-to-landscape system. The City’s Water Conservation Team can help connect you to a landscape designer and conduct a water-wise house call to provide information on making the most of your home. Within the house, rebates for upgrading to high-efficiency toilets and washing machines. The SMUD Energy Store also provides rebates for smart controllers, aerators, and showerheads.

Links to Resources:

- ▶ [Check out the City’s Residential Rebates for outdoor landscaping and toilets](#)
- ▶ [Find other rebates on water efficient home fixtures at the SMUD Energy Store](#)



Drought-tolerant Landscape



BUSINESSES AND EMPLOYERS

Businesses and employers will play a key role in reducing GHG emissions in Sacramento and supporting this CAAP. This section provides a list of actions that businesses and employers can take to support GHG emissions reductions in Sacramento.

Install Bike-friendly Facilities for Your Employees and Encourage Public Transit Use

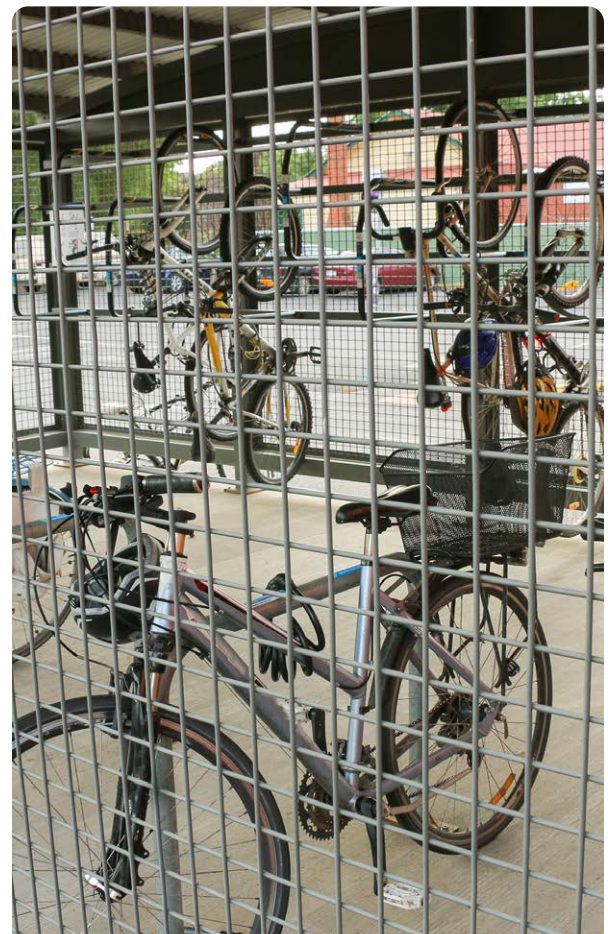
Impact: High. You can help your employees decarbonize their commute and bike, walk, or take the bus to work. Consider installing bike racks or secure parking rooms for employees to safely store their bikes during the workday, providing showering facilities, and/or offering financial incentives for employees to bike, walk, carpool, or take the bus to work.

Cost: Low to moderate. Bike racks and secure parking rooms can range significantly in price. Installation of showering facilities and financial incentives could range depending on current infrastructure in place and number of employees. Reducing emissions from transportation will be crucial to reaching the City's long-term goals because approximately 57 percent of the City's emissions come from the transportation sector. In addition to providing the necessary infrastructure, there are a variety of initiatives in place to encourage employees to actively commute. For example, the Federal Bike Commuter Benefit became effective in 2009, and if a company elects to offer this benefit, employees can receive up to \$20 a month for

each month they commute primarily by bike, as long as they don't accept any of the other transit benefit.

Links to Resources:

- ▶ [Explore more ways to encourage your employees to bike to work](#)
- ▶ [Check out Transportation Demand Management ideas from SACOG](#)
- ▶ [Learn more about developing a successful bike commuting program for employees](#)



Bicycle Locker

Install EV Chargers in the Employee Parking Lot and Convert Fleet to Electric when Possible

Impact: High. Transportation is the largest contributor to Sacramento’s GHG emissions, and a vast majority of those emissions come from passenger vehicles. Sacramento’s transportation strategy includes electrifying vehicle trips to the greatest extent possible (*Measure TR-3*). Converting your fleet to electric, installing EV chargers in your workplace parking lot, and developing a workplace charging program for your employees will support this important effort.

Cost: Moderate to high. EV-charging infrastructure can range in price depending on categories of EV charger from approximately \$813 (Level 1 – Non-networked charger) to \$140,000 (DC fast – Networked 350 kW) per charger.¹¹ However, there are a variety of funding opportunities, including grants, that support the installation of EV-charging infrastructure. Replacement of fossil fuel powered fleet vehicles at the end of their life with electric alternatives would mean only the marginal cost (difference between a standard vehicle and EV) would need to be considered as a cost increase. The long-term savings associated with EV’s as well as the incentives available could more than make up for this increased upfront cost.

Links to Resources:

- [Review Sacramento’s guide for going electric](#)
- [Explore this Business Clean Vehicle Fleet Program](#)



EV Charging Stations

¹¹ The International Council on Clean Transportation (ICCT). *Estimating electric vehicle charging infrastructure costs across major U.S. metropolitan areas*. Retrieved on November 4, 2021 from https://theicct.org/sites/default/files/publications/ICCT_EV_Charging_Cost_20190813.pdf



Install Solar Panels and/or Battery Storage at Your Business

Impact: *Moderate to high.* Installing solar at your business reduces your electricity emissions and your bills. These are key aspects of Sacramento’s energy strategy (see [Measures E-2 and E-4](#)). Battery storage takes this one step further by allowing you to store solar energy for use at night, decreasing your emissions footprint and energy costs even further at the time when the grid is supplying the most carbon-intensive electricity. Battery storage can also increase your business’s resiliency by providing electricity during power outages or disasters.

Cost: Up-front cost for installing solar panels and batteries on your business can be high (currently anywhere from \$5,000 to \$17,000 after tax breaks for solar and \$11,000 to \$18,000 for batteries), but on-bill cost savings start right away and can pay off the installation in 7 to 20 years for solar and 6 to 12 years for battery storage. Average savings for solar after 20 years is \$20,000 on average. SMUD and other programs provide financing options for installing solar.

Links to Resources:

- [Get your business started with solar](#)
- [Learn more about battery storage for your business](#)
- [10 benefits of solar energy for commercial buildings](#)



Energy Storage

Develop (or Keep) Work-from-home Policies for Employees

Impact: Moderate to high. Allowing your employees to work from home, even one day per week, will reduce vehicle miles traveled in Sacramento, save your employees money, improve air quality, and reduce traffic impacts. Most passenger vehicle miles in California are from commuting to and from work. Removing the need to commute to work via car supports Sacramento's efforts to reduce vehicle miles traveled, traffic congestions, and helps reduce GHG emissions. As the impacts of COVID-19 recede, consider leaving employees flexibility to work from home some or all the time as feasible. Due to the COVID-19 pandemic, a number of employees have already been telecommuting, showing the potential for the efficacy of telecommute options. Not only does employee telecommuting provide GHG reductions but it also provides flexibility for employees with longer commute times.

Cost: Free. There are no additional costs associated with developing or retaining work-from-home policies for employees. In fact, in most instances, employers are able to save money on overhead. For example, according to Forbes, prior the pandemic, employers saved an average of \$22,000 per full-time remote employee.¹² Likewise, the costs would be reduced for employees. According to a recent FlexJobs survey, the average remote

worker saves \$4,000 per year by not spending money on gas, coffee, lunches, and clothes for their wardrobe.¹³

Links to Resources:

- ▶ [Review suggestions for how to create an effective work-from-home policy from BuiltIn](#)
- ▶ [Take a look at this sample telecommuting policy from Global Workplace Analytics](#)
- ▶ [Review the State's suggestions for how to support teleworking](#)



Working from Home

12 Jeff DeVerter. Forbes Technology Council. *In Defense of Remote Work*. Retrieved on November 4, 2021 from <https://www.forbes.com/sites/forbestechcouncil/2020/12/02/in-defense-of-remote-work/?sh=2dbab07a144a>

13 Rachel Pelta. FlexJobs. *6 Ways Working from Home will Save you \$4,000 or More Annually*. Retrieved on November 4, 2021 from <https://www.flexjobs.com/blog/post/does-working-remotely-save-you-money/>



Reduce Food Waste

Impact: *Low to moderate.* Sacramento has adopted a strategy to divert organic waste from the landfill through enhanced composting programs in the City (*Measure W-1*). You can support this effort by continuing to divert and reduce your food waste at your business.

Cost: *Free.* In general, reducing waste through strategic business planning and thoughtful purchasing policies not only reduces upfront costs but also reduces waste management costs as well. Commercial waste is generally collected and measured using the number of dumpsters that a facility uses. Reducing the amount of waste generated would reduce the number of trips associated with delivery and waste hauling and therefore reduce GHG emissions and improve local air quality as well.

Links to Resources:

- [Managing food waste at the workplace](#)
- [Managing food waste at your restaurant](#)
- [Learn about food donation programs](#)
- [Donate your left-over food](#)



Edible Food Donations

CLIMATE ACTION & ADAPTATION PLAN

Practice Sustainable Business

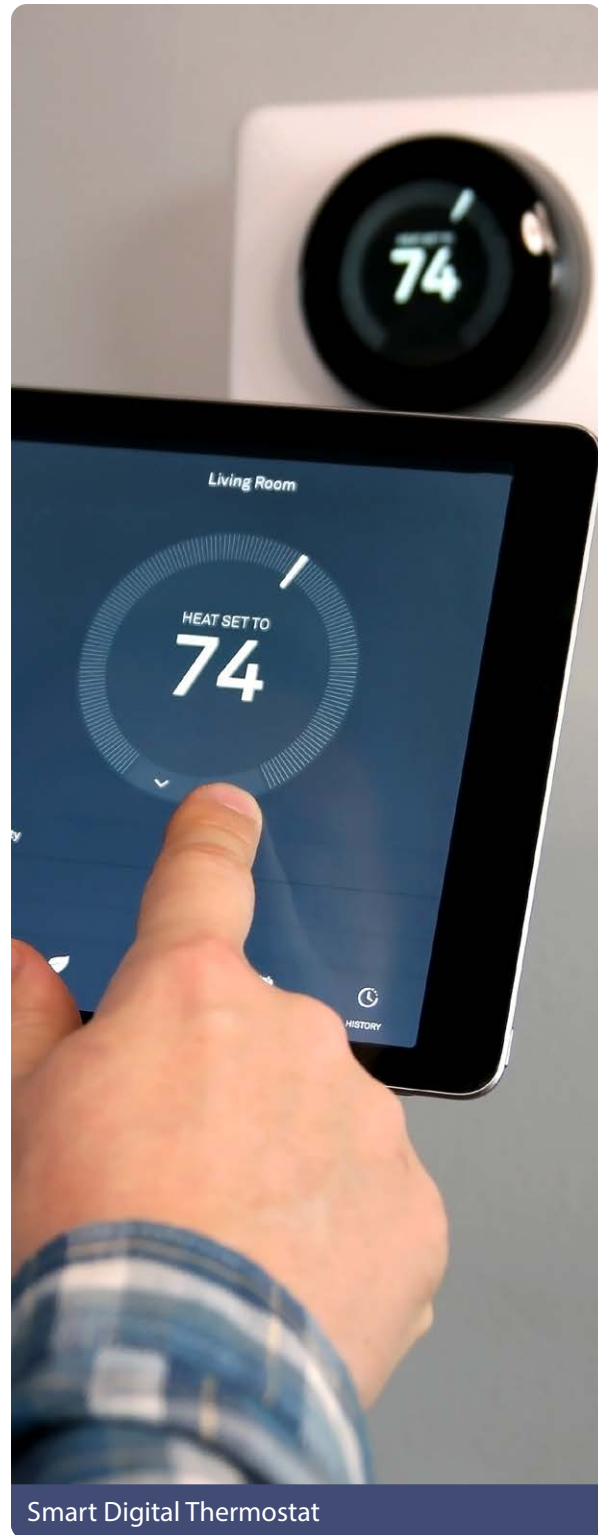
Impact: Low to moderate. You can reduce your organization's GHG emissions by procuring sustainable materials and developing other employee-focused sustainability policies.

Cost: Low. There may be slight marginal costs associated with practicing sustainable business; however, as noted in [Chapter 8](#), the cost of doing nothing at all is far greater. Shifting business practices may result in minimal upfront costs, which generally will diminish over time when the full life cycle of the operations/actions are compared.

Links to Resources:

- ▶ [Review this business guide to sustainable business practices](#)
- ▶ [Learn more about small businesses and sustainability](#)
- ▶ [Explore rebates and incentives for energy savings](#)
- ▶ [Sacramento County Business Sustainability](#)

In addition to the resources listed above, there are a variety of contractors that design and promote sustainable business practices.



Smart Digital Thermostat



Save Water While Saving Money

Impact: High. Businesses need to do their part in being water wise in the workplace. The City's Water Conservation Team offers several programs to help your business save water, including a rebate program for water-wise upgrades.

Cost: Low. Make improvements to save or reduce water usage and save up to \$50,000 (\$0.50 per 748 gallons saved). Eligible upgrades include:

- High efficiency toilets and urinals
- Equipment and technology for space cooling
- Refrigeration, laundry, cleaning, and flushing
- Air conditioning condensate capture
- Elimination of water intensive phases or industrial processes
- Outdoor rebates including turf conversion, irrigation upgrades, and smart controllers

The Water Conservation Team also provides a customized rebate program to tailor to your business needs.

Links to Resources:

- ▶ [Check out the City Water Conservation Team's Business Rebates](#)



Saving Water Saves Money



MUNICIPAL GHG REDUCTION MEASURES



The City of Sacramento has developed its own plan to make substantial progress towards achieving carbon neutrality in all municipal operations by 2045. These measures and actions align with both the Mayors' Commission on Climate Change and the CAAP's ambitious community measures and actions and will allow the City to continue its role as a leader in climate action both within the community and the region. The City has developed a suite of measures and specific actions, identified in this chapter, that will collectively reduce emissions 74% below 1990 levels by 2030, and near zero in 2045. The municipal measures closely mirror the CAAP's community-level strategies with a goal of exceeding community goals

wherever feasible. These measures and actions include electrification of municipal buildings, vehicle fleets, and reductions in energy usage, water, and waste.



Downtown Sacramento

Photo by Carlos Eliason

Municipal GHG Emissions

GHG EMISSIONS INVENTORY

To better understand the progress to date and develop new measures and actions, the City developed a GHG emissions inventory of municipal operations for 2016 (Figure 10-1 and Table 10-1). While municipal emissions are only a small portion of community-wide

emissions – captured as part of the community GHG inventory described in Chapter 2 – they are broken out and analyzed separately to support the development of a municipal operations-specific GHG reduction plan for the City. Municipal GHG emissions are primarily attributed to electricity and natural gas usage in City-owned buildings and facilities (27%), gasoline and diesel usage in the City’s vehicle fleets (28%), electricity usage for streetlights and traffic signals (9%), water and wastewater treatment and conveyance related to water usage in municipal facilities (17%), and landfill process emissions from the City’s waste facilities (19%).

Figure 10-1. Municipal GHG Emissions Inventory by Sector in 2016

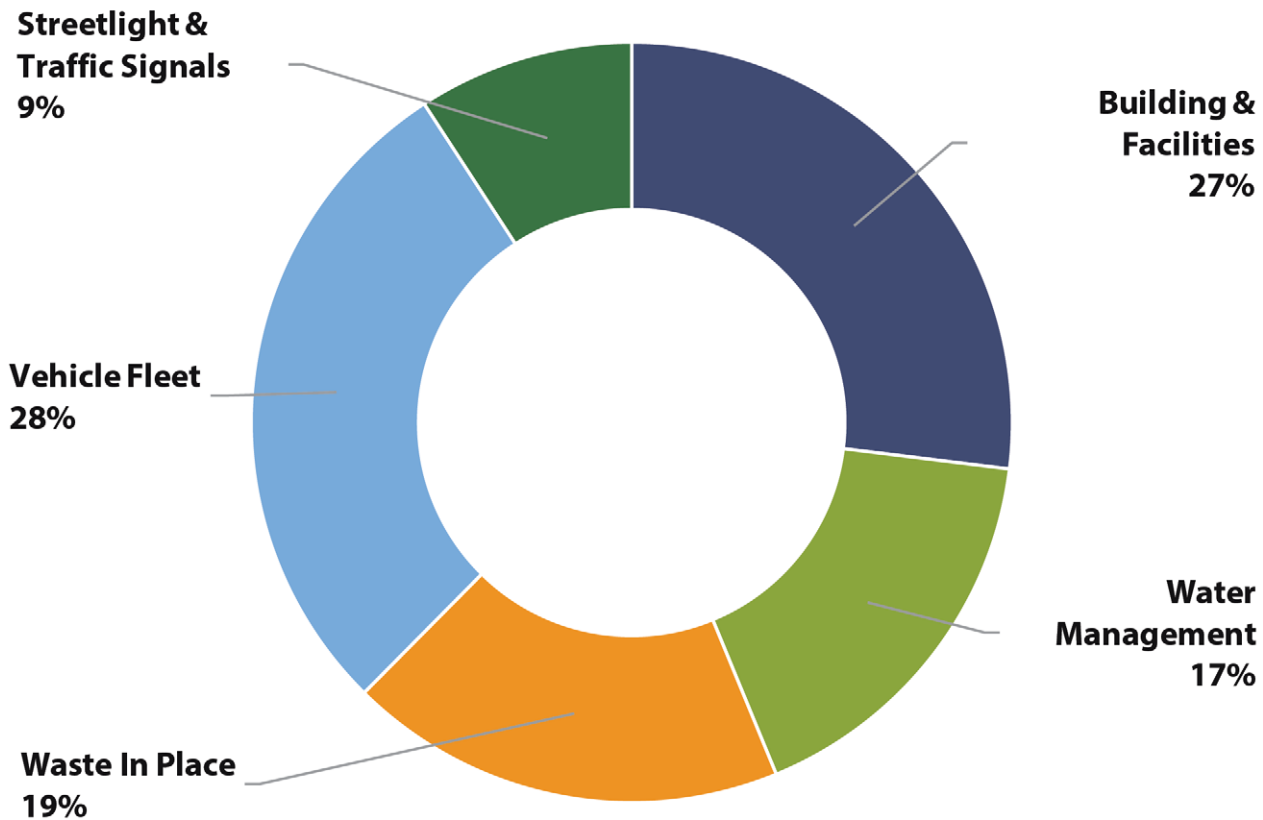




Table 10-1. Municipal GHG Emissions Inventory by Sector (MT CO₂e)

Sector	Emissions
Vehicle Fleet	16,035
Building & Facilities	15,214
Waste-in-Place	10,512
Water Management	9,516
Streetlight & Traffic Signals	5,186
Total	56,463

MUNICIPAL PROGRESS AND SUCCESSES

The City of Sacramento has conducted two previous municipal GHG emissions inventories for the years of 2005 and 2013. Based on these previous inventories, municipal GHG emissions decreased 24% between 2005 and 2013, and 28% between 2005 and 2016 (*Figure 10-2*). Sustainability projects in Sacramento have been driven by aggressive planning efforts, including the City’s 2010 Climate Action Plan for Municipal Operations and subsequent 2016 update to that plan. The 2016 Climate Action Plan for Internal Operations documented a 24 percent reduction in GHG emissions from municipal operations between 2005 to 2013, exceeding the 2010 plan’s 2020 target by 2% and several years ahead of schedule. This CAAP serves to update and build on these efforts.

A number of sustainability projects driven by these past plans have contributed to the emissions reductions since 2005. For example, the

City has completed extensive energy efficiency retrofits throughout its buildings, including replacement of fluorescent lights with light-emitting diodes (LED), installation of solar panels, installation of high efficiency heating, ventilation, and air conditioning (HVAC) replacements, and building envelope improvements that reduced heating and cooling loads. Solar panel systems installed and operated under a Power Purchase Agreement (PPA) generate approximately 4 MWh of on-site solar power for the City each year. The City also procures 31,000 MWh of off-site solar power annually. In addition, energy efficiency projects save another ~8,000 MWh annually, significantly reducing the energy emissions associated with municipal facilities while saving money. To date, the City has also retrofitted approximately one third of the streetlights and most traffic signals in the City to LEDs, significantly reducing electricity usage in another large sector of emissions.

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As one of the first cities to significantly invest in electric vehicles (EVs), Sacramento has also taken on a variety of EV infrastructure projects including EV charger upgrades at municipal facilities. The City currently operates more than 160 EV chargers at City-owned facilities, over 100 of which are available to the public. The City also offers incentives for EV owners in Sacramento, including preferred parking in City

lots. Efforts are underway to continue growing the number of EV chargers available for both the public and municipal fleet.

Together, these actions have led to a 28% reduction in municipal emissions between 2005 and 2016, which meets the City’s GHG reduction targets for 2020 by exceeding a 22% reduction. In 2020, the City is estimated to have realized a 32% reduction based on the municipal forecast.

Figure 10-2. Municipal GHG Emissions Over Time (MT CO₂e)¹



1. Note that electricity emissions from water management were separated out from the buildings and facilities sector in 2013 and are therefore not shown separately in the 2005 inventory results.

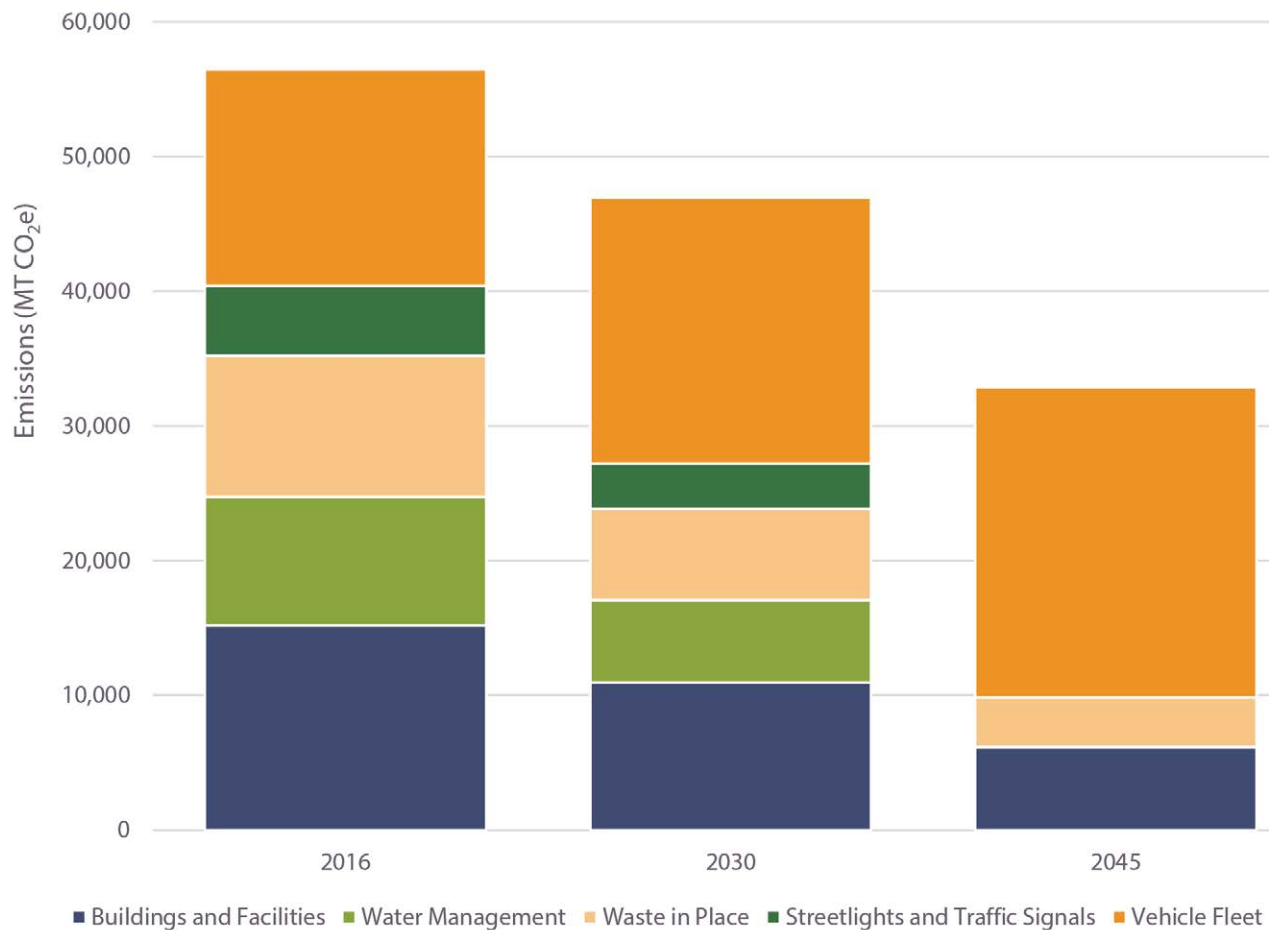


GHG EMISSIONS FORECAST

A GHG emissions forecast (*Figure 10-3*) was developed based on the inventory, which projects municipal emissions for 2030 and 2045 based on expected municipal operations, and the reduced carbon intensity of SMUD's electricity due to the renewable portfolio standard.² The municipal emissions forecast shows that

without additional action, municipal emissions will decrease 17% by 2030 and 42% by 2045, primarily due to expected decreases in the carbon intensity of electricity emissions required by SB 100. See Appendix F for details on the data and methods used for the municipal GHG emissions inventory and forecast.

Figure 10-3. Municipal GHG Emissions Forecast (MT CO₂e)



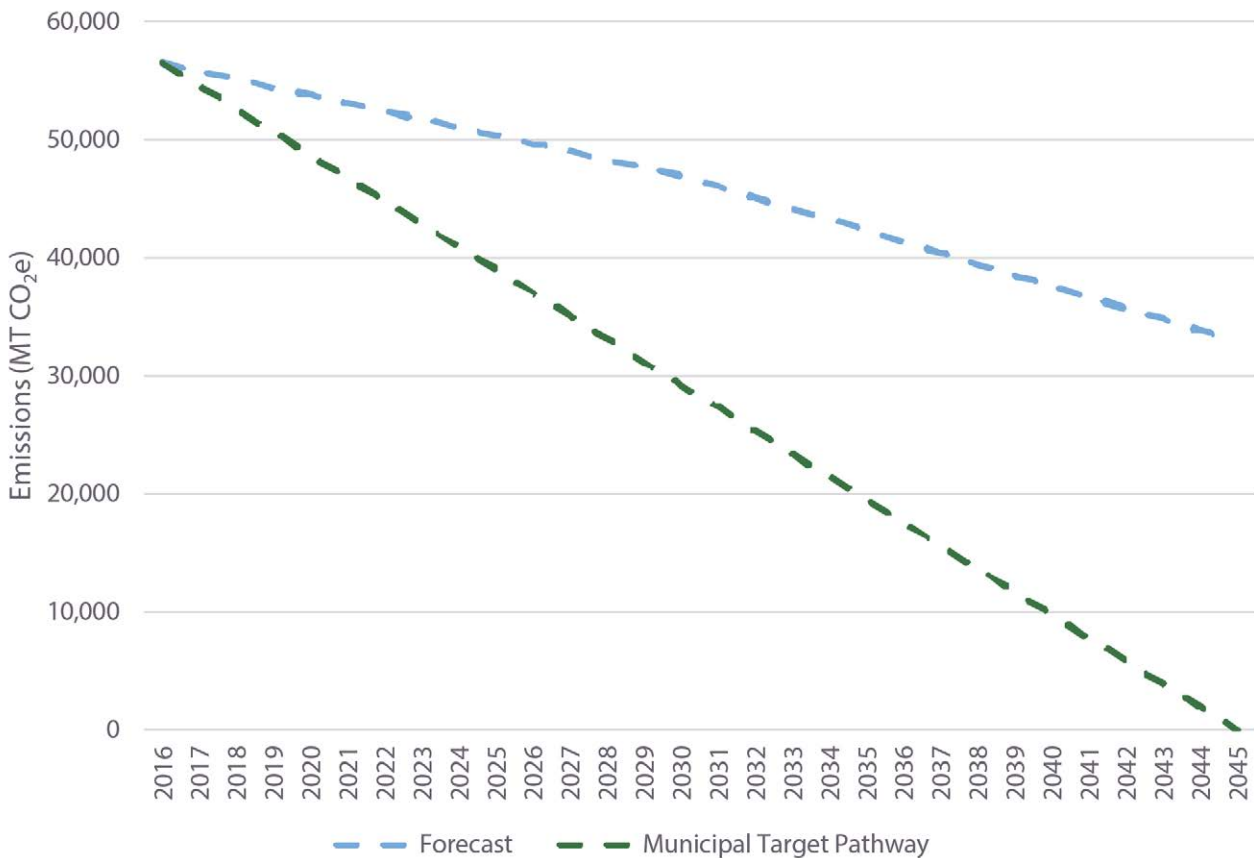
2. The forecast does not include electricity reductions expected from SMUD's Carbon-free 2030 Plan. Instead, the forecast incorporates the less aggressive reductions expected from the renewable portfolio standard, which requires utility providers to procure 100 percent renewable electricity by 2045. The additional reductions associated with SMUD's Carbon-free 2030 Plan are included in the measures and actions.

Municipal Target Pathway

Based on the inventory and forecast, the City developed a GHG emissions target pathway that mirrors the community climate action targets by planning for a linear reduction to carbon neutrality. This pathway would decrease municipal emissions by 63% from 2005 levels

by 2030 and achieve carbon neutrality by 2045.³ These targets are more aggressive than the previous targets established by the City of Sacramento Internal Operations Climate Action Plan.⁴ A comparison of the municipal target pathway and the forecast is shown in *Figure 10-4*. The gap between the target pathway and the forecast in each year is the magnitude of GHG emissions to be reduced by the City’s municipal measures.

Figure 10-4. Municipal Target Pathway (MT CO₂e)



3. While 1990 is used as a baseline for the community, there is no well-defined methodology to backcast to 1990 for municipal emissions. Therefore, a reduction from 2005 levels is commonly used for municipal target setting.

4. Accessed at: <https://www.cityofsacramento.org/Public-Works/Facilities/Sustainability/Climate-Action-Plan-for-Internal-Operations>

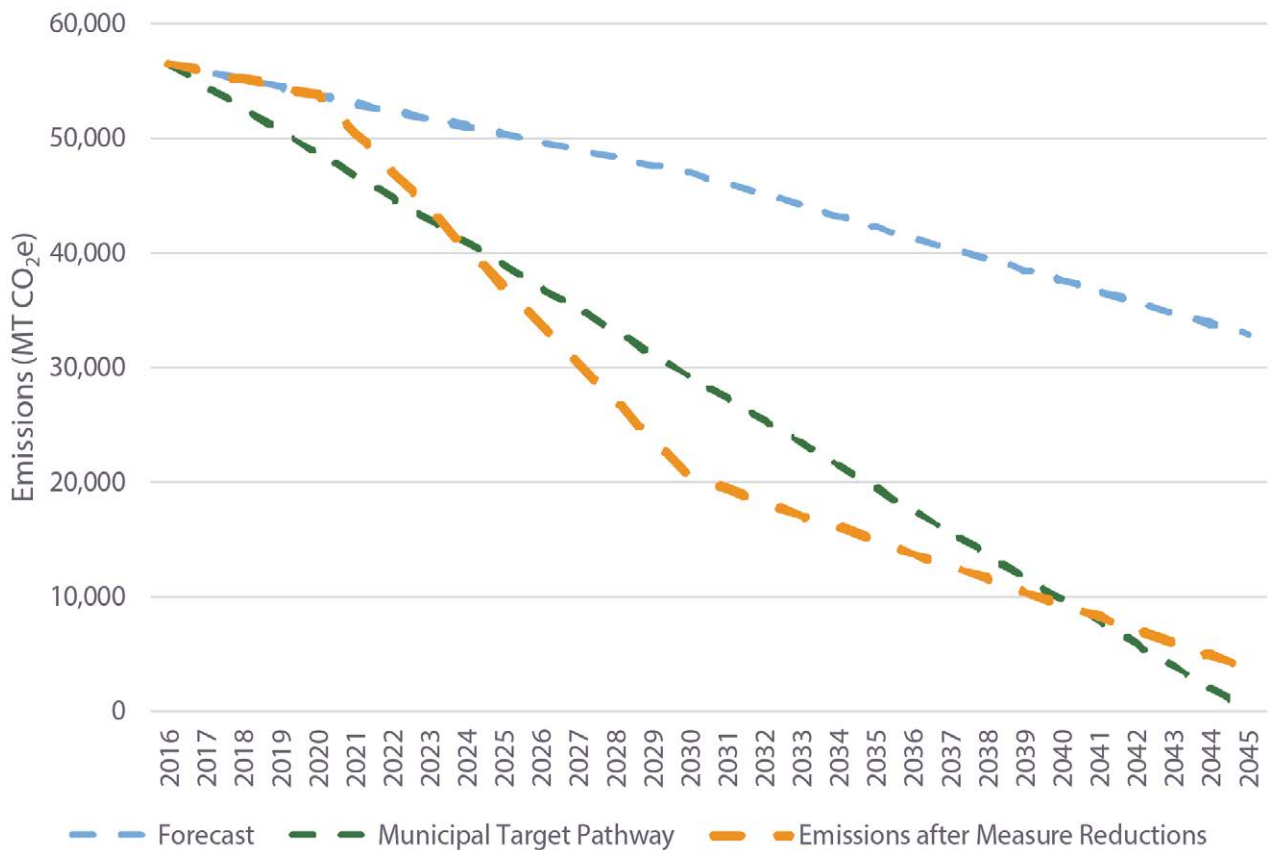


GHG Reduction Measures

The measures and actions to reduce GHG emissions for Sacramento’s municipal operations include reducing natural gas emissions in municipal facilities, transitioning fleet vehicles to EVs, developing programs to incentivize more sustainable employee commutes, encouraging employees to purchase their own EVs, prioritizing teleconferencing and telecommuting over in-person work and meetings, and

analyzing and reducing the waste stream from municipal facilities. Collectively, the municipal measures are expected to achieve a 74% reduction in municipal GHG emissions below 1990 levels by 2030, and near-zero GHG emissions in 2045 (Figure 10-5). Importantly, while the GHG emissions reductions from municipal measures were quantified, they were not added to the community-level GHG emissions reductions shown in Chapter 5 due to potential for double counting. See Appendix G for details on the data and methods used to quantify GHG emissions reductions from municipal measures (MM).

Figure 10-5. GHG Emissions Reductions from Municipal Measures (MT CO₂e)



CLIMATE ACTION & ADAPTATION PLAN

Table 10-2. Municipal GHG Emissions Reductions by Measure

Measure #	Measure Description	2030 Reduction (MT CO ₂ e)	2045 Reduction (MT CO ₂ e)
MM-1	Reduce natural gas consumption 50% below 2016 levels by 2030 and 100% by 2045. Reduce electricity use 25% below 2016 levels by 2030.	3,069	6,130
MM-2	Electrify or decarbonize 100% of light-duty fleet vehicles by 2035 and 100% of municipal fleet by 2045.	9,246	23,009
MM-3	Reduce emissions from trips between City facilities occurring during the workday.	Supportive	Supportive
MM-4	Reduce municipal waste sent to landfills.	Supportive	Supportive
MM-5	Reduce emissions from water usage/conveyance and stormwater drainage (in MT of CO ₂ e per MG delivered) 100% by 2030.	6,093	0 ¹
MM-6	Improve carbon sequestration potential of municipal parks, greenspace at City properties, and street tree planters in the public right-of-way.	Supportive	Supportive
MM-7	Procure carbon-free electricity by 2030, in alignment with SMUD’s 2030 Zero Carbon Plan	8,198	0 ¹
MM-8	Reduce City employee commuter VMT.	Supportive	Supportive
MM-9	Encourage an increase in the number of employee-owned EV and plug-in hybrid electric vehicles 28% by 2030 and 100% by 2045	Supportive	Supportive
Reduction Summary			
Estimated Reductions Achieved from Full Implementation of Measures		26,540	29,139
Total Reduction Needed to Achieve Targets		17,749	32,880
Gap (or Surplus) to Target		-8,791	3,741

1. GHG emissions reductions associated with MM-5 and MM-7 are zero in 2045 because the State has required all electricity providers to procure 100% carbon-free electricity by 2045, making these emissions equal to zero in 2045.



MUNICIPAL MEASURE 1: Reduce natural gas consumption 50% below 2016 levels by 2030 and 100% by 2045. Reduce electricity use 25% below 2016 levels by 2030

Municipal Measure 1 (MM-1) reduces natural gas consumption in municipal buildings and facilities through a commitment to electrification, energy efficiency, and on-site renewable energy. This aligns with the CAAP's electrification strategy for the community and allows the City to lead this effort by demonstrating the feasibility of electrification projects. Currently, about 25% of Sacramento's 400+ municipal buildings and facilities use natural gas as an energy source. In order for the City to contribute its part in reaching carbon neutrality on a community-wide level, the majority of the City's building stock will need to be carbon neutral. Electrification allows buildings to use the 100% carbon neutral electricity that will be provided by SMUD by 2030 through the 2030 Zero Carbon Plan. Installing on-site renewable energy projects further facilitates electrification by increasing the local grid's resiliency. This measure ensures (1) that new municipal buildings will be built 100% electric so that they will not need to be retrofitted later, (2) that old municipal buildings will be retrofitted on as fast a timeline as possible, and (3) decreases municipal building emissions to the extent feasible while they are not electric to achieve 2030 GHG emission targets.

SUCCESS IN ACTION:

Sacramento's 2035 General Plan committed the City to reducing energy consumption 25% below 2005 levels by 2030. In line with this goal, the City completed lighting retrofits on 21 community centers, club houses, and libraries in 2019. Lighting retrofit projects are estimated to save the City over \$261,000 per year. Due to these and other energy efficiency retrofits, the City achieved a 34% decrease in energy consumption in 2019, far exceeding the 2035 General Plan energy consumption target. This corresponds to a savings of 366,000 therms of natural gas and 54,084 MWh of electricity per year.

Expected GHG Reductions

- **2030:** 3,069 MT CO₂e
- **2045:** 6,130 MT CO₂e

CLIMATE ACTION & ADAPTATION PLAN

Actions and Implementation

Action	Lead	Support
MM-1.1: Electrification – Implement an “electric first” commitment for building projects and major retrofits.	Public Works	
MM-1.2: Building Retrofits – Develop a strategy to transition 100% of existing municipally owned and controlled buildings and facilities to electric by 2045 through expansion of the City’s Energy Efficiency Reinvestment Program. This includes auditing remaining City facilities, establishing a retrofit project pipeline of fundable projects prioritized based on opportunities to reduce energy costs and eliminate natural gas, developing a phase-out plan for each piece of natural gas equipment, and creating an internal revolving loan fund for City facility retrofits.	Public Works	
MM-1.3: SolarShares - Maintain participation in SolarShares for off-site solar photovoltaics to offset at least 35% of municipal power in 2030.	Public Works	Utilities
MM-1.4: Streetlights - Retrofit all post-top streetlights to LED and remaining streetlights as feasible by 2030.	Public Works	
MM-1.5: Municipal Green Building Policy - Update the Municipal Green Building Policy to include all-electric retrofits at time of replacement and prohibit new cogeneration in buildings.	Public Works	
MM-1.6: Generator Phase-out - Evaluate the feasibility of phasing out diesel generators by 2033 by replacing them with solar and storage to provide backup power for buildings. Utilize renewable diesel requirements for existing generators in the short-term if needed.	Public Works	





Action	Lead	Support
MM-1.7: Solar - Expand on-site production of renewable power and develop energy storage technologies for critical operations.	Public Works	
MM-1.8: Battery Storage Pilot Project - Identify a site and construct a battery storage pilot project as well as encourage pairing battery storage systems with all solar PV system installations. Specify that the battery uses GHG emissions for arbitrage rather than rates to increase GHG reduction potential.	Public Works	
MM-1.9: Microgrid Pilot Project - Identify a site and construct a microgrid pilot project preferably for a critical facility like a fire station.	Public Works	Fire Department
MM-1.10: Energy Management - Install and utilize energy management software in existing and new buildings in order to allow for building monitoring, responsive repairs, and assessment of long-term energy trends. Provide trainings on software to facilities management.	Public Works	
MM-1.11: Electrification Study – Conduct an electrification study to identify sources of natural gas and diesel which can be eliminated/switched at time of replacement.	Public Works	
MM-1.12: Additional Resources – Identify additional resources (money and staffing) to assist with implementation of Municipal Measure 1.	Public Works	



Photo by Carlos Eliason

MUNICIPAL MEASURE 2: Electrify or decarbonize 100% of light-duty fleet vehicles by 2035 and 100% of municipal fleet by 2045

MM-2 establishes a plan to transition the City's vehicle fleet to ZEVs. This aligns with the CAAP's electrification strategy for the community and allows the City to lead this effort by demonstration. Electrifying the vehicle fleet will reduce the City's dependence on fossil fuels and enable GHG emissions from vehicles replaced by EVs to go to zero in 2030, due to the increasing availability of carbon neutral electricity from SMUD. The City of Sacramento will electrify the vehicle fleet in a phased approach through the City's Fleet Sustainability Policy, which establishes a "ZEV-first commitment." The City will start with light-duty vehicles and will include medium- and heavy-duty vehicles as the technology becomes available. Currently, the City's fleet of 2,433 units is comprised of 2,179 on-road vehicles and 254 off-road vehicles. A total of 1,632 units (roughly 67% of the fleet) are less than 10 years old, while the remainder of the fleet, numbering 801 units (15% of the fleet), is more than 15 years old and could be replaced with ZEVs prior to 2025 where technologies allow.

SUCCESS IN ACTION:

The City of Sacramento received the designation of #1 government green fleet in the nation in 2019, reflecting the City's long-term commitment to ZEV adoption. Currently, 7.1% of the City's light-duty vehicles are ZEVs, including electric and plug-in hybrids, while still more are cleaner fuel alternatives, including renewable diesel, natural gas, hybrid, and ethanol-powered vehicles. The City's fleet size has reduced 18% since 2010 and fleet fuel consumption reduced 3.7% between 2017 and 2018.

Expected GHG Reductions

- **2030:** 9,246 MT CO₂e
- **2045:** 23,009 MT CO₂e



Actions and Implementation

Action	Lead	Support
MM-2.1: ZEV First – Continue to implement the City’s adopted “Zero-emission Vehicle First” policy that directs City departments to purchase ZEVs and develop a plan to convert 100% of all light-duty vehicles in the City’s fleet to ZEVs by 2035 while forging partnerships with manufacturers to pilot medium and heavy-duty ZEVs.	Public Works	All
MM-2.2: Renewable Diesel and Alternatives – Continue to use renewable diesel in all diesel fleet vehicles.	Public Works	
MM-2.3: EV Chargers – Install EV charging infrastructure across City-owned facilities for fleet, motor pool vehicles, and personal vehicle fueling.	Public Works	
MM-2.4: Hybrid Phase-in – Replace all expiring mid-size vehicles and trucks with hybrid models if no all-electric alternative is available.	Public Works	
MM-2.5: Anti-idling Policy – Expand and enforce existing anti-idling policies on all City vehicles.	Public Works	



Amtrack Station

Photo by Carlos Eliason

CLIMATE ACTION & ADAPTATION PLAN

MUNICIPAL MEASURE 3: Reduce emissions from work-related trips by City employees

MM-3 contains strategies for reducing vehicle trips between City facilities, including prioritizing teleconferencing and telecommuting over in-person meetings or on-site office work as feasible and encouraging active and public transportation. Although employee commute trips are not captured in the City’s municipal GHG inventory, these are important supportive measures that model the broader city-wide

workplace shifts that support community reduction measures. The mechanism through which the City plans to avoid unnecessary trips is through incentive programs for employees and by institutionalizing work-from-home as a default option for many employees.

Expected GHG Reductions

- Supportive

Actions and Implementation

Action	Lead	Support
MM-3.1: Teleconferencing and Telecommuting – Promote video conferencing and telecommuting in place of in person meetings or working in the office when possible.	Human Resources	All Departments
MM-3.2: Vehicle Trips – Reduce vehicle trips for City business by encouraging active transportation modes, transit, and carpooling. Award points or have a program to encourage staff to take active and transit modes. Have a prize drawing quarterly to further incentivize adoption.	Human Resources	All Departments
MM-3.3: Bikepools – Expand incorporation of bicycles (including electric bicycles) into City motor pool fleet for employees to use for work-related business.	Public Works	All Departments



MUNICIPAL MEASURE 4: Reduce municipal waste sent to landfills

MM-4 establishes a program to reduce waste and waste-related emissions associated with municipal facilities. MM-4 focuses on organic waste, in alignment with the CAAP’s focus on implementing SB 1383 and community-wide reductions in organic waste. The City will lead the community-wide effort to reduce and divert organic waste through new composting

and recycling programs and employee education programs. The City does not currently track its waste output; however, MM-4.1 directs the City to conduct a waste audit and develop a plan for reducing waste going forward.

Expected GHG Reductions

- Supportive

Actions and Implementation

Action	Lead	Support
MM-4.1: Assess new technologies and the recyclables market periodically to determine the feasibility of reusing or recycling the most challenging portions of the City’s waste stream and developing a zero-waste plan for City facilities.	Public Works	
MM-4.2: Compost and Recycling for Buildings - Ensure organics recycling collection services are available in all owned facilities, as well as ensure its availability in all future occupied facilities, by 2022.	Finance	
MM-4.3: Employee Outreach – Run online and in person outreach and educational events that encourage waste diversion among City employees, including the creation of a training around compost and recycling in City Facilities to be taken by all new hires during their onboarding process.	Human Resources	All Departments as appropriate
MM-4.4: Centralization – End deskside collection of garbage by custodial, and switch instead to combined organics, recycling and garbage stations.	Finance	

CLIMATE ACTION & ADAPTATION PLAN

Action	Lead	Support
MM-4.5: Update the City’s Sustainable Purchasing Policy which mandates procurement of items which have substantial quantities of recycled or reused content and are recyclable, reusable or compostable themselves.	Finance	
MM-4.6: Develop and implement a plan for procuring compost, mulch, and renewable natural gas in alignment with SB 1383 requirements and using these materials for City facilities and operations.	Finance	Youth, Parks, and Community Enrichment



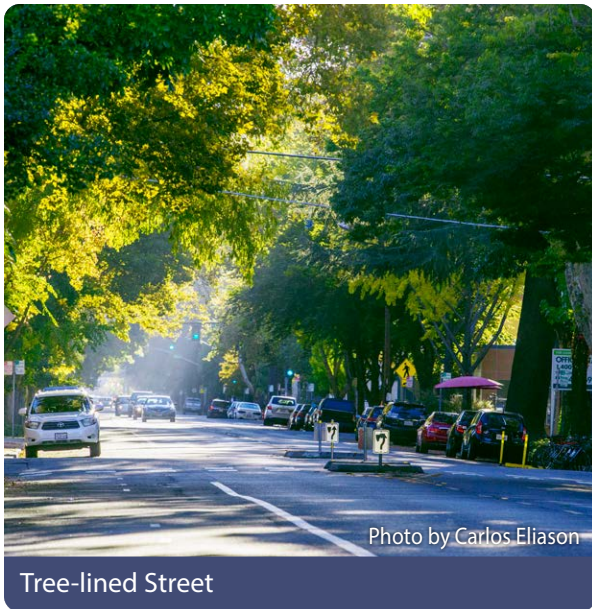
Photo by Carlos Eliason

Farmers Market



MUNICIPAL MEASURE 5: Reduce emissions from water usage/conveyance and stormwater drainage (in MT of CO₂e per MG delivered) 100% by 2030

MM-5 provides a strategy to reduce utility-related emissions associated with water usage at municipal buildings and facilities, including transitioning to 100% carbon-free electricity for water conveyance and stormwater drainage. Because water and wastewater conveyance and stormwater drainage are necessary services that the City will continue to provide through 2045 and beyond, the only way to reduce emissions in this sector is to reduce the carbon intensity of the electricity used, by adding more renewable resources—through purchase or direct construction—to the grid mix. In 2017, water management accounted for almost 20% of overall emissions and is therefore a key emissions sector to address.



SUCCESS IN ACTION:

The City has enacted multiple water conservation best practices over the past decade. 100% of Sacramento residences and businesses are connected to Advanced Metering Infrastructure data, providing real-time water use data online so that building owners and City staff can track water usage and quickly respond to leaks and water waste. In 2019, the Department of Utilities and the Department of Public Works partnered to retrofit toilets and urinals in municipal facilities in 2019, a project that has saved 309,000 gallons of water every year. Additionally, the Department of Utilities, Department of Public Works, and the Department of Youth, Parks, and Community Enrichment are partnering to increase waterwise landscaping on streetscapes.

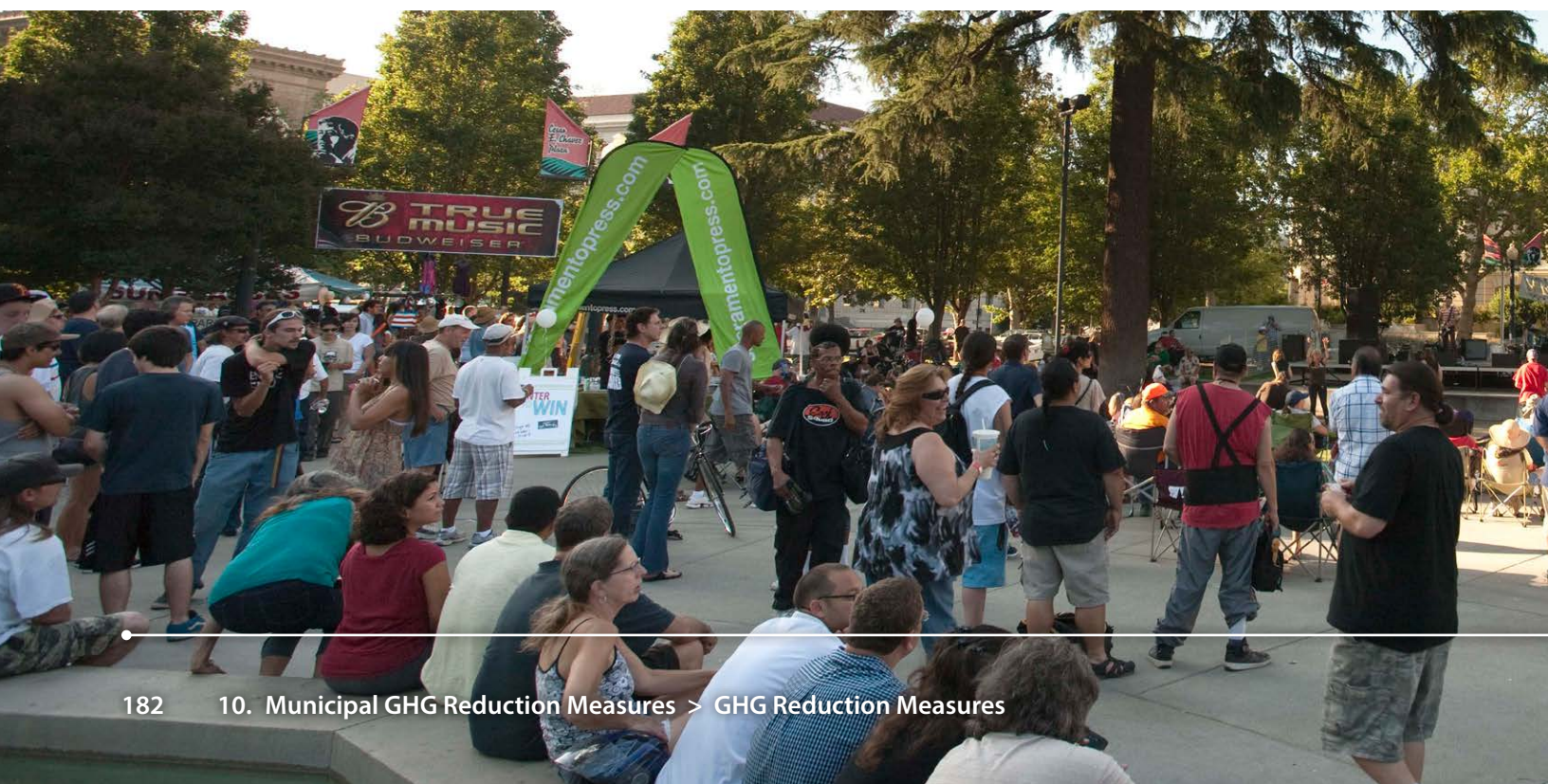
Expected GHG Reductions

- 2030: 6,093 MT CO₂e
- 2045: 0 MT CO₂e

CLIMATE ACTION & ADAPTATION PLAN

Actions and Implementation

Action	Lead	Support
MM-5.1: Purchase 100% carbon-free electricity for water conveyance and stormwater drainage needs.	Utilities	
MM-5.2: Investigate deployment of on-site solar and storage projects to increase resiliency of critical water and stormwater infrastructure.	Utilities	Public Works
MM-5.3: Continue to implement and track low water use landscapes (native and drought tolerant plants) for new park development per YPCE Strategic Plan Policy 2.5d and e, and the Model Water Efficiency Landscape Ordinance.	Utilities/Public Works	Youth, Parks, and Community Enrichment
MM-5.4: Evaluate the feasibility of converting sports fields to synthetic turf and add new synthetic fields where possible.	Youth, Parks, and Community Enrichment	
MM-5.5: Continue to evaluate the existing watering/irrigation schedule and determine what water reduction strategies can be implemented per YPCE Strategic Plan Policy 2.5d and e. Examples include reducing the number of watering days and watering in the evening to reduce evapotranspiration.	Youth, Parks, and Community Enrichment, Public Works	Utilities





Action	Lead	Support
<p>MM-5.6: Optimize the efficiency of irrigation control systems by training staff how to correctly use them. YPCE will inventory EPA WaterSense certified Smart Irrigation Controllers and host trainings to ensure that the appropriate staff learn how to operate each controller to improve the management, use, reporting, and data analysis of the irrigation control systems.</p>	<p>Youth, Parks, and Community Enrichment</p>	<p>Utilities</p>
<p>MM-5.7: Continue to report for the Model Water Efficient Landscape Ordinance each year. YPCE will work with the Community Development Department and the Department of Utilities to submit the Model Water Efficient Landscape Ordinance Implementation Annual Report every January.</p>	<p>Youth, Parks, and Community Enrichment</p>	
<p>MM-5.8: Continue investigation of energy efficiency improvements of water utility operations and systems and continue to improve the energy efficiency of utility pumps and water treatment plants.</p>	<p>Utilities</p>	
<p>MM-5.9: Water Conservation Inspections for City Facilities: Include landscape irrigation inspections in water conservation inspection and provide educational materials/media for building maintenance staff on how maintain landscape irrigation and track and set leak alerts for buildings.</p>	<p>Utilities</p>	<p>Departments facilities</p>

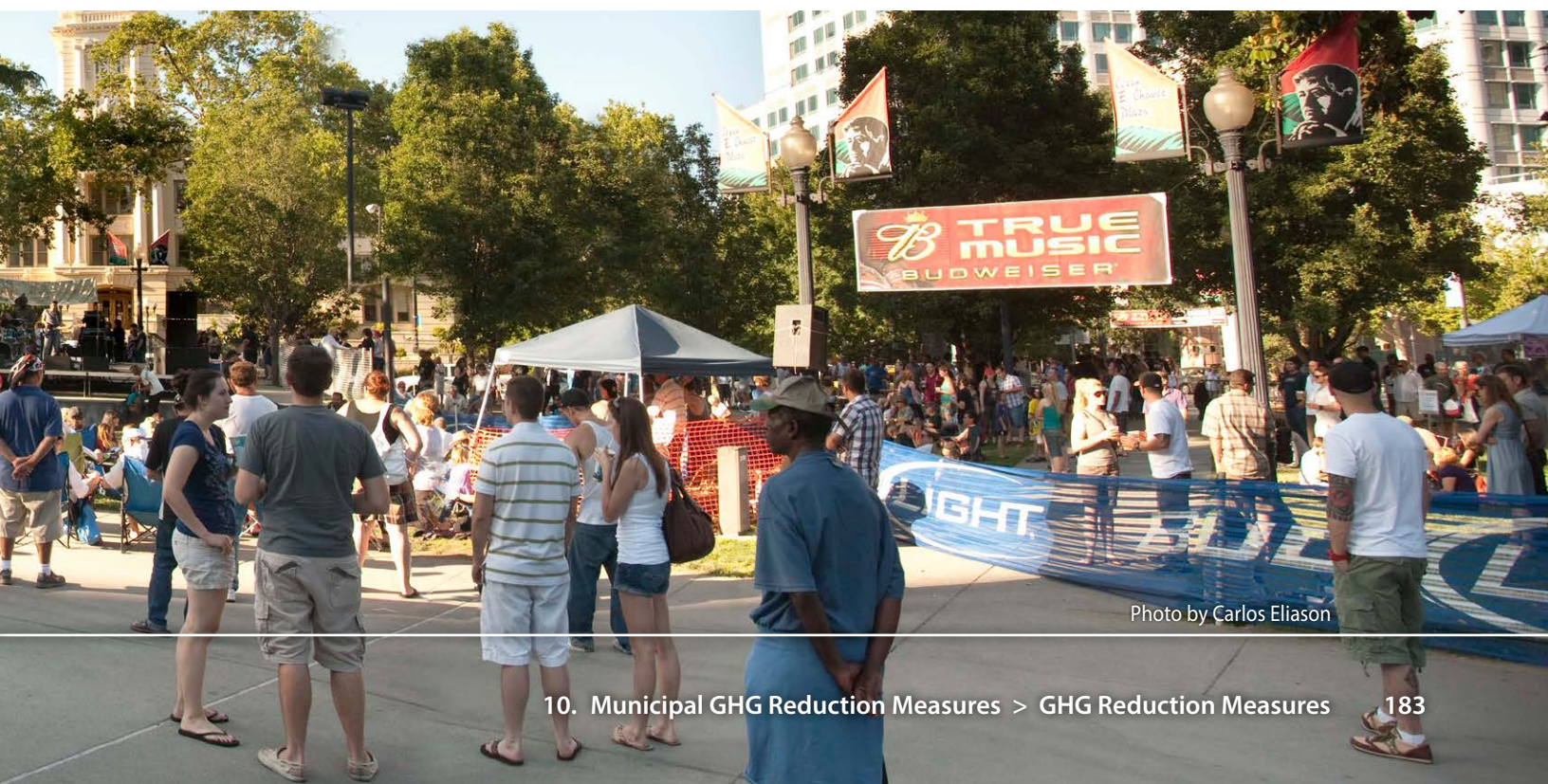


Photo by Carlos Eliason

MUNICIPAL MEASURE 6: Improve carbon sequestration potential of municipal parks, greenspace at City properties, and street tree planters in the public right-of-way

MM-6 provides a strategy to improve the carbon sequestration potential of open space and parks owned or maintained by the City, including the installation of low-water use landscapes, and replacing high-water use species with low water-use species where feasible. This measure is designed to reap the ecological and carbon sequestration benefits of plants, compost, and soils while minimizing increased water usage through water efficient landscaping. As new carbon sequestration opportunities and technologies emerge, such as carbon sequestration in hardscape materials, the City will implement additional actions beyond those identified below.

SUCCESS IN ACTION:

Sacramento is designated as one of the densest human-planted urban forests in the world and one of the best urban forests in the nation. The City currently boasts approximately 19 square miles of tree canopy and maintains approximately 100,000 public trees. Sacramento's tree canopy currently stores more than 1.5 million tons of CO₂ and provides approximately \$4.5 million in annual benefits due to reduced air pollution, reduced stormwater runoff, and sequestered carbon. Since 2018, the Department of Youth, Parks, and Community Enrichment has planted over 2,000 new trees, converted 3.5 acres of turf to low water-use landscaping, and constructed 10 new parks that meet or exceed the State- and City-adopted Model Water Efficient Landscape Ordinance. The City is also an active participant in the Global Cool Cities Coalition.



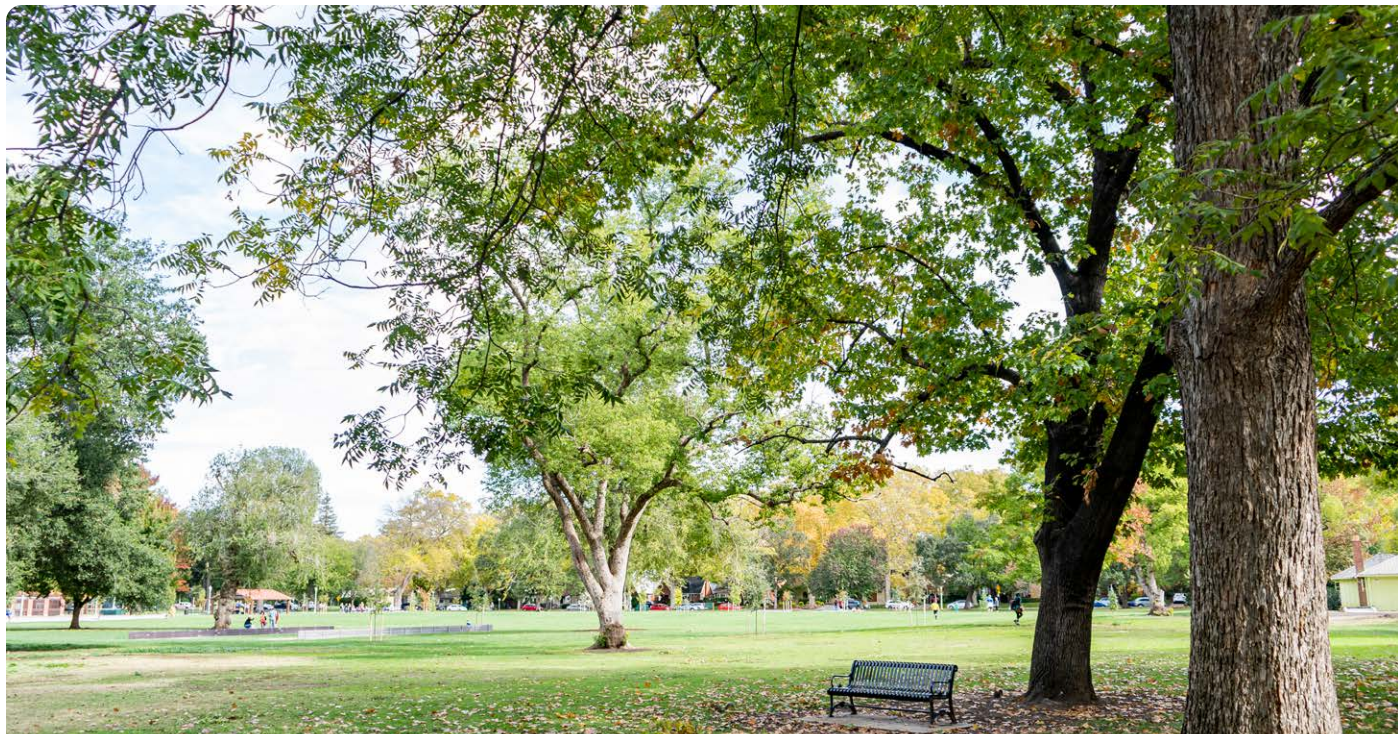
Expected GHG Reductions

- Supportive



Actions and Implementation

Action	Lead	Support
MM-6.1: Evaluate existing park turf areas for conversion to low water use landscapes using non-irrigated, drought tolerant, or mulched landscaping.	Youth, Parks, and Community Enrichment; Public Works	
MM-6.2: For passive recreation areas, continue to reduce landscape water usage with low-water use plants, compost, and landscape design that emphasizes drought tolerant plants and mulch areas.	Youth, Parks, and Community Enrichment	Public Works
MM-6.3: Investigate and explore options for carbon sequestration at City facilities such as through carbon sequestration in materials for construction and hardscapes or soil health restoration projects.	Youth, Parks, and Community Enrichment	Public Works



McKinley Park

CLIMATE ACTION & ADAPTATION PLAN

MUNICIPAL MEASURE 7: Procure carbon-free electricity by 2030

MM-7 aligns with SMUD’s 2030 Zero Carbon Plan which will provide the City with 100% carbon-free electricity by 2030. While there are no specific municipal actions listed, the City will support SMUD in the implementation of the 2030 Zero Carbon Plan as highlighted in the community actions (*Chapter 6*). This measure directly supports additional GHG emissions reductions from MM-1 by driving to zero the electricity emissions that would otherwise be added from new all-electric equipment.

SUCCESS IN ACTION:

Past efforts to procure carbon-free electricity for Sacramento have included installations of over 4 MW of on-site solar power. About 35% of the City’s municipal power currently comes from on-site solar or community solar through the SolarShares program. The SolarShares program generated 4,190 MWh of community solar power in 2019.

Expected GHG Reductions

- **2030:** 8,198 MT CO₂e
- **2045:** 0 MT CO₂e

Actions and Implementation

Action	Lead	Support
MM-7.1: Procure carbon-free electricity for municipal operations by 2030.	Office of Climate Action & Sustainability	All Departments as appropriate



MUNICIPAL MEASURE 8: Reduce City employee commuter VMT

While employee commute is not included in the municipal GHG emissions inventory, the City chose to establish employee commute VMT reduction goals going forward to set an example for community-wide VMT reduction. MM-8 establishes various incentives, including financial incentives and programs to encourage municipal employees to reduce their commute VMT. This measure ensures the City and its employees are doing their fair share towards reducing VMT in the community, providing leadership through demonstration. A 2021 survey of 600 City employees found that

nearly 90% of respondents drove to work alone before the COVID-19 pandemic and that 77% commuted between 12-20 miles round trip each workday. While the City cannot require employees to choose alternate commuting methods, MM-8 will help promote alternative options and incentives to City employees to choose transportation modes other than single-occupancy vehicles to commute to work and actively reduce their own VMT.

Expected GHG Reductions

- Supportive

Actions and Implementation

Action	Lead	Support
MM-8.1: Establish a Transportation Demand Management program for City employees.	Human Resources	All Departments as appropriate
MM-8.2: Survey City staff to determine baseline commute data. Conduct a new survey every 2 years.	Human Resources, Information Technology	
MM-8.3: Conduct internal outreach to educate staff on available incentives and solicit feedback on which options work best and how to improve incentives/reduce hurdles to implementation.	Human Resources	
MM-8.4: Paid Time Off Rewards Program – Implement a sustainable commute rewards program rewarding employees with time off for using alternative modes of transportation.	Human Resources	
MM-8.5: Pre-Tax Commuter Benefit – Continue providing pre-tax commuter benefits for transit commuters and encourage use of commuter benefits for bicycle commuters as allowed by federal law.	Human Resources	

CLIMATE ACTION & ADAPTATION PLAN

Action	Lead	Support
MM-8.6: Parking Cash-out – Engage with labor partners to explore alternatives to traditional employee commute provisions such as City-provided parking and parking stipends, and instead incentivize carpooling, public transit, and active transportation.	Human Resources	
MM-8.7: Dynamic Ridematch – Promote the regional carpool matching platform that allows employees to request carpool with peers on days and times when they are needed.	Human Resources	
MM-8.8: Remote work – Promote and support working remotely for employees where possible by encouraging it for office employees as appropriate, by providing necessary equipment, training, and encouraging all meetings (when possible) to be set up for web conferencing so that people who aren’t physically in the room can attend. Allow for hybrid work-from-home schedules to increase flexibility for employees.	Human Resources	Information Technology



Photo by Carlos Eliason

Bicycle Commuters



MUNICIPAL MEASURE 9: Encourage an increase in the number of employee-owned EV and plug-in hybrid electric vehicles 28% by 2030 and 100% by 2045

MM-9 establishes financial incentives and a commitment to increased EV infrastructure at municipal facilities to encourage City employees to transition from fossil fuel-powered personal vehicles to EVs. This measure will also help the City to determine the major hurdles to EV adoption among City employees, from which the City can develop additional courses

of action. This measure ensures the City and its employees are doing their fair share towards transitioning to electric vehicles in the community, providing leadership through demonstration.

Expected GHG Reductions

- Supportive

Actions and Implementation

Action	Lead	Support
MM-9.1: EV Chargers – Implement the 2017 EV Strategy directive to meet or exceed CALGreen Tier 2 standards for EV chargers, and transition existing facilities to provide EV charging capacity as feasible.	Public Works	All
MM-9.2: Commuting Surveys – Conduct a survey of City Staff to determine how staff commute to work, what kinds of vehicles they own, and what hurdles they face in purchasing EVs. Conduct a new survey every 2 years.	Human Resources, Information Technology	
MM-9.3: EV Rebates – Provide information to all City staff about local, State, and federal rebates annually. Include lifecycle and maintenance cost information of EV ownership.	Human Resources	



A.

APPENDICES



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SACRAMENTO
CITY LIMIT
POP. 418,711 ELEV. 25

WARNING
GET BEYOND GATE
WHEN BELL RINGS

GATE

EMBASSY SUITES



City of Sacramento Climate Action and Adaptation Plan

Appendix A - Community GHG Emissions Inventory and Forecast

prepared by

Rincon Consultants, Inc.
449 15th Street, Suite 300
Oakland, California 94609

June 2022

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1 Introduction

California considers greenhouse gas emissions (GHG) and the impacts of climate change to be a serious threat to the public health, environment, economic well-being, and natural resources of the State, and has taken an aggressive stance to mitigate the impact on climate change at the State-level through the adoption of legislation and policies. Many cities have developed local climate action plans and aligned goals to correspond with State emissions reduction targets. The two major State GHG-related goals are established by Assembly Bill (AB) 32 and Senate Bill (SB) 32. AB 32 required State agencies reduce State GHG emissions to 1990 levels by 2020 whereas SB 32 requires a 40 percent reduction below 1990 levels by 2030. The goals set by AB 32 were achieved by the State in 2016¹ and many jurisdictions are completing GHG inventories to quantify progress toward their own 2020 goals as well as develop targets to align with the requirements of SB 32.

This technical appendix provides a complete analysis of the previous community-wide GHG emissions inventories completed for the City of Sacramento's 2005 and 2011² emissions as well as details on the methodology used for the 2016 inventory update which is also used as the baseline for the forecasting process. Emissions are forecast for the years 2020, 2025, 2030, 2040, and 2045 to align with State and City targets.

Estimating GHG emissions enables local governments to establish an emissions baseline, track emissions trends, identify the greatest sources of GHG emissions within their jurisdictions, and set targets for future reductions. This inventory is intended to inform completion of a qualified GHG reduction plan for the City of Sacramento and is compliant with the ICLEI – Local Governments for Sustainability (ICLEI) *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*³ (Community Protocol) as well as California Environmental Quality Act (CEQA) Guidelines Section 15183.5(b) for the requirements of a 'qualified' GHG emissions reduction plan. Methodology for some sections has been updated slightly to conform with the industry standard for California cities as recommended in the Association for Environmental Professionals (AEP) *California Supplement to the United States Community-Wide GHG Emissions Protocol*⁴ (California Supplement). Emissions inventories are an iterative process, and each year must be viewed in the context of other inventories and relative trends of each sector to maintain consistency with the emissions inventory methods and factors.

GHG emissions contained within this inventory include activities under the jurisdictional control or significant influence of the City of Sacramento, as recommended by AEP in preparing Community Protocol and CEQA-compliant inventories.⁴ The municipal operations inventory is a subset of the community-wide inventory, meaning the municipal emissions are included within the community-wide inventory. These municipal emissions calculations and forecast are included in a separate technical appendix.

¹ California Air Resources Board. California Greenhouse Gas Emissions Inventory. Accessed at: <https://ww3.arb.ca.gov/cc/inventory/inventory.htm>. Accessed on: July 2019

² Portions of the 2011 inventory were extrapolated based on growth from 2005 levels and therefore all sectors may not be comparable.

³ ICLEI. 2013. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.1

⁴ Association of Environmental Professionals. 2013. The California Supplement to the United States Community-Wide Greenhouse Gas (GHG) Protocol.

1.1 Executive Summary

The City of Sacramento has completed a GHG inventory for the 2016 calendar year to measure progress toward its 2020 GHG reduction goals as set in the first City of Sacramento Climate Action Plan⁵ and assist in the development of an updated plan by developing a forecast and gap analysis to identify climate action plan policies that will be needed to achieve longer term targets. SB 32⁶ established 2030 as the next major milestone of GHG reduction targets. The 2016 City of Sacramento inventory was used to develop a forecast to assist the City in setting targets which are consistent with State-level goals and the City of Sacramento General Plan which is currently being updated. Two projections were developed for the City to quantify expected emissions over time: a *business-as-usual scenario* and an *adjusted scenario*.

A summary of the 2016 GHG emissions by sector is provided in Table 1 with a discussion of the inventory methodology and detailed results in Section 3. A summary of the emissions forecast by year through 2045 is provided in Table 4 with further discussion in Section 4.

Table 1 2016 GHG Inventory

Sector	Activity Data	Emission Factors	Units	Emissions (MT CO ₂ e)
Residential Electricity (kWh)	1,423,419,583	0.000224	MT CO ₂ e/kWh	318,275
Residential Gas (therms)	59,977,656	0.00531	MT CO ₂ e/therm	318,304
Industrial and Commercial Electricity (kWh)	2,191,180,705	0.00022	MT CO ₂ e/kWh	489,945
Commercial Gas (therms)	28,980,911	0.00531	MT CO ₂ e/therm	153,803 ¹
District Gas (therms)	3,432,409	0.00531	MT CO ₂ e/therm	18,216 ¹
Transportation (VMT)	4,347,013,534	0.000445	MT CO ₂ e/mile	1,935,870
Generated Waste (tons)	525,968	0.255412	MT CO ₂ e/Ton	134,339
Waste-In-Place	N/A ²	N/A ²	MT CO ₂ e/Ton	26,504
Wastewater (kWh)	N/A ³	N/A ³	MT CO ₂ e/kWh	19,867
Water (kWh)	42,963,998	0.00022	MT CO ₂ e/kWh	9,607
Total Emissions				3,424,729

¹ No natural gas usage was reported for large industrial users due to California Public Utilities Commission privacy rules. The remaining industrial usage is from Pacific Gas & Electric "district" users.

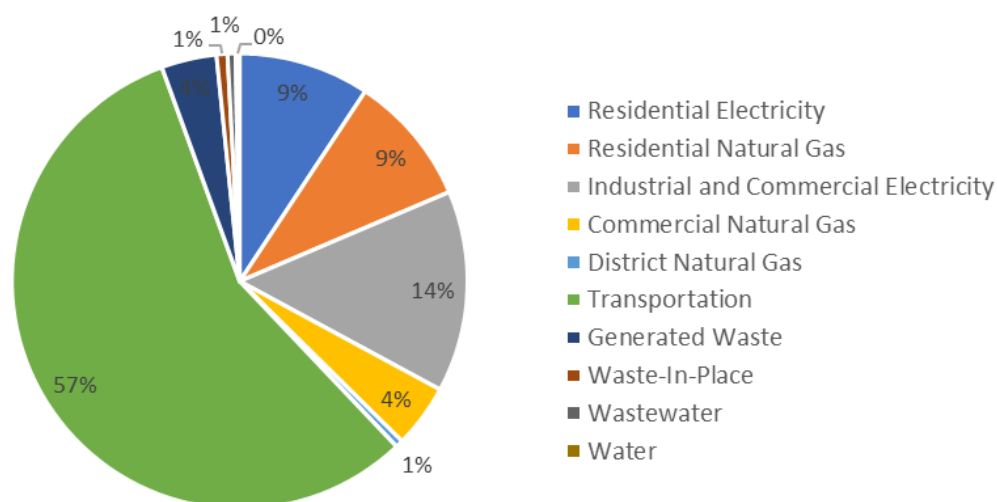
² Waste-in-place is a direct output of a landfill gas modeling system and does not have activity data

³ Wastewater is a combination of stationary and process emissions, further detail is Section 3.3.

MWh = megawatt hours; kWh = kilowatt hours; CO₂e = carbon dioxide equivalent; MT = metric tons; VMT = vehicle miles traveled

⁵ City of Sacramento. 2012. City of Sacramento Climate Action Plan. Accessed at http://www.cityofsacramento.org/~media/Corporate/Files/CDD/Resourcess/Online%20Library/CAP%20Climate%20Action%20Plan/3_Chapter_1_Intro%20CAP.pdf Accessed on: June 2019

⁶ Senate Bill 32 requires the State of California to reduce its overall greenhouse gas emissions 40 percent from 1990 levels by 2030.

Figure 1 2016 City of Sacramento Community Emissions by Sector**Table 2 Summary of Emissions Changes from 2005 to 2016**

Sector	2005 Emissions (MT CO ₂ e)	2016 Emissions (MT CO ₂ e)	Percent Change
Residential Electricity	365,319	318,275	-13%
Commercial/Industrial Electricity	624,811	489,945	-22%
Residential Gas	348,859	318,304	-9%
Commercial/District Gas	186,527	172,019	-8%
Waste	455,222	160,843	-65%
Water	12,810	9,607	-25%
Wastewater	57,380	19,867	-65%
Transportation	2,184,617	1,935,870	-11%
Total Emissions	4,235,545	3,424,729	-19%
Per Capita Emissions (MT CO₂e/person)	9.57	7.25	-26%

MT CO₂e = metric tons of carbon dioxide equivalent

Since 2005 the City of Sacramento has reduced overall emissions by 19 percent and has seen emissions reductions in every sector as seen in Table 2. Major reductions were seen in the waste sector and wastewater sectors although these sectors make up smaller proportions of the City's overall emissions. Reductions in the natural gas sector were driven primarily by a reduction in gas consumption whereas emissions reductions in the electricity and transportation sectors were driven entirely by reductions in emission factors and saw increases in activity data as shown in Table 3. During this time the City saw an increase in population of 10 percent which resulted in a 26 percent reduction in per capita emissions from 2005 to 2016. This translated to a 19 percent reduction in total GHG emissions from 2005 to 2016. This reduction exceeds the emission reduction target of 15 percent below 2005 levels by 2020 and therefore, if emissions do not increase over the next four years, the 2020 CAP target is expected to be met.

Table 3 Summary of Activity Data Changes from 2005 to 2016

Raw Activity Data	2005 Activity Data	2016 Activity Data	Percent Change
Population	442,662	472,692	7%
Residential Electricity (kWh)	1,307,301,693	1,423,419,583	9%
Residential Gas (therms)	65,698,581	59,977,656	-9%
Commercial Electricity (kWh)	2,235,898,207	2,191,180,705	-2%
District Industrial Gas (therms)	5,339,537	3,432,409	-36%
Commercial Gas (therms)	29,788,020	28,980,911	-3%
Wastewater (kWh)	N/A	99,541,452	N/A
Water (kWh)	N/A	42,963,997.60	N/A
Waste (tons)	684,088	525,968	-23%
VMT (miles)	4175278800	4,347,013,534	-15%
VMT Emission Factor (MT CO ₂ e/mile)	0.000523	0.000445	-13%
SMUD Emission Factor (MT CO ₂ e/MWh)	0.279	0.224	-20%

MT CO₂e = metric tons of carbon dioxide equivalent; kWh = kilowatt hours; MWh = megawatt hours; VMT = vehicle miles travelled

A *business-as-usual (BAU)* forecast provides a forecast of how GHG emissions would change over time if consumption trends continue as they did in 2016 and growth were to occur as projected in the City's current General Plan, absent any regulations which would reduce local emissions. The results of the (BAU) scenario are shown in Table 4. Additional discussion on the Business-as-Usual Forecast is included in Section 4.2.

A more informative metric for future emissions is the adjusted forecast. An adjusted forecast incorporates State and federal programs which are currently codified and are expected to continue being implemented through 2045, such as SB 100 and California Air Resources Board (CARB) tailpipe emissions standards. This forecast provides a more accurate picture of future emissions growth and the emissions reduction the City and community will be responsible for after State regulations are implemented. Calculating the difference between the adjusted scenario GHG emissions forecast and the reduction targets set by the City determines the gap to be closed through City Climate Action Plan policies. The results of the adjusted scenario forecast are included in Table 5 and Figure 2.

Table 4 Business-as-Usual Forecast Summary by Sector by Year

Sector	2016 Emissions (MT CO ₂ e)	2020 Emissions (MT CO ₂ e)	2025 Emissions (MT CO ₂ e)	2030 Emissions (MT CO ₂ e)	2040 Emissions (MT CO ₂ e)	2045 Emissions (MT CO ₂ e)
Population	472,692	507,587	551,206	594,824	668,786	697,764
Jobs	308,724	324,910	345,142	365,374	403,933	421,435
Residential Electricity	318,275	341,770	371,140	400,509	450,309	469,821
Commercial/Industrial Electricity	489,945	515,632	547,740	579,848	641,041	668,817
Residential Gas	318,304	341,801	371,174	400,546	450,350	469,864
Commercial/District Gas	172,019	181,037	192,310	203,584	225,068	234,820
Waste	160,843	171,357	184,500	197,643	220,803	230,371
Water	9,607	10,235	11,020	11,805	13,188	13,759
Wastewater	19,867	21,166	22,789	24,412	27,273	28,455
Transportation	1,935,870	1,975,873	2,025,876	2,075,879	2,175,885	2,226,350
Total Emissions	3,424,729	3,558,871	3,726,548	3,894,225	4,203,918	4,342,257
Per Capita Emissions (MT CO₂e/person)	7.25	7.01	6.76	6.55	6.29	6.22

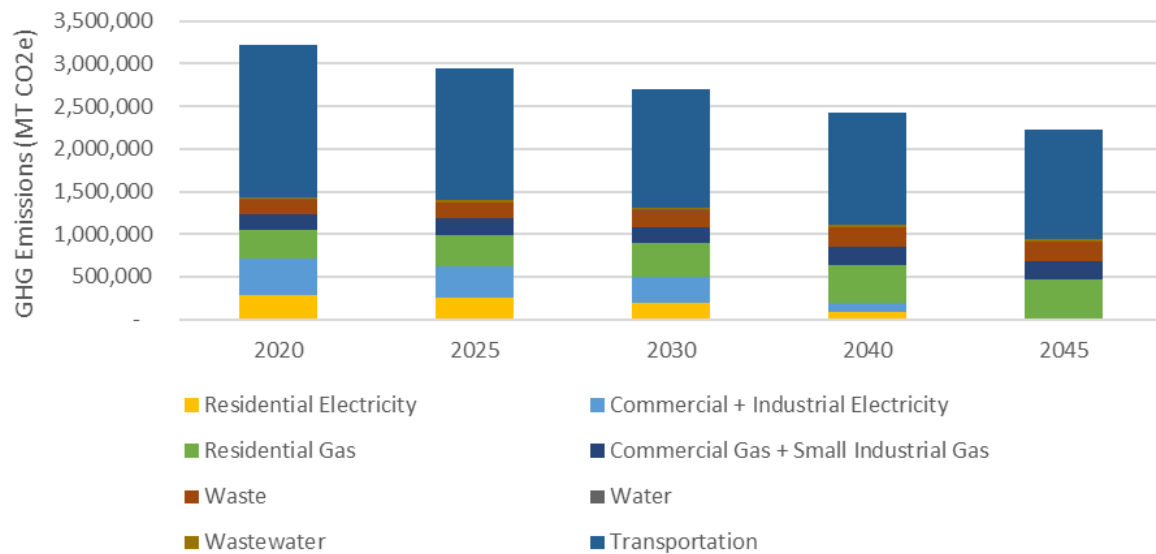
MT CO₂e = metric tons of carbon dioxide equivalent

Table 5 Adjusted Forecast Summary by Sector by Year

Sector	2016 Emissions (MT CO ₂ e)	2020 Emissions (MT CO ₂ e)	2025 Emissions (MT CO ₂ e)	2030 Emissions (MT CO ₂ e)	2040 Emissions (MT CO ₂ e)	2045 Emissions (MT CO ₂ e)
Population	472,692	507,587	551,206	594,824	668,786	697,764
Jobs	308,724	324,910	345,142	365,374	403,933	421,435
Residential Electricity	318,275	283,625	246,723	195,341	77,934	0
Commercial/Industrial Electricity	489,945	430,228	375,327	297,950	120,298	0
Residential Gas	318,304	341,390	368,706	396,022	442,341	460,488
Commercial/District Gas	172,019	180,361	188,252	196,143	211,183	218,009
Waste	160,843	171,357	184,500	197,643	220,803	230,371
Water	9,607	8,572	7,714	6,296	2,638	0
Wastewater	19,867	21,166	22,789	24,412	27,273	28,455
Transportation	1,935,870	1,777,557	1,552,442	1,389,757	1,326,075	1,289,999
Total Emissions	3,424,729	3,214,256	2,946,452	2,703,565	2,428,545	2,227,322
Per Capita Emissions (MT CO₂e/person)	7.25	6.33	5.35	4.55	3.63	3.19

MT CO₂e = metric tons of carbon dioxide equivalent

Figure 2 Adjusted GHG Emissions Forecast Results by Sector and Forecast Year



1.2 Background

The State of California considers GHG emissions and the impacts of global warming to be a serious threat to the public health, environment, economic well-being, and natural resources of California, and has taken an aggressive stance to mitigate the State's impact on climate change through the adoption of legislation and policies, the most relevant of which are summarized below.

- **Executive Order S-3-05**, signed by former Governor Schwarzenegger in 2005, establishes statewide GHG emissions reduction goals to achieve long-term climate stabilization as follows: by 2020, reduce GHG emissions to 1990 levels and by 2050, reduce GHG emissions to 80 percent below 1990 levels. The 2050 goal was accelerated by the 2045 carbon neutral goal established by Executive Order (EO) B-55-18, as discussed below.⁷
- **Assembly Bill 32**, known as the Global Warming Solutions Act of 2006, requires California's GHG emissions be reduced to 1990 levels by the year 2020 (approximately a 15 percent reduction from 2005 to 2008 levels). The AB 32 Climate Change Scoping Plan, first published in 2008, identifies mandatory and voluntary measures to achieve the statewide 2020 emissions limit, and encourages local governments to reduce municipal and community GHG emissions proportionate with State goals.⁸
- **Senate Bill 32**, signed by former Governor Brown in 2016, establishes a statewide mid-term GHG reduction goal of 40 percent below 1990 levels by 2030. CARB formally adopted an updated Climate Change Scoping Plan in December 2017, laying the roadmap to achieve 2030 goals and giving guidance to achieve substantial progress toward 2050 State goals.

⁷ Executive Orders are binding only unto State agencies. Accordingly, EO S-03-05 will guide State agencies' efforts to control and regulate GHG emissions but will have no direct binding effect on local government or private actions.

⁸ Specifically, the AB 32 Climate Change Scoping Plan states CARB, "encourages local governments to adopt a reduction goal for municipal operations emissions and move toward establishing similar goals for community emissions that parallel the State commitment to reduce GHG emissions by approximately 15 percent from current levels by 2020" (p. 27). "Current" as it pertains to the AB 32 Climate Change Scoping Plan is commonly understood as between 2005 and 2008.

- **Executive Order B-55-18**, signed by former Governor Brown in 2018, expanded upon EO S-3-05 by creating a statewide GHG goal of carbon neutrality by 2045. EO S-55-18 identifies CARB as the lead agency to develop a framework for implementation and progress tracking toward this goal in the next Climate Change Scoping Plan Update.

The State of California, via CARB, has issued several guidance documents concerning the establishment of GHG emissions reduction targets for local climate action plans to comply with legislated GHG emissions reductions goals and CEQA Guidelines Section 15183.5(b). In the first California *Climate Change Scoping Plan*,⁹ CARB encouraged local governments to adopt a reduction target for community emissions paralleling the State commitment to reduce GHG emissions. In 2016, the State adopted SB 32 mandating a reduction of GHG emissions by 40 percent from 1990 levels by 2030 and in 2017 CARB published *California's 2017 Climate Change Scoping Plan* (hereafter referred to as the Scoping Plan Update) outlining the strategies the State will employ to reach these targets.¹⁰ With the release of the Scoping Plan Update, CARB recognized the need to balance population growth with emissions reductions and in doing so, provided a new methodology for proving consistency with State GHG reduction goals through the use of per capita efficiency targets. These targets are generated by dividing a jurisdiction's GHG emissions for each horizon year by the jurisdiction's total population for that target year and are discussed further in Section 5.

1.3 Greenhouse Gases

The 2016 City of Sacramento Community Inventory was developed using the Community Protocol¹¹ and California Supplement.¹² Emissions were calculated using the principles and methods from these protocols. Emissions from nitrous oxide (N₂O), methane (CH₄), and carbon dioxide (CO₂) are included in this assessment. Each GHG has a different capability of trapping heat in the atmosphere, known as its global warming potential (GWP), which is normalized relative to CO₂ and expressed as carbon dioxide equivalent, or CO₂e. The CO₂e values for these gases are derived from the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change GWP values for consistency with the yearly CARB GHG inventory, as shown in Table 6.^{13,14}

Table 6 Global Warming Potentials of Greenhouse Gases

Greenhouse Gas	Molecular Formula	Global Warming Potential
Carbon Dioxide	CO ₂	1
Methane	CH ₄	25
Nitrous Oxide	N ₂ O	298

MT CO₂e = metric tons of carbon dioxide equivalent

⁹ California Air Resources Board. 2008. Climate Change Scoping Plan. Accessed at: https://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf. Accessed on: June 20, 2019

¹⁰ California Air Resources Board. California's 2017 Climate Change Scoping Plan. Accessed at: https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf. Accessed on: June 20, 2019

¹¹ ICLEI. 2012. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions.

¹² Association of Environmental Professionals. 2013. The California Supplement to the United States Community-Wide Greenhouse Gas (GHG) Protocol. Accessed at: https://califaep.org/docs/California_Supplement_to_the_National_Protocol.pdf. Accessed on: June 20, 2019

¹³ Intergovernmental Panel on Climate Change. 2007. Fourth Assessment Report: Climate Change. Direct Global Warming Potentials.

¹⁴ All calculations use Intergovernmental Panel on Climate Change Fourth Assessment Report GWP values with the exception of the first order of decay modeling performed for waste-in-place at the 28th Street and L&D landfills, which use a static SAR2 GWP value for methane of 21 and cannot be altered.

1.4 Excluded Emissions

The following emissions sectors have been excluded from both the 2005 and 2011 inventories and therefore were also excluded from the 2016 inventory and emissions forecast. Additional updates were also made to the 2005 and 2011 inventories in order to maintain consistency between all inventory years. These changes are summarized in Sections 2.2 and 2.3.

Consumption-based Emissions

GHG emissions from consumption of goods within the city are excluded from the inventory and forecast of City of Sacramento emissions. Currently there exists no widely accepted standard methodology for reporting consumption-based inventories.

Natural and Working Lands

GHG emissions from carbon sinks and sources in natural and working lands are not included in this inventory and forecast due to the lack of granular data and standardized methodology. CARB has included a state-level inventory of natural and working lands in the 2017 Scoping Plan Update¹⁵ greenhouse gas inventory; however, at the time of this City of Sacramento community-wide inventory, sufficient data and tools were not available to conduct a jurisdiction-specific working lands inventory. The Nature Conservancy and California Department of Conservation¹⁶ are exploring options for a tool which may be able to perform these inventories at a more specific geographic level.

Agricultural Emissions

Emissions from agricultural activities are not included in this inventory as the Community Protocol and California Supplement¹⁷ both note agricultural activity is not a required component of Community Protocol inventories and should be included only if relevant to the community conducting the inventory. Regulations exist to encourage urban agriculture within the City boundaries. Many of the emissions from these activities (e.g., energy) are covered under other sectors included in this inventory and no major commercial-scale livestock activity is noted within the city boundaries.

High GWP

High GWP emissions, including chlorofluorocarbons (CFCs) and hydrofluorocarbons (HFCs) used as substitutes for ozone-depleting substances, are not included in this inventory as it is not a required component of the Community Protocol. The California Supplement notes these emissions are not generally included in California inventories, including in Sacramento.

Off-Road Emissions

To maintain consistency with previous inventories (2005 and 2011) off-road emissions were not included in this analysis.

¹⁵ California Air Resources Board. 2017. California's Climate Change Scoping Plan.

¹⁶ California Department of Conservation. TerraCount Scenario Planning Tool. Accessed at: <https://maps.conservation.ca.gov/terraaccount/>. Accessed on: May 15, 2019

¹⁷ Association of Environmental Professionals. 2013. *The California Supplement to the United States Community-Wide Greenhouse Gas (GHG) Emissions Protocol*. https://califaep.org/docs/California_Supplement_to_the_National_Protocol.pdf

1.5 Forecast and Target Years Summary

Prior to 2016, the City of Sacramento completed two community-wide GHG emissions inventories, one for the year 2005 and an updated inventory for 2011. Portions of the 2011 inventory, including water, waste-in-place, and transportation, allocated emissions based solely on the overall growth of the city and therefore an accurate historical comparison between all inventories may not be feasible without further modifications to previous inventories as discussed in Section 2.

The emissions forecast is based upon the latest available data from City GHG inventories, in this case the 2016 inventory completed by Rincon. This forecast uses benchmark years of 2020, 2025, 2030, 2040 and 2045, consistent with currently codified GHG reduction targets or executive orders which are expected to be codified in future, and a target of carbon neutrality on or before 2045.

The forecast years align with the following targets:

- 2020 (AB 32)
- 2025 (progress evaluation)
- 2030 (SB 32)
- 2040 (General Plan horizon year)
- 2045 (EO B-55-18)

The 2030 and 2040 targets are required for consistency with SB 32 and the Sacramento 2040 General Plan Update respectively, while the remainder of the targets identify a clear path and milestones of progress toward the long-term State reduction goals.

2020 Progress

The first City of Sacramento Climate Action Plan was adopted in 2012. It identified how the City and broader community can reduce the City of Sacramento's GHGs and included a GHG emissions reduction target of 15 percent reduction below 2005 emissions levels by 2020. The City of Sacramento Climate Action Plan was incorporated into the City's 2035 General Plan¹⁸ and adopted in 2015. Based on the 2016 inventory the City of Sacramento exceeded the 2020 reduction goal by 4.8 percent and four years ahead of schedule by emitting an estimated 3,424,729 MT of CO₂e.

This 2016 inventory and forecast also considered per capita emissions reductions due to the rate at which Sacramento has grown since 2005. In 1990, GHG emissions were an estimated 9.75 MT CO₂e per person. This was calculated by back-casting the 2005 GHG inventory to 1990 (which assumes a 15 percent emission increase from 1990 to 2005) and then dividing by the 1990 population. In 2016, per capita emissions dropped to 7.25 MT CO₂e per person. This equates to an emissions reduction of 26 percent below 2005 levels and 28 percent below 1990 levels. Details and discussion of previous inventories and changes made for consistency as part of this update can be found in Section 2.

¹⁸ City of Sacramento. 2035 General Plan. Accessed at: <http://www.cityofsacramento.org/Community-Development/Resources/Online-Library/2035--General-Plan> Accessed on: May 15, 2019

2 Previous Inventories

A summary of previous GHG emissions inventories can be found in Table 7. A description of the variability between methodologies used in each of the inventory years is summarized in the following sections.

Table 7 Sacramento GHG Inventories Summary

Sector	1990 Emissions¹ (MT CO₂e)	2005 Emissions² (MT CO₂e)	2011 Emissions² (MT CO₂e)	2016 Emissions (MT CO₂e)
Residential Energy	607,052	714,178	656,472	636,578
Commercial & Industrial Energy	689,637	811,337	650,627	661,964
Transportation	1,856,925	2,184,617	2,091,154	1,935,870
Generated Waste	344,506	405,301	113,192	134,339
Waste-in-place	42,432	49,921	25,773	26,504
Wastewater	48,773	57,380	18,719	19,867
Water	10,889	12,810	9,804	9,607
Total Emissions	3,600,213	4,235,545	3,565,741	3,424,729
Per Capita Emissions (MT CO₂e/person)	9.75	9.57	7.58	7.25

¹ All 1990 inventory data calculated as a 15 percent reduction from 2005 inventory levels per California Air Resources Board guidelines.

² Methodology inconsistent, cannot be compared directly to other years

MT CO₂e = metric tons of carbon dioxide equivalent

2.1 1990 Baseline

The State of California uses 1990 as a reference year to remain consistent with AB 32 and SB 32, which codified the State’s 2020 and 2030 GHG emissions targets by directing CARB to reduce statewide emissions to 1990 levels by 2020 and 40 percent below 1990 levels by 2030. The City of Sacramento’s initial inventory was conducted for the year 2005. The State indicated in the first Climate Change Scoping Plan in 2008 that local governments wishing to remain consistent with State targets could use a 15 percent reduction from 2005-2009 levels as a proxy for a 1990 baseline.¹⁹ The updated 1990 proxy baseline used for target setting by the City of Sacramento is 3,600,213 MT CO₂e.

2.2 2005 Inventory Updates

In 2009, the Sacramento County Department of Environmental Review and Assessment, with guidance from ICF, Jones & Stokes prepared a GHG inventory of 2005 emissions in Sacramento County. This inventory included unincorporated areas as well as the cities of Citrus Heights, Elk Grove, Folsom, Galt, Isleton, Rancho Cordova, and Sacramento.

¹⁹ Due to lack of 1990 inventory data for local governments, page 27 of the 2008 Climate Change Scoping Plan identifies 15 percent below “current” (2005-2009) levels by 2020 as consistent with the State goals of 1990 levels by 2020, allowing local governments to back-cast to develop 1990 baselines for future GHG reduction targets.

Several updates to the 2005 inventory were performed as part of the current inventory and forecast efforts to align the 2005, 2011, and 2016 methodologies. These included removing large industrial natural gas users, updating the transportation emissions calculation methodologies and updating waste emissions methodology to California-specific emissions factors and AR4 GWP. Complete data for water and wastewater was not available, so the original numbers were left as found.

Natural Gas

Because of the California Public Utility Commission (CPUC) 15/15 Rule²⁰, although PG&E reported industrial gas use for 2005, PG&E did not report comparable data in 2016. To allow for a comparison between across all years, the 2005 inventory was updated to remove industrial gas. Large industrial emitters removed from the inventories are under the purview of the CARB Cap-and-Trade Program for emissions reductions and are, therefore, also already accounted for in the 2017 Scoping Plan Update. Attempts were made to estimate industrial natural gas emissions through CAP-and-Trade program data and permits, however, no complete data set could be identified. Therefore, using best available data (utility data provided by PG&E) industrial gas needed to be removed from historical inventories to allow for a consistent comparison of GHG emissions from this sector over time. Because industrial and commercial data was aggregated in the 2005 inventory, an estimate of commercial gas was made by calculating the average of the 2017 and 2016 ratios of commercial gas usage to residential gas usage (0.48207). This ratio was then used to identify the commercial portion of the commercial/industrial aggregated natural gas data. The commercial gas portion was then used to recalculate emissions for 2005 (and 2011) and the estimated industrial portion was dropped.

The ratio of residential to commercial gas use was used to correct for population growth and temperature changes which might have increased or decreased gas use in the city of Sacramento. Natural gas consumption labeled as “district” users, such as fire and school districts, were included in all years. In future years if the California Energy Commission were to change their data aggregation rules, industrial data could be reincorporated.

Waste

In 2005 and 2011, two different waste emission factors were utilized. This caused an increase in emissions from 2005 to 2011 even though the City achieved a 37 percent reduction in overall tonnage. However, neither the 2005 nor 2011 inventory documentation provided clear guidance on the methodologies used to calculate these emission factors. These values also did not make sense as an increase in methane capture occurred during these times. Therefore, to address this problem updated emission factors were derived from a waste characterization study performed by CalRecycle, previously known as the California Integrated Waste Management Board (CIWMB). Factors from the 2004 waste characterization study for the State of California were applied to the 2005 waste tonnage.

Waste-in-place was also assessed for the 2005 inventory. When the waste-in-place inventory was originally completed, it used 2002 as the baseline year for tonnage of waste in the landfills and did not include tonnage added to the landfill from 2002 through 2005. This information was added to the CARB first order decay model and rerun to achieve a more accurate value.

²⁰ The 15/15 rule states no data can be provided if there are less than 15 users in any sector or if one user makes up more than 15 percent of the total usage. This applies to natural gas and electricity consumption.

Transportation

The 2005 inventory data provided in the 2012 City of Sacramento Climate Action Plan includes total transportation emissions as well as the daily vehicle miles traveled (VMT).²¹ However, detailed emissions factors were not cited. Therefore, the EMFAC2017 model was used to re-calculate an emission factor, weighted average emissions per VMT, for 2005. Recalculating the emission factor and updating the 2005 inventory ensures consistency with future inventories and provides transparency for future work if needed. While the methodology used to derive the VMT number was unable to be verified, the VMT values appear to be consistent between inventory years and a note in the previous inventory files indicated that the data was established using the Regional Targets Advisory Committee (RTAC) origin-destination model.

Summary of Inventory Data

Table 8 and Table 9 include all of the activity data, emission factors, and total emissions available for both the original 2005 inventory (Table 8) and the updated inventory (Table 9). The only sectors for which an emission factor and activity data could not be established either through the historical inventory or through the update process were water and wastewater.

Table 8 Original 2005 GHG Inventory Data

Sector	Original Activity Data	Original Emission Factor	Original Emissions (MT CO ₂ e)
Residential Electricity (kWh)	1,307,301,693	0.00028	748,792 ¹
Residential Gas (therms)	65,698,581	0.00531	
Commercial and Industrial Electricity (kWh)	2,235,898,207	0.00028	979,777 ¹
Commercial Gas (therms)	61,791,582	0.00531	
Industrial Gas (therms)	*included in Commercial	0.00531	
District Gas (therms)	5,339,537	0.00531	28,656
On-road Transportation (VMT)	4,175,278,800	0.000482	2,013,962
Waste (tons)	684,088	0.299459	204,856
Waste-in-Place	N/A	N/A	37,006
Wastewater	Unknown	Unknown	57,380
Water (MGY)	Unknown	Unknown	12,810
Total			4,083,239

¹ Data presented as it was provided in the original 2005 inventory.

kWh = kilowatt hours; mgy = million gallons per year; N/A = not applicable; MT CO₂e = metric tons of carbon dioxide equivalent; VMT = vehicle miles traveled

²¹ Ascent Environmental, January 13, 2012. http://ascentenvironmental.com/files/9714/0537/0505/Sacramento_CAP_Final_Draft.pdf

Table 9 Updated 2005 GHG Inventory Data

Sector	Updated Activity Data	Updated Emission Factor	Updated Emissions (MT CO ₂ e)
Residential Electricity (kWh)	1,307,301,693	0.00028	365,319
Residential Gas (therms)	65,698,581	0.00531	348,859
Commercial and Industrial Electricity (kWh)	2,235,898,207	0.00028	624,811
Commercial Gas (therms)	29,787,868	0.00531	158,174
Industrial Gas (therms)	*Removed from Inventory	0.00531	–
District Gas (therms)	5,339,537	0.00531	28,353
On-Road Transportation (VMT)	4,175,278,800	0.000523	2,184,617
Waste (tons)	684,088	0.59247	405,301
Waste-in-Place	N/A	N/A	49,921
Wastewater	Unknown	Unknown	57,380
Water (mgy)	Unknown	Unknown	12,810
Total			4,235,545

kWh = kilowatt hours; mgy = million gallons per year; N/A = not applicable; MT CO₂e = metric tons of carbon dioxide equivalent; VMT = vehicle miles traveled

2.3 2011 Inventory Updates

In 2015, the City of Sacramento, with the assistance of Ascent Environmental, conducted a GHG inventory estimate of community-wide emissions for the year 2011. After reviewing the inventory during the 2019 CAP 2.0 process, several inconsistencies were identified between the 2005 inventory, 2011 inventory, and current best practices.

Several updates to the 2011 inventory estimate were performed as part of the current effort to align the 2005, 2011, and 2016 methodologies. These included removing large industrial natural gas users (due to data availability in 2016), updating waste emissions methodology to California-specific emissions factors and AR4 GWP, and updating the transportation emissions calculation methods.

The following section outlines the changes made to the 2011 inventory for consistency with the other inventory years. Although 2011 is less important than 2005 (which derives the baseline 1990 emissions) and 2016 (which informs current progress), it still provides a useful data point for the City of Sacramento's overall emission reduction progress.

Natural Gas

Because of the CPUC 15/15 Rule²², industrial gas was no longer reported in 2016. To allow for a comparison between across all years, the 2011 inventory was updated to remove industrial gas. Large industrial emitters removed from the inventories are under the purview of the CARB Cap-and-Trade Program for emissions reductions and are, therefore, also already accounted for in the 2017 Scoping Plan Update. Because industrial and commercial data was aggregated in the 2011 inventory, an estimate of industrial gas was made and subtracted to isolate the commercial emissions. To accomplish this, the average of the 2017 and 2016 ratios of commercial gas usage to residential gas

²² The 15/15 rule states no data can be provided if there are less than 15 users in any sector or if one user makes up more than 15 percent of the total usage. This applies to natural gas and electricity consumption.

usage (0.48207) was applied to the 2011 inventory. This ratio was then used to identify the industrial emissions portion of the commercial/industrial aggregated natural gas data.

The ratio of residential to commercial gas use was used to correct for population growth and temperature changes which might have increased or decreased gas use in the city of Sacramento. Natural gas consumption labeled as “district” users, such as fire and school districts, was included in all years.

Waste

As noted above, in 2005 and 2011 two different waste emission factors were utilized. This caused an increase in emissions from 2005 to 2011 even though the City achieved a 37 percent reduction in overall tonnage. This was because the original 2005 calculation methodology was not able to be identified during the 2011 inventory. To address this problem, emission factors derived from the CalRecycle (formerly CIWMB) waste characterization study for the State of California for 2008 were applied to the tons of waste generated in 2011.

Waste-in-place was also updated for the 2011 inventory. When the inventory was originally completed, it simply re-used the 2005 data for 2011. However, waste-in-place is a cumulative emissions calculation. Because the landfills in Sacramento are either closed or accepting less waste, this led to an overestimate of emissions. A first order decay model using landfill waste data from 2005 to 2011 was used to update the waste-in-place number.

Transportation

The 2011 inventory data includes total transportation emissions as well as the daily VMT.²³ However, the emissions factor was calculated using older methods no longer considered standard. Therefore, the EMFAC2017 model was used to re-calculate the average emissions per VMT in 2011. While not able to verify the methodology used to derive VMT, the VMT values appear to be consistent between inventory years and a note in the previous inventory workbook suggested the data was provided using the RTAC origin-destination model.

Summary of Inventory Data

Table 10 and Table 11 include all of the activity data, emission factors, and total emissions available for both the original inventory (Table 10) and the updated inventory (Table 11). The only sectors for which an emission factor and activity data could not be established either through the historical inventory or through the update process were water and wastewater.

²³ The documents provided by Ascent in the summary of the 2005/2011 inventories stated that VMT values were derived from the RTAC Origin-Destination model and were provided by Fehr and Peers as well as SACMET.

Table 10 Original 2011 GHG Inventory Data

Sector	Original Activity Data	Original Emission Factor	Original Emissions (MT CO ₂ e)
Residential Electricity (kWh)	1,343,895,669	0.00020	656,472 ¹
Residential Gas (therms)	74,151,520	0.00531	
Commercial and Industrial Electricity (kWh)	2,346,768,051	0.00020	814,087 ¹
Commercial Gas (therms)	66,911,808	0.00531	
Industrial Gas (therms)	*included in Commercial	0.00531	
District Gas (therms)	3,872,204	0.00531	20,561
On-road Transportation (VMT)	4,234,269,734.09	0.000475	2,009,724
Waste (tons)	427,980	0.78300	335,108
Waste-in-Place	N/A	N/A	37,006
Wastewater	Unknown	Unknown	18,719
Water (mgy)	37,149	0.263921	9,804
Total			3,901,481

¹ Numbers presented as they were in the original 2011 GHG inventory.

kWh = kilowatt hours; mgy = million gallons per year; N/A = not applicable; MT CO₂e = metric tons of carbon dioxide equivalent; VMT = vehicle miles traveled

Table 11 Updated 2011 GHG Inventory Data

Sector	Original Activity Data	Original Emission Factor	Original Emissions (MT CO ₂ e)
Residential Electricity (kWh)	1,343,895,669	0.00020	262,727
Residential Gas (therms)	74,151,520	0.00531	393,745
Commercial and Industrial Electricity (kWh)	2,346,768,051	0.00020	458,786
Commercial Gas (therms)	32,256,175	0.00531	171,280
Industrial Gas (therms)	*included in Commercial	N/A	N/A
District Gas (therms)	3,872,204	0.00531	20,561
On-road Transportation (VMT)	4,234,269,734	0.000494	2,091,154
Waste (tons)	427,980	0.264478517	113,192
Waste-in-Place	N/A	N/A	25,773
Wastewater	Unknown	Unknown	18,719
Water (MGY)	37,149.00	0.263921	9,804
Total			3,565,741

kWh = kilowatt hours; mgy = million gallons per year; N/A = not applicable; MT CO₂e = metric tons of carbon dioxide equivalent; VMT = vehicle miles traveled

3 2016 Community Inventory

The methodologies, data sources, calculations, and results associated with the 2016 GHG inventory update are included in this section. Information regarding updates to the 2005 and 2011 inventories and information relating to the emissions forecast is located in Section 2.2 and Section 2.3 of the technical appendix, respectively.

The 2016 GHG inventory is structured based on emissions sectors. The ICLEI Community Protocol recommends local governments examine their emissions in the context of the sector responsible for those emissions. Many local governments will find a sector-based analysis more directly relevant to policy making and project management, as it assists in formulating sector-specific reduction measures for climate action planning. The reporting sectors are made up of multiple subsectors to allow for easier identification of sources and targeting of reduction policies.

The 2016 inventory reports all Basic Emissions Generating Activities²⁴ required by the Community Protocol²⁵ by the following main sectors:

- Energy (electricity and natural gas)
- Transportation
- Water and Wastewater
- Solid Waste

The data used to complete this inventory and forecast came from multiple sources, as summarized in Table 12. Data for the 2016 inventory calculations were provided by the City via personal communication with Helen Selph.

²⁴ Required emissions generating activities include use of electricity by the community, use of fuel in residential and commercial stationary combustion equipment, on-road passenger and freight motor vehicle travel, use of energy in potable water and wastewater treatment and distribution, and generation of solid waste by the community.

²⁵ ICLEI. 2012. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Section 2.2.

Table 12 Inventory and Forecast Data Sources

Sector	Activity Data	Unit	Source
Inventory			
Energy	Electricity Consumption	kWh	Sacramento Municipal Utilities District
	Natural Gas Consumption	Therms	Pacific Gas and Electric
Transportation	Annual Mileage	VMT	EMFAC2017 Model; Sacramento Area Council of Governments
Water	Water Pumping	AF	Sacramento DOU
	Electricity Usage	kWh	
Wastewater	Electricity Consumption, Water Treated	kWh MGD	Sacramento DOU; Sacramento Regional County Sanitation District; City of Sacramento 2011 Climate Action Plan
Solid Waste	N/A	N/A	CalRecycle; Sacramento Public Works Department United States Environmental Protection Agency Landfill Methane Outreach Program Reporting
Forecast Growth Indicators			
Population	Residents	Persons	City of Sacramento General Plan; California Department of Finance Demographic Projections
Commerce	Jobs	Number of Jobs	City of Sacramento General Plan
Transportation	Annual Mileage, Emissions	N/A	EMFAC2017 Model; Sacramento Area Council of Governments
Building Efficiency	Title 24 Efficiency Increases	Percent	California Energy Commission
Electricity Emissions	Renewable Portfolio Standard	Percent	Renewable Portfolio Standard; Senate Bill 100
kWh; kilowatt hours; VMT = vehicle miles traveled; AF = acre-foot; MGD = million gallons per day; N/A = not applicable; Sacramento DOU = Sacramento Department of Utilities			

3.1 Energy

The energy sector includes GHG emissions resulting from the consumption of electricity and natural gas. Both energy sources are used in residential, commercial, and industrial buildings and for other power needs throughout the City of Sacramento. The following subsections describe the data sources, emission factors and calculation methodologies associated with electricity and natural gas.

Overall, residential and non-residential (commercial and industrial) energy emissions were approximately equal in 2016 at 49 percent and 50 percent respectively (Figure 3). It should be noted that, similar to previous years, this does not include large industrial users' gas use in the analysis. Non-residential electricity was reported in aggregate by Sacramento Municipal Utility District (SMUD) and included both industrial and commercial data. Due to data availability issues, large industrial gas data were not provided by PG&E and not been included in this inventory. Additional information on why this change was made as well as the methodologies used to estimate 2016 commercial gas data are provided in the natural gas section.

Electricity

Emissions resulting from electricity consumption were estimated by multiplying annual electricity consumption by an electricity emission factor representing the average emissions associated with generation of one megawatt hour (MWh) of electricity. Electricity is supplied to the City by SMUD. In its 2016 report to the verification body, The Climate Registry, SMUD reported an electricity carbon intensity factor of 492.95 pounds CO₂e per MWh.²⁶ SMUD also reported to the California Energy Commission, an average of 20 percent renewable energy in its portfolio in 2016.²⁷ From 2005, residential electricity use increased by 116.1 MWh while commercial electricity decreased by 44.7 MWh for a net increase of 71.4 MWh. Therefore, the 181,910 MT CO₂e reduction in GHG emissions from electricity between 2005 and 2016 was due to an approximately 20 percent reduction in the SMUD electricity emission factor.

To calculate emissions from electricity, the total electricity use reported by SMUD was multiplied by the carbon intensity factor to determine MT CO₂e. This value represents all residential, commercial, and industrial electricity use within the city. Prior to performing this calculation, the electricity use associated with in-boundary water sector activities (42,964 MWh) was removed to avoid double counting water emissions. This is discussed further in the water and wastewater section.

In 2016, a total 808,220 MTCO₂e was generated within the community due to residential and commercial electricity use. Table 13 and Table 14 show the breakdown of emissions from electricity by both category (residential, commercial/industrial) and by source.

Natural Gas

In order to calculate emissions from natural gas consumption, the total therms consumed is multiplied by the PG&E reported emissions factor of 11.7 pounds CO₂/therm. Due to CPUC privacy regulations, the majority of 2016 industrial therms were not provided.²⁸ This resulted in a substantial decrease in emissions from industrial natural gas use from the 2005 baseline.

Any remaining reported industrial use is from PG&E “district” users, such as fire and school districts. Industrial emissions removed from the inventories are under the purview of the CARB Cap-and-Trade Program for emissions reductions and are, therefore, already accounted for in the 2017 Scoping Plan Update. The California Supplement does not recommend including these sources unless they are under the direct jurisdictional control of the reporting agency.²⁹ Overall natural gas usage in the commercial sector decreased from 29.8 million therms in 2005 to 29.0 million therms in 2016 while the emission factor remained constant. This means that 100 percent of the 45,063 MT CO₂e reduction was attributed to a decrease in gas use.

In 2016, the commercial, district industrial, and residential categories consumed a total of 92,390,976 therms of natural gas, which, based on the emission factor of 0.00531 MT CO₂/therm, generated 490,323 MTCO₂e. A complete breakdown of natural gas use by category and sector is provided in Table 14.

²⁶ The Climate Registry. 2016 Default Emissions Factors. Accessed at: <https://www.theclimateregistry.org/wp-content/uploads/2014/11/2016-Climate-Registry-Default-Emission-Factors.pdf>. Accessed on: June 17, 2019

²⁷ California Energy Commission. Sacramento Municipal Utility District 2016 Power Content Label. Accessed at: https://www2.energy.ca.gov/pcl/labels/2016_labels/Sacramento_Municipal_Utility_District.pdf Accessed July 15, 2019

²⁸ Minor industrial emissions reported through PG&E from the ‘District’ customer class are included in this inventory.

²⁹ Association of Environmental Professionals. 2013. The California Supplement to the United States Community-Wide Greenhouse Gas (GHG) Protocol. Page 9.

Figure 3 Energy Emissions by Category for Year 2016

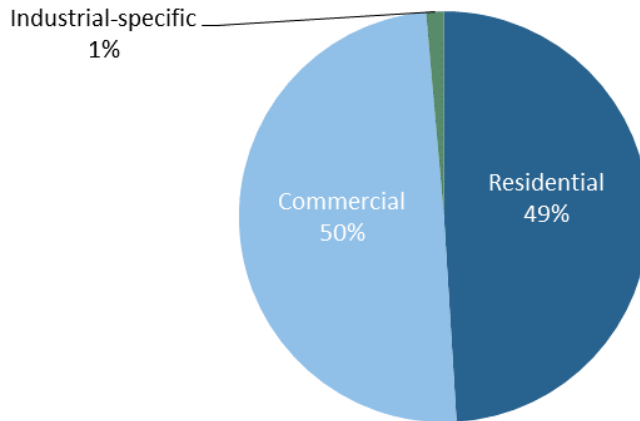


Table 13 Energy Emissions by Category for Year 2016

Source	Activity Data	Emission Factor	Total Emissions (MT CO ₂ e)
Residential			636,578
Natural Gas	59,977,656 therms	0.00531 MT CO ₂ e/therm	318,304
Electricity	1,423,420 MWh	0.2236 MT CO ₂ e/MWh	318,275
Commercial			643,747
Natural Gas	28,980,911 therms	0.00531 MT CO ₂ e/therm	153,803
Commercial and Industrial Electricity	2,191,181 MWh	0.2236 MT CO ₂ e/MWh	489,945
District Industrial			18,216
Natural Gas ¹	3,432,409 therms	0.00531 MT CO ₂ e/therm	18,216
Total			1,298,542

¹ Large industrial natural gas has been removed due to CPUC privacy rules. See Energy Section for discussion.

MWh = megawatt hours; MT CO₂e = metric tons of carbon dioxide equivalent

Table 14 Energy Emissions by Energy Source for Year 2016

Source	Activity Data	Emission Factor	Total Emissions (MT CO ₂ e)
Natural Gas	92,390,976 therms	0.00531 MT CO₂e/therm	490,332
Commercial	28,980,911 therms	0.00531 MT CO ₂ e/therm	153,803
Residential	59,977,656 therms	0.00531 MT CO ₂ e/therm	318,304
District Industrial ¹	3,432,409 therms	0.00531 MT CO ₂ e/therm	18,216
Electricity	3,581,960 MWh	0.2236 MT CO₂e/MWh	808,220
Commercial/Industrial	2,191,181 MWh	0.2236 MT CO ₂ e/MWh	489,945
Residential	1,423,420 MWh	0.2236 MT CO ₂ e/MWh	318,275
Total			1,298,542

¹ Large industrial natural gas has been removed due to CPUC privacy rules. See Energy Section for discussion

MWh = megawatt hours; MT CO₂e = metric tons of carbon dioxide equivalent

3.2 Transportation

Transportation modeling for VMT attributed to the City of Sacramento was completed by Fehr & Peers Transportation Consultants using Sacramento Area Council of Government (SACOG) activity-based model, SACSIM.³⁰ The emissions associated with on-road transportation were then calculated by multiplying the estimated daily VMT and the average vehicle emissions rate established by CARB EMFAC2017 modeling for vehicles within the region. In 2016 on-road transportation attributed to the City of Sacramento resulted in 1,935,870 MT CO₂e, a 248,747 MT CO₂e reduction compared to 2005. During this time VMT increased by 4 percent or 172 million miles traveled. Therefore, the emissions reductions in this sector were driven by an increase in average vehicle efficiency and adoption of electric vehicles which resulted in a 10 percent decrease in average vehicles emissions per mile.

The VMT modeling results allocate VMT derived from the activity-based model to the City of Sacramento using the Origin-Destination (O-D) method. The O-D VMT method is the preferred method recommended by the U.S Community Protocol in on-road methodology TR.1 and TR.2 to estimate miles traveled based on trip start and end locations. Under these recommendations, all trips that start and end within the City are attributed to the City. Additionally, one half of the trips that start internally and end externally and vice versa are attributed to the City. A summary of the VMT results can be found in Table 15.

Table 15 Estimated Transportation Emissions for 2016

Source	Activity Data (VMT) ²	Emission Factor	Total Emissions (MT CO ₂ e)
Internal-Internal Daily VMT	3,588,476	0.000445 MT CO ₂ e per VMT	1,598
½ Internal-External Daily VMT	4,463,016	0.000445 MT CO ₂ e per VMT	1,988
½ External-Internal Daily VMT	4,475,924	0.000445 MT CO ₂ e per VMT	1,993
Total Daily VMT	12,527,417	0.000445 MT CO ₂ e per VMT	5,579
Yearly VMT¹	4,347,013,534	0.000445 MT CO₂e per VMT	1,935,870

1 Weekday to annual conversion of 347 is used per CARB guidance on VMT modeling

2 The origin-destination methodology for VMT calculation attributes 100 percent of internal-to-internal daily trips, 50 percent of internal-external and external-internal daily trips, and excludes all pass-through trips. This sum is then multiplied by 347 to get an annual VMT number.

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

Transportation emissions are generated by the community of Sacramento through on-road transportation, including passenger, commercial, and heavy machinery. Emissions factors are established using the latest CARB and EPA-approved emissions modeling software, 2017 State Emissions FACTors (EMFAC) Model. Carbon dioxide, nitrous oxide, and methane emissions from engine combustion are multiplied by their GWP to determine CO₂e per VMT. Emissions for both passenger and commercial vehicles were established using the EMFAC2017 GHG module and weighted by VMT to establish an average emissions factor per VMT for the City. Emissions from electricity used by charging of electric vehicles are captured under the electricity sector. In 2016, the average emissions factor for cars on the road in the County of Sacramento was 0.000445 MTCO₂e

³⁰ Sacramento Area Council of Governments. SACOG Travel Demand Model. Accessed at: <https://www.sacog.org/modeling> Accessed on: October 4, 2019

per VMT as calculated using the EMFAC2017 model.³¹ Technical details on the EMFAC2017 modeling tool can be found on the EMFAC Mobile Source Emissions Inventory Technical Support Documentation Portal.³²

3.3 Water and Wastewater

Water

Water is supplied to Sacramento by the Sacramento Department of Utilities, primarily sourced from the Sacramento and American rivers and from local groundwater reservoirs. The primary water treatment plant facilities for the community are E.A. Fairbairn Water Treatment Plant and Sacramento River Water Treatment Plant, both located within the city boundaries. Water supplied to the community contributes emissions through the use of energy to extract, convey, treat, and deliver water. The amount of energy required for community water usage was calculated following Community Protocol Method WW.14, where the total emissions are equal to the energy used in each of the four phases above. The energy required for each segment of the water cycle was provided by the Sacramento Department of Utilities or based on phase-specific averages where it was unavailable. SMUD provided the annual electricity use for the water extraction, conveyance, and delivery phases (40,101 MWh),³³ while a kWh phase average of 100 kWh/million gallons was used for the treatment phase. As all energy use is in-boundary, total MWh for water transactions has been subtracted from the community energy use total calculated in Section 3.1 to avoid double counting.

SMUD is the electricity provider for the City; therefore, SMUD's energy emissions factor of 492.95 pounds CO₂e/MWh was applied to the calculated electricity used for water consumption in the city. Energy consumption related to water use in the city of Sacramento resulted in the generation of approximately 9,607 MTCO₂e in 2016, or 33 percent of total water and wastewater emissions. In 2016, Sacramento water treatment plants produced 87,811 acre-feet of water. The 2005 water consumption for the City was not recorded in the previous inventory and therefore, a comparison of the methodology was not possible. However, it is likely that emission reductions have been driven in part by a reduced electricity emission factor.

Wastewater

The wastewater generated by community residents and businesses creates GHG emissions during the treatment processes, including process, stationary, and fugitive emissions. The sources and magnitude of emissions depend on the type of wastewater treatment plant and the treatment processes utilized.

Wastewater generated in the city of Sacramento is collected in local sewer lines which ultimately discharge into the Sacramento Regional Wastewater Treatment Plant managed by Regional San in Elk Grove, California. As the wastewater treatment plant treats sewage from multiple jurisdictions, methane and nitrous oxide emissions were allocated to Sacramento on a population basis per Community Protocol Methodology WW.13 shown in Figure 4. Total carbon dioxide emissions from

³¹ EMFAC2017. Base year 2016, County of Sacramento model run. Accessed at: <https://www.arb.ca.gov/emfac/> Accessed on: July 16, 2019

³² California Air Resources Board. EMFAC Software and Technical Support Documentation. Accessed at: <https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-modeling-tools-emfac> Accessed on: October 4, 2019.

³³ D. Vang, personal communication, August 2018.

the Sacramento Regional Wastewater Treatment Plant were unavailable from the USEPA Greenhouse Gas Reporting Program, the ICLEI-recommended data source. Therefore, separate emissions sources (nitrous oxide, methane, electricity use) were calculated based on the population increase from 2011. In 2016, a total of 40 MT N₂O and 32 MT CH₄ were emitted from the effluent discharge and stationary sources at the treatment plant. As shown in Table 16 the total process emissions and electricity usage for Sacramento wastewater treatment and disposal resulted in emissions of 19,867 MT CO₂e per year, or 67 percent of the water and wastewater emissions.

Table 16 Water and Wastewater Emissions for Year 2016

Source	Activity Data	Emission Factor	Total Emissions (MT CO ₂ e)
Water Use	42,963,998 MWh	0.22359 MT CO₂e/MWh	9,607
Supply, Conveyance, Distribution	40,101 MWh	0.22359 MT CO ₂ e/MWh	8,967
Treatment	2,863 MWh	0.22359 MT CO ₂ e/MWh	640
Wastewater Generation	N/A	N/A	19,867
Process Nitrous Oxide Emissions	40 MT N ₂ O	1 N ₂ O to 298 CO ₂ e	11,780
Stationary Methane Emissions	32 MT CH ₄	1 CH ₄ to 25 CO ₂ e	804
Electricity Emissions	32,640 MWh	0.22359 MT CO ₂ e/MWh	7,298
			29,474

MWh = megawatt hours; MT = metric tons; CO₂e = carbon dioxide equivalent; CH₄ = methane; N₂O = nitrous oxide

Figure 4 Wastewater Methodology

Equation WW.13_{CH4} Attributed CH₄ Emissions		
<i>Attributed CH₄ Emissions = P/P_{tot} * E</i>		
Where:		
Description		Value
Attributed CH ₄ Emissions	= Annual CH ₄ credited to the community (mtCO ₂ e)	Result
P	= Population of community served by the given WWTP	User input
P _{tot}	= Total population the WWTP serves	User input
E	= Total CH ₄ produced by WWTP (mtCO ₂ e)	User input
Source: Developed by ICLEI Staff and Wastewater Technical Advisory Committee		

3.4 Solid Waste

GHG emissions result from management and decay of organic material solid waste. The Community Protocol provides multiple accounting methods to address both emissions arising from solid waste generated by a community (regardless of where it is disposed of) as well as emissions arising from solid waste disposed of inside a community’s boundaries (regardless of where it was generated). GHG emissions from the decomposition of organic material in this sector are broken down into two parts:

- Community Waste - Lifetime methane emissions from solid waste generated by the community in the year of the inventory, using Community Protocol method SW.4³⁴. This methodology attributes 100 percent of lifetime GHG emissions from the tonnage reported in the inventory year.
- Waste-in-Place - Methane emissions from existing solid waste-in-place at landfills located within the community limits using Community Protocol method SW.1³⁵. This methodology attributes just the GHG emissions emitted in the inventory year based on the total lifetime tonnage in the landfill.

Due to the slow rate of emissions generation associated with decomposition of solid waste, this two-pronged approach also allows policy makers to target solid waste activity in a particular year, similar to other sectors (e.g., fuel combustion resulting in immediate emissions). Accounting for both of these sources may lead to some double counting in the waste sector as any waste counted in the total tonnage for the year, but also put in the City's in-boundary landfill would be counted twice. However, the City's in-boundary landfills are now closed and both methodologies convey different aspects of the solid waste emissions profile and are included for consistency with previous inventories. All emissions from vehicular transport of solid waste are included in the transportation emissions sector.

Two landfills are located within the city; therefore, solid waste emissions were estimated using both SW.1 to calculate the in-boundary landfill emissions and SW.4 to calculate the full methane commitment of solid waste generated by Sacramento in 2016. A summary of waste emissions is provided in Table 17.

Table 17 Summary of Solid Waste Emissions for Year 2016

Source	Activity Data (tons)	Emission Factor	Total Emissions (MT CO ₂ e)
Waste-in-Place	N/A	N/A	26,504
28th Street Landfill	N/A	N/A	12,027
L & D Landfill	N/A	N/A	14,478
Waste Disposal	525,968	0.2554 MT CO₂e/ton	134,339
Total Waste Emissions			160,843

MT CO₂e = metric tons of carbon dioxide equivalent

Waste-in-Place

As a primary data source for waste-in-place emissions, the Community Protocol recommends utilizing data reported from the United States Environmental Protection Agency (USEPA) in accordance with the GHG Mandatory Reporting Rule (MRR; 40 Code of Federal Regulations [CFR] §98). If the facilities are not subject to the USEPA MRR, then the alternate approach SW.1.1 should be used. Method SW.1.1 estimates emissions based on the first order decay (FOD) model and the waste-in-place in the landfill and is summarized in Figure 5. The FOD model is an exponential equation which estimates the amount of landfill gas generated in a municipal solid waste landfill based upon the amount of municipal solid waste in the landfill (or "waste-in-place") at the point of time for which landfill gas generation is to be estimated, the capacity of that waste to generate

³⁴ <https://icleiusa.org/publications/us-community-protocol/>

³⁵ <https://icleiusa.org/publications/us-community-protocol/>

methane and a methane generation rate constant which describes the rate at which municipal solid waste in the landfill is expected to decay and produce landfill gas.

Figure 5 Waste-in-Place Methodology

Equation SW.1.1 Alternate Method – Methane Emissions from Landfills		
<i>Annual fugitive CH₄ emissions =</i>		
<i>Comprehensive LFG Collection: ((TMMG*LFGE)*(Ox))</i>		
<i>Partial or No LFG Collection: ((TMMG*(1-%LF)*Ox)+((TMMG*%LF*LFGE)*(Ox)))</i>		
Where:		
Term	Description	Value
Annual CH ₄ emissions	= Total annual fugitive landfill CH ₄ emitted (mtCO ₂ e)	Result
TMMG	= Total modeled CH ₄ generated	User Input
OX*	= Account for 10% oxidation rate	(1-.10)
% LF	= Percent of landfill covered by gas collection	User Input
LFGE	= Account for 75% LFG collection efficiency	(1-.75)
Source: 40 CFR 98, Subpart HH, and 40 CFR 60, Subpart WWW		
* If using the California ARB Landfill Emissions Tool oxidation has already been incorporated into landfill outputs therefor you do not have to multiply by 0.9.		

The Community Protocol recommends reviewing the Landfill Methane Outreach Program (LMOP) maintained by the USEPA as the first source of emissions verification for landfills.³⁶ As of 2016, no emissions from the 28th Street Landfill or L&D Landfill were reported to LMOP,³⁷ therefore, a FOD modeling tool developed by CARB and recommended by ICLEI was utilized.³⁸ The FOD model outputs emissions in methane and carbon dioxide. However, only methane emissions were accounted for as the carbon dioxide is considered biogenic in origin and not recommended for inclusion per the Community Protocol. Results of the model runs for both 28th Street Landfill and L&D Landfill can be found in the attached documentation and Table 18. A collection efficiency of 75 percent was applied per the Community Protocol for landfills with methane capture. Fugitive methane emissions from existing waste at the L&D and 28th Street landfills were calculated to be 26,504 MT CO₂e in 2016. Annual waste-in-place emissions decreased by 23,416 MT CO₂e from 2005 to 2016 due to the amount of waste remaining in the now closed landfills as modeled by the FOD modeling tool.

³⁶ United States Environmental Protection Agency. 2016. Landfill Methane Outreach Program. Accessed at: <https://www.epa.gov/lmop/project-and-landfill-data-state>. Accessed on: May 15, 2019

³⁷ United States Environmental Protection Agency. 2016. Greenhouse Gas Reporting Program. Accessed at: <https://www.epa.gov/ghgreporting>. Accessed on: May 15, 2019

³⁸ California Air Resources Board. Local Government Operations Protocol for Greenhouse Gas Assessments. Accessed at: <https://ww3.arb.ca.gov/cc/protocols/localgov/localgov.htm>. Accessed on: May 20, 2019

Table 18 Waste-in-Place Summary for Year 2016

Sector	28th Street Landfill Emissions (MT CO₂e)	L&D Landfill Emissions (MT CO₂e)
Methane generated	48,107	57,910
Methane captured (removed) at landfill	-36,080	-43,432
Subtotal Waste-in-Place Emissions	12,027	14,478
Total Waste-in-Place		26,504

MT CO₂e = metric tons of carbon dioxide equivalent

Community Generated Waste

While communities may want to understand the GHG emissions from landfills located within their boundaries (SW.1.1), they are required to estimate the emissions resulting from waste disposed by the community (SW.4.1), regardless of whether the receiving landfill(s) are located inside or outside of the community boundary.³⁹

Community Protocol Method SW.4.1 is summarized in Figure 6, utilizing mass of waste being disposed, organic content of waste, methane capture ability of the landfill, oxidation rate, and methane GWP. The 2016 emissions factor for generated waste in Sacramento was derived from the 2014 CalRecycle State Waste Characterization Study shown in Table 19.

³⁹ <https://icleiusa.org/publications/us-community-protocol/>

Figure 6 Waste Generation Methodology

Equation SW.4.1 Methane Emissions		
$CH_4 \text{ Emissions} = GWP_{CH_4} * (1 - CE) * (1 - OX) * M * \sum_i P_i * EF_i$		
Where:		
Term	Description	Value
CH ₄ emissions	= Community generated waste emissions from waste M (mtCO ₂ e)	Result
GWP _{CH₄}	= CH ₄ global warming potential	
M	= Total mass of waste entering landfill (wet short ton)	User Input
P _i	= Mass fraction of waste component i	User Input
EF _i	= Emission factor for material i (mtCH ₄ /wet short ton)	Table SW.5
CE	= Default LFG Collection Efficiency	No Collection, 0 Collection, 0.75
OX	= Oxidation rate	0.10
Source: As developed by ICLEI staff and Solid Waste Technical Advisory Committee. Emissions factors from U.S. EPA Municipal Solid Waste Publication (2008) available at http://www.epa.gov/epawaste/nonhaz/municipal/pubs/msw2008data.pdf		

In 2016, Sacramento produced 525,968 tons of waste.⁴⁰ A CO₂e emissions factor for mixed-waste of 0.2554 MT CO₂e/ton was established and multiplied by the total waste disposed of from the community to calculate emissions from waste generated in 2016 of 134,339 MT CO₂e. This emission factor includes the expected lifetime emissions associated with the specified tonnage of waste sent to landfill. The emissions factor was developed using SW 4.1 as well as the relative waste stream percentages of different organic materials as shown in Table 19 to establish a methane emissions factor. The efficiency capture used was 75 percent, which was an update from previous inventories which relied on a regional average (42 percent) from the 2005 inventory. CalRecycle and USEPA LMOP data allow for more precise tracking of waste destination and methane capture ability and the majority of Sacramento’s waste in 2016 was transported to L & D Landfill in Sacramento, Kiefer Landfill in Sloughouse, and Forward Landfill in Manteca, all of which operate landfill gas capture programs.⁴¹ From 2005 to 2016 GHG emissions from community waste decreased by 270,963 MT of CO₂e. This was due to a combination of factors including a reduced emission factor due to installation of methane capture programs at landfills as well as an overall reduction in waste generation of 158,120 tons.

⁴⁰ Waste tonnage and destinations from <https://www2.calrecycle.ca.gov/LGCentral>. Accessed on: May 20, 2019

⁴¹ Landfill gas capture program data verified from <https://www.epa.gov/lmop/project-and-landfill-data-state>. Accessed on: May 20, 2019

Table 19 CalRecycle 2014 Waste Characterization Factor

Waste Type	WIPFRAC	TDOD	DANF	ANDOC	Weighted CH ₄ /ton	Weighted MT CO ₂ e/ton
Newspaper	1.44%	47.09%	15.05%	0.117%	0.000143208	0.003580198
Office Paper	0.73%	38.54%	87.03%	0.617%	0.000344557	0.00861393
Corrugated Boxes	3.13%	44.84%	44.25%	0.952%	0.000872251	0.021806282
Coated Paper	12.10%	33.03%	24.31%	0.721%	0.001366096	0.034152408
Food	18.12%	14.83%	86.52%	1.990%	0.00326912	0.081728001
Grass	1.84%	13.30%	47.36%	0.120%	0.000163279	0.004081975
Leaves	3.52%	29.13%	7.30%	0.069%	0.00010509	0.002627254
Branches	3.27%	44.24%	23.14%	0.200%	0.000470807	0.011770174
Lumber	11.91%	43.00%	23.26%	1.451%	0.00167506	0.041876495
Textiles	5.85%	24.00%	50.00%	0.656%	0.000986758	0.024668962
Diapers	4.29%	24.00%	50.00%	0.520%	0.000723544	0.018088588
Construction/Demolition	2.31%	4.00%	50.00%	0.110%	6.48827E-05	0.001622068
Medical Waste	0.11%	15.00%	50.00%	0.000%	1.19281E-05	0.000298201
Sludge/Manure	0.57%	5.00%	50.00%	0.001%	1.991E-05	0.000497751
MSW Total					0.010216492	0.255412288

WIPFRAC = fraction of waste in waste-in-place; TDOD = total degradable organic carbon; DANF = decomposable anaerobic fraction; ANDOC = anaerobically degradable organic carbon; CH₄ = methane; MT CO₂e = metric ton of carbon dioxide equivalent

4 Forecast

A baseline inventory (i.e., the City of Sacramento’s 2016 inventory) sets a reference point for a single year. However, annual emissions change over time due to external factors such as population and job growth. An emission’s forecast accounts for projected growth and presents an estimate of GHG emissions in a future year. Calculating the difference between the GHG emissions forecast and the reduction targets set by the City determines the gap to be closed through City Climate Action Plan policies. This section quantifies the reduction impact State regulations will have on the City of Sacramento’s forecast and presents the results in an *adjusted scenario* forecast. The *adjusted scenario* incorporates the impact of State regulations which would reduce the City of Sacramento’s GHG emissions to provide a more accurate picture of future emissions growth and the responsibility of the City and community for GHG reductions once State regulations to reduce GHG emissions have been implemented.

Several indicator growth rates were developed and applied to the various emissions sectors to forecast emissions as shown in Table 22. The growth rates were applied to the most recent inventory year (2016) data to obtain projected activity data (e.g., energy use, waste production). Growth rates were developed from the 2035 Sacramento General Plan population and job forecasts, EMFAC Modeling, and Department of Finance population forecasts for Sacramento County. Applicable State and federal regulatory requirements, including Corporate Average Fuel Economy standards, Advanced Clean Car Standards, Renewable Portfolio Standard, and Title 24 efficiencies were then incorporated to accurately reflect expected reductions from State programs.

As the City of Sacramento General Plan Update is completed, population forecasts will shift. Therefore, the forecast presented in Section 4.1 may be updated over the course of the project to be consistent with the General Plan Update. To deal with these changes, a “model” has been developed which allows for these variables to be easily adjusted as changes occur.

4.1 Forecast Results Summary

Overall emissions in Sacramento are forecast to decrease 35 percent by 2045 under existing programs and regulations (Adjusted Forecast) as shown in Table 20. The adjusted forecast emissions reductions are due to SB 100 requiring 100 percent GHG-free electricity in 2045, electricity-related emissions are expected to reduce to zero. Transportation, natural gas, and waste emissions are expected to constitute the majority of emissions by 2045.

Table 20 Summary of BAU Forecast and Legislative Reductions by Year

	2020	2025	2030	2040	2045
Emissions Forecast	Emissions (MT CO ₂ e)	Emissions (MT CO ₂ e)	Emissions (MT CO ₂ e)	Emissions (MT CO ₂ e)	Emissions (MT CO ₂ e)
Business-as-usual forecast	3,558,871	3,726,548	3,894,225	4,203,918	4,342,257
Reduction from State measures	344,615	780,096	1,190,660	1,775,373	2,114,935
Adjusted Forecast	3,214,256	2,946,452	2,703,565	2,428,545	2,227,322

MT CO₂e = metric tons of carbon dioxide equivalent

Waste emissions will likely be lower than the current forecast due to SB 1383 and the requirements for a statewide 75 percent reduction in organic materials being sent to landfill by 2025. Due to the uncertainty of how these requirements will be enacted within the city of Sacramento, the modeling of the change in emissions from SB 1383 was not included and waste-reduction measures identified in the Climate Action Plan will be credited to the City.

As shown in Table 21, State regulations will reduce community GHG emissions substantially by 2045. However, a substantial gap remains between the adjusted scenario and the targets discussed in Section 5. The required reductions to close the gap will come from existing and newly identified GHG reduction measures included in this and future iterations of the Sacramento Climate Action Plan.

Table 21 Adjusted Absolute and Per Capita Emissions Forecast

Year	Population	Absolute Emissions (MT CO ₂ e)	Per Capita Emissions (MT CO ₂ e/person)
2016	472,692	3,424,729	7.2
2020	507,587	3,214,256	6.3
2025	551,206	2,946,452	5.3
2030	594,824	2,703,565	4.5
2040	668,786	2,428,545	3.6
2045	697,764	2,227,322	3.2

MT CO₂e = metric tons of carbon dioxide equivalent

4.2 Business-as-Usual Forecast

The City of Sacramento business-as-usual scenario forecast provides an estimate of how GHG emissions would change in the forecast years if consumption trends continue as in 2016, absent any new regulations which would reduce local emissions. Several indicator growth rates were developed from 2016 activity levels and applied to the various emissions sectors to project future year emissions. Table 22 contains a list of growth factors used to develop the business-as-usual scenario forecast, with a summary of the results in Table 23. The BAU growth factors were then multiplied by the population or service person growth rates to develop the BAU emissions forecast.

Table 22 Business-as-Usual Growth Factors

Sector	Activity Data
Emissions per capita (MT CO ₂ e/capita)	7.25
Residential electricity per capita (kWh/capita)	3,011
Commercial electricity use per job (kWh/employment)	7,098
Residential gas per capita (therm/capita)	127
Commercial gas use per job (therm/job)	93.9
Industrial gas per job (therm/job)	11.1
Per job industrial gas use (therm)	11.1
Waste per service person (tons/SP)	0.67
Per service pop WW GHG (MT CO ₂ e)	0.0254
CO ₂ e per ton waste (MT CO ₂ e/ton)	0.306
Water electricity per service person (kWh/SP)	55.0
Water emissions per capita (MT CO ₂ /capita)	0
Total VMT per service person (VMT/SP)	5,563

kWh = kilowatt hour; SP = service person (sum of population and employment) MT CO₂e = metric tons of carbon dioxide equivalent; VMT = vehicle miles traveled

Under the business-as-usual forecast scenario, the City of Sacramento's GHG emissions are projected to continue increasing through 2045 as shown in Table 23. This increase is led primarily by a strong commercial and residential development trend. After the current General Plan horizon year of 2035, major increases in in emissions are largely attributed to the increased population and vehicular traffic from the greater Sacramento County Area traveling into the city. By 2045, the City is expected to produce 4,393,112 MT CO₂e under business-as-usual projections, an increase of 42 percent over 2016 emissions.

Table 23 Business-as-usual Forecast by Sector

Sector	2020	2025	2030	2040	2045
	Emissions (MT CO ₂ e)	Emissions (MT CO ₂ e)	Emissions (MT CO ₂ e)	Emissions (MT CO ₂ e)	Emissions (MT CO ₂ e)
Residential Electricity	341,770	371,140	400,509	450,309	469,821
Commercial & Industrial Electricity	515,632	547,740	579,848	641,041	668,817
Residential Gas	341,801	371,174	400,546	450,350	469,864
Commercial & Small Industrial Gas	181,037	192,310	203,584	225,068	234,820
Waste	171,357	184,500	197,643	220,803	230,371
Water	10,235	11,020	11,805	13,188	13,759
Wastewater	21,166	22,789	24,412	27,273	28,455
Transportation	1,975,873	2,025,876	2,075,879	2,175,885	2,277,215
Total Emissions	3,558,871	3,726,548	3,894,225	4,203,918	4,393,122
Per Capita Emissions (MT CO₂e/person)	7.01	6.76	6.55	6.29	6.30

MT CO₂e = metric tons of carbon dioxide equivalent

4.3 State Legislation

The adjusted scenario estimates future City of Sacramento emissions under codified GHG reduction strategies currently being implemented at the State and federal level. The 2017 Scoping Plan Update identified several existing State programs and targets, or known commitments required by statute which can be assumed to achieve GHG reductions without City action, such as increased fuel efficiency standards of mobile vehicles. The following known commitments are factored into the adjusted scenario projection and a summary of the programs can be found in Table 24.

The largest GHG reductions realized by State programs in Sacramento will occur from the increasing decarbonization of the electricity supply due to SB 100 and the Renewable Portfolio Standard (RPS), avoiding over 1,000,000 MT CO₂e by 2045. The transportation sector will also experience over 975,000 MT CO₂e by 2045 through State and federal fuel efficiency and tailpipe emissions standards.

Table 24 Summary of Legislative Reductions

Legislation	2020 Emissions (MT CO ₂ e)	2025 Emissions (MT CO ₂ e)	2030 Emissions (MT CO ₂ e)	2040 Emissions (MT CO ₂ e)	2045 Emissions (MT CO ₂ e)
Senate Bill 100	140,172	269,898	437,139	803,480	1,033,535
Title 24	6,127	36,764	67,400	122,084	145,049
Transportation (Pavley, etc.)	198,315	473,434	686,121	849,810	936,351
Total	344,615	780,096	1,190,660	1,775,373	2,114,935

MT CO₂e = metric tons of carbon dioxide equivalent

Transportation Legislation

The CARB EMFAC2017 transportation modeling program incorporates legislative requirements and regulations including Advanced Clean Cars program (Low Emissions Vehicles III, Zero Emissions Vehicles program, etc.), and Phase 2 federal GHG Standards. Signed into law in 2002, AB 1493 (Pavley Standards) required vehicle manufactures to reduce GHG emissions from new passenger vehicles and light trucks from 2009 through 2016, with a target of 30 percent reductions by 2016, while simultaneously improving fuel efficiency and reducing motorists' costs.⁴²

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 (the Advanced Clean Cars 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 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. The new standards will reduce Californian GHG emissions by 34 percent in 2025.⁴³

⁴² California Air Resources Board. Clean Car Standards – Pavley, Assembly Bill 1493. May 2013.

⁴³ California Air Resources Board. Facts About the Advanced Clean Cars Program. December 2011. Accessed at: http://www.arb.ca.gov/msprog/zevprog/factsheets/advanced_clean_cars_eng.pdf. Accessed on: May 20, 2019

Reductions in GHG emissions from the above referenced standards were calculated using the CARB EMFAC2017 model for Sacramento County. The EMFAC2017 model integrates the estimated reductions into the mobile source emissions portion of the model.⁴⁴

Title 24

Although it was not originally intended to reduce GHG emissions, California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was 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. Starting in 2020, new residential developments will include on-site solar generation and near-zero net energy use. For projects implemented after January 1, 2020, the California Energy Commission estimates the 2019 standards will reduce consumption by seven percent for residential buildings and 30 percent for commercial buildings, relative to the 2016 standards. These percentage savings relate to heating, cooling, lighting, and water heating only and do not include other appliances, outdoor lighting not attached to buildings, plug loads, or other energy uses. The calculations and GHG emissions forecast assume all growth in the residential and commercial/industrial sectors is from new construction.

The 2017 Scoping Plan Update calls for the continuation of ongoing triennial updates to Title 24 which will yield regular increases in the mandatory energy and water savings for new construction. Future updates to Title 24 standards for residential and non-residential alterations past 2023 are not taken into consideration due to lack of data and certainty about the magnitude of energy savings realized with each subsequent update.

Renewables Portfolio Standard & Senate Bill 100

Established in 2002 under SB 1078, enhanced in 2015 by SB 350, and accelerated in 2018 under SB 100, California's 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.

SMUD provides electricity in Sacramento and is subject to the RPS requirements. SMUD forecast emissions factors include reductions based on compliance with RPS requirements through 2045. In 2016, SMUD reported an emissions factor of 492.95 pounds CO₂e per MWh.

Assembly Bill 939 & Assembly Bill 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 (also

⁴⁴ Additional details are provided in the EMFAC2017 Technical Documentation, July 2018. Accessed at: <https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf>. Accessed on: May 20, 2019. 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 emissions estimates.

known as 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, actions beyond the projected waste diversion target of 5.9 pounds per person per day set under AB 939 for the City of Sacramento will be quantified and credited to the City during the Climate Action Plan measure development process. As of 2016, Sacramento is meeting both the 5.9 pounds per person per day and 9.5 pounds per job per day diversion targets set by CalRecycle under AB 341.

Senate Bill 1383

SB 1383 established a methane emissions reduction target for short-lived climate pollutants in various sectors of the economy, including waste. 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 2025.⁴⁵ 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 has proven difficult. For example, Santa Clara County suggests 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.⁴⁶ As such, SB 1383 is not included as part of the adjusted forecast. Instead measures addressing compliance with SB 1383 will be addressed through newly identified GHG reduction measures included in the Climate Action Plan.

4.4 Adjusted Scenario Forecast

The adjusted scenario is based on the same information as the business-as-usual scenario but also includes the legislative actions and associated emissions reductions occurring at the State and federal levels. These actions include regulatory requirements to increase vehicle fuel efficiency or standards to reduce the carbon intensity of electricity. The difference between the emissions projected in the adjusted scenario and the GHG reduction targets established for each horizon year is the amount of GHG reductions which are the responsibility of the City. This “gap analysis” provides the City with the total GHG emissions reduction required as well as information on the emissions sectors and sources which have the most GHG reduction opportunities.

The electricity and water/wastewater sectors all experience a strong downward trend, approaching near-zero in 2045 due to extremely stringent RPS from SB 100. Natural gas emissions are expected to continue an upward trajectory until the 2035 due to strong population growth projections in the city. This trend is partially offset due to the increasingly stringent efficiency requirements for new homes in the upcoming Title 24 code cycles. Commercial growth will also lead commercial natural gas emissions on a similar trajectory. Transportation emissions are expected to decrease sharply in the next 10 to 15 years due to existing fuel efficiency requirements and fleet turnover rates. As most current regulations expire in 2025 or 2030, emissions standards will experience diminishing returns while VMT continues to increase, leading to lower rates of emissions reduction in the transportation sector.

⁴⁵ CalRecycle. April 16, 2019. Short-Lived Climate Pollutants (SLCP): Organic Waste Methane Emissions Reductions (General Information). Accessed at: <https://www.calrecycle.ca.gov/climate/slcp>. Accessed on: May 20, 2019

⁴⁶ Santa Clara County. June 20, 2018. SB 1383 Rulemaking Overview. Accessed at: <https://www.sccgov.org/sites/rwr/rwrc/Documents/SB%201383%20PowerPoint.pdf>. Accessed on: May 20, 2019

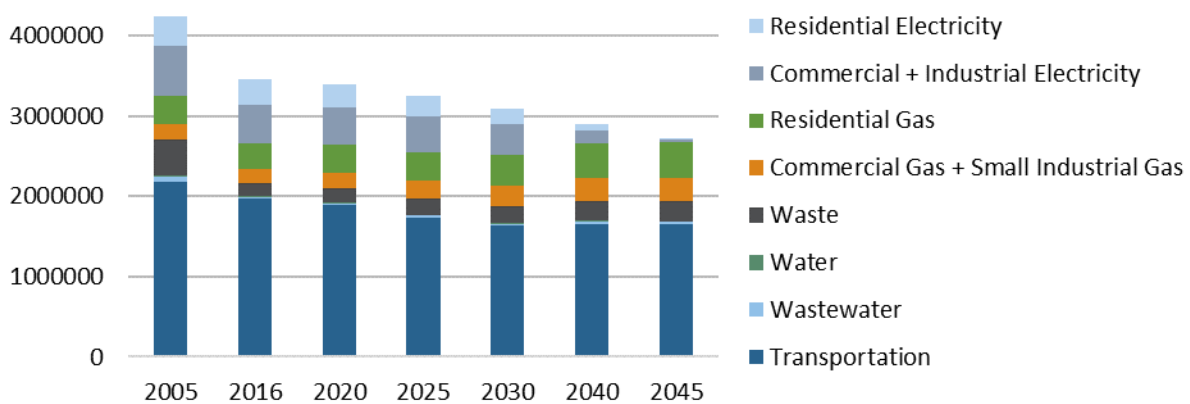
A summary of Sacramento’s projected emissions by sector and year through 2045 can be found in Figure 7 and Table 25. Further details on the growth rates and emissions for each sector can be found in the corresponding discussion sections.

Table 25 Adjusted Scenario Forecast Summary by Sector by Target Year

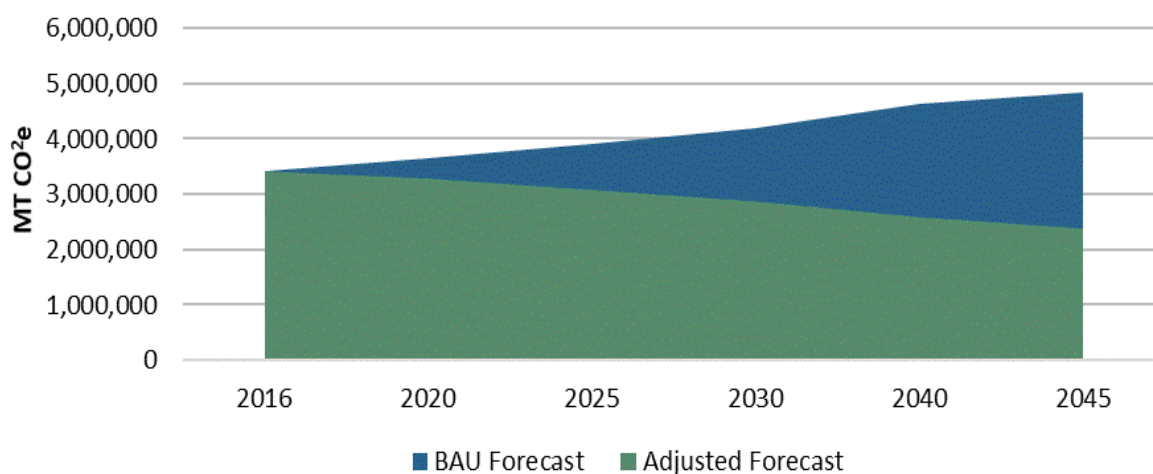
Sector	2016 Emissions (MT CO ₂ e)	2020 Emissions (MT CO ₂ e)	2025 Emissions (MT CO ₂ e)	2030 Emissions (MT CO ₂ e)	2040 Emissions (MT CO ₂ e)	2045 Emissions (MT CO ₂ e)
Population	472,692	507,587	551,206	594,824	668,786	697,764
Jobs	308,724	324,910	345,142	365,374	403,933	421,435
Residential Electricity	318,275	283,625	246,723	195,341	77,934	0
Commercial/ Industrial Electricity	489,945	430,228	375,327	297,950	120,298	0
Residential Gas	318,304	341,390	368,706	396,022	442,341	460,488
Commercial + District Industrial Gas	172,019	180,361	188,252	196,143	211,183	218,009
Waste	160,843	171,357	184,500	197,643	220,803	230,371
Water	9,607	8,572	7,714	6,296	2,638	0
Wastewater	19,867	21,166	22,789	24,412	27,273	28,455
Transportation	1,935,870	1,777,557	1,552,442	1,389,757	1,326,075	1,319,471
Total Emissions	3,424,729	3,214,256	2,946,452	2,703,565	2,428,545	2,256,794
Per Capita Emissions (MT CO₂e/person)	7.25	6.33	5.35	4.55	3.63	3.23

MT CO₂e = metric tons of carbon dioxide equivalent

Figure 7 Summary of Adjusted Scenario Forecast by Sector by Year



As shown in Figure 8, without legislative reductions, the City’s emissions would increase proportionally with population and economic growth. In reality, several existing legislative reductions would limit the City’s emissions growth, causing projected emissions to decrease. This scenario is depicted by the Adjusted Forecast. The legislative reductions for each sector and scaling methods used to project emissions are discussed in detail below.

Figure 8 BAU Scenario and Adjusted Scenario Forecast

4.5 Electricity

Between 2016 and 2045, electricity emissions for commercial, residential, and industrial buildings in the city of Sacramento, together representing the building energy electricity sector, are assumed to decrease from 808,220 MT CO₂e to 0 MT CO₂e, despite steady growth in Sacramento's population and employment levels due to the adoption of SB 100 and the renewable portfolio standard. SMUD's current plan to reach carbon neutral electricity includes the use of offsets. These offsets have not been identified fully and future work will need to ensure no double counting occurs between SMUD and Sacramento's efforts to reach carbon neutral emissions.

Emissions from future electricity use were forecasted by projecting anticipated growth in residential and commercial sectors and multiplying by expected electricity emission factors. Anticipated growth in the residential sector was projected as a function of population growth within the city while commercial sector electricity use was projected as a function of employment projections. Legislative adjustments included in the electricity sector forecast include RPS of 60 percent by 2030 and 100 percent GHG-free by 2045. Additionally, Title 24 building code efficiency increases for the 2019 code cycle were applied to all new growth within the city. The methodologies for the electricity sector which were forecasted in the adjusted scenario are summarized in Table 26 and Table 27.

Table 26 Electricity Sector Adjusted Scenario Forecast Methodology

Source Category	Forecasted Activity Data (Scaling Factor)	Emission Factor	Applied Legislative Reductions
Residential Electricity	Population growth in Sacramento	Assumes an electricity mix of 44 percent, 60 percent, and 100 percent GHG-free by 2025, 2030, and 2045, respectively, for SMUD emission factors per RPS requirements.	Title 24 standards for new construction in 2019 (53 percent residential, 30 percent commercial), RPS requirements
Commercial & Industrial Electricity	Employment growth in Sacramento		

RPS = Renewable Portfolio Standard; GHG = greenhouse gas; SMUD = Sacramento Municipal Utility District

Table 27 Electricity Adjusted Scenario Forecast Results by Target Year

Activity Data	2020	2025	2030	2040	2045
Residential Electricity					
Population	507,587	551,206	594,824	668,786	697,764
BAU per capita kWh	3,011.30	3,011.30	3,011.30	3,011.30	3,011.30
BAU total kWh	1,528,498,898	1,659,848,041	1,791,197,185	2,013,918,450	2,101,180,304
Adjusted kWh (Title 24)	1,514,575,889	1,576,309,986	1,638,044,083	1,742,723,078	1,783,736,149
Emissions factor (MT CO ₂ e/MWh)	0.18726	0.15652	0.11925	0.04472	0.0
Emissions (MT CO₂e)	283,625	246,723	195,341	77,934	0
Commercial Electricity					
Employment	324,910	345,142	365,374	403,933	421,435
BAU per job kWh	7,097.54	7,097.54	7,097.54	7,097.54	7,097.54
BAU total kWh	2,306,059,234	2,449,657,395	2,593,255,556	2,866,927,114	2,991,149,311
Adjusted kWh (Title 24)	2,297,443,344	2,397,962,057	2,498,480,770	2,690,050,860	2,777,006,398
Factor (MT CO ₂ e/MWh)	0.18726	0.15652	0.11925	0.04472	0.00000
Emissions (MT CO₂e)	430,228	375,327	297,950	120,298	0
MT CO ₂ e = metric ton of carbon dioxide equivalent; kWh = kilowatt hour; MWh = megawatt hour; BAU = business-as-usual					

4.6 Natural Gas

Emissions from projected natural gas use were forecast using a similar methodology to the electricity sector. Anticipated natural gas use was projected for the residential and commercial sectors separately using population change and employment increase as growth indicators respectively. These results were multiplied by a natural gas emission factor of 0.00531 MT CO₂e per therm of natural gas.⁴⁷ Unlike electricity, the natural gas emission factor is based on the quality of the gas and remains relatively constant over time. This analysis did not consider any shift to renewable gas which may become more common over time and the use of which may affect future natural gas emission factors. The methodologies and data used to calculate natural gas emissions over time are summarized in Table 28 and Table 29.

Legislative adjustments applied for the natural gas sector include efficiency increases from Title 24 building code updates for new construction after the 2019 code cycle begins. Specific efficiency increases for new buildings over the previous triennial cycle are discussed in Section 4.3.

⁴⁷ The Climate Registry. 2016 Default Emissions Factors. Accessed at: <https://www.theclimateregistry.org/wp-content/uploads/2014/11/2016-Climate-Registry-Default-Emission-Factors.pdf>. Accessed on May 20, 2019

Table 28 Natural Gas Adjusted Scenario Forecast Methodology

Source Category	Forecasted Activity Data (Scaling Factor)	Emission Factor	Applied Legislative Reductions
Residential Natural Gas	Population growth in Sacramento	0.00531 MT CO ₂ e/therm	Title 24 standards for efficiency in new construction in 2019 (7 percent residential, 30 percent commercial over 2016 Title 24)
Commercial & District Natural Gas	Employment growth in Sacramento		

MT CO₂e = metric ton of carbon dioxide equivalent

Table 29 Natural Gas Adjusted Scenario Forecast Results by Target Year

Activity Data	2020	2025	2030	2040	2045
Residential Gas					
BAU therms	64,405,311	69,939,880	75,474,449	84,859,102	88,535,995
Title 24 adjusted therms	64,327,827	69,474,976	74,622,125	83,349,853	86,769,363
Factor (MT CO ₂ e/therm)	0.00531	0.00531	0.00531	0.00531	0.00531
Emissions (MT CO₂e)	341,390	368,706	396,022	442,341	460,488
Commercial Gas					
BAU therms	34,112,675	36,236,869	38,361,064	42,409,385	44,246,958
Title 24 adjusted therms	33,985,224	35,472,160	36,959,095	39,792,920	41,079,221
Factor (MT CO ₂ e/therm)	0.00531	0.00531	0.00531	0.00531	0.00531
Emissions (MT CO₂e)	180,361	188,252	196,143	211,183	218,009

MT CO₂e = metric ton of carbon dioxide equivalent; BAU = business-as-usual

4.7 Waste

The forecast used a baseline emissions rate of 0.7458 tons of waste per service population along with projected growth in Sacramento service population to establish the estimated tonnage of waste being disposed yearly through 2045. As the inventoried waste emissions include both waste-in-place and waste generation, an emissions factor of MT CO₂e per ton of waste was used to forecast emissions. An overall 2016 solid waste emissions factor, incorporating both generated waste and waste-in-place emissions, of 0.3058 MT CO₂e per ton of municipal solid waste was used to project emissions consistent with service population growth. Emissions from the waste sector will likely be less than the projected totals due to decreasing rates of organic material in the waste stream and recent legislation such as SB 1383 discussed in previous sections. At this time no mandate exists for individual cities and the waste reductions from these bills are incorporated into the Climate Action Plan through City reduction measures to avoid double counting. A summary of the methodologies and data used to model waste emission over time are provided in Table 30 and Table 31.

Table 30 Solid Waste Adjusted Scenario Forecast Methodology

Forecasted Activity Data (Scaling Factor)	Emission Factor	Applied Legislative Reductions
Service population growth	0.7458 tons per service person, 0.3058 MT CO ₂ e/ton of solid waste	N/A

MT CO₂e = metric ton of carbon dioxide equivalent; N/A = not applicable

Table 31 Waste Emissions Adjusted Scenario Forecast Results by Target Year

Activity Data	2020	2025	2030	2040	2045
Service Population	832,497	896,347	960,198	1,072,719	1,119,199
Ton waste per Service Population	0.6731	0.6731	0.6731	0.6731	0.6731
Total tons waste	560,350	603,328	646,306	722,043	753,328
Waste Factor (MT CO ₂ e/ton)	0.3058	0.3058	0.3058	0.3058	0.3058
Emissions (MT CO₂e)	171,357	184,500	197,643	220,803	230,371

MT CO₂e = metric ton of carbon dioxide equivalent

4.8 Transportation

Transportation emissions forecasts were developed consistent with the inventory methodology, through the determination of on-road annual VMT multiplied by a year-specific weighted emissions factor for emissions per mile travelled. VMT forecasts for the City of Sacramento were provided by Fehr and Peers Transportation Consultants through the use of SACOG SACSIM software. SACSIM was utilized to model VMT through 2040 with projected annual growth in County VMT as a proxy to extrapolate VMT for the years 2040 to 2045. Emissions factors were established for each year through the use of the EMFAC2017 GHG module, which established VMT and total emissions for each vehicle type in the County. These respective emissions factors were applied in each year to establish transportation emissions forecasts as shown in Table 32 and Table 33.

Table 32 Transportation Adjusted Scenario Forecast Methodology

Source Category	Forecasted Scaling Factor	Emissions Factor	Applied Legislative Reductions
On-road Transportation	SACSIM VMT Modeling ¹	EMFAC2017 model analyzing light duty (LDA, LDT1, LDT2, MDV, MCY) and heavy duty (LHD, T6, T7, PTO, MH, SBUS, UBUS, OBUS, Motor Coach, All Other Buses) vehicles.	EMFAC emission factors account for legislative reductions from Advanced Clean Cars, Pavley Clean Car Standards, Tractor-Trailer Greenhouse Gas Regulation, and adopted fuel efficiency standards for medium- and heavy-duty vehicles.

¹ SACSIM incorporates data from many sources, including US Census, travel survey, and highway monitoring information. More information can be found on the SACOG SACSIM website at <https://www.sacog.org/modeling>

MT CO₂e = metric ton of carbon dioxide equivalent; VMT = vehicle miles traveled

Table 33 Transportation Adjusted Scenario Forecast Results by Target Year

Activity Data	2020	2025	2030	2040	2045
Population	507,587	551,206	594,824	668,786	697,764
VMT	4,436,839,519	4,549,121,999	4,661,404,480	4,885,969,442	4,999,288,804
EMFAC (MT CO ₂ e/VMT)	0.000401	0.000341	0.000298	0.000271	0.000258
Emissions (MT CO₂e)	1,777,557	1,552,442	1,389,757	1,326,075	1,289,999

MT CO₂e = metric ton of carbon dioxide equivalent; VMT = vehicle miles traveled

4.9 Water and Wastewater

Due to the increased use of the water system attributed to increases in job and population growth in Sacramento, service population was used as a scaling metric to determine water and wastewater service emissions through 2045. The Sacramento Wastewater Treatment Plant is currently undergoing renovations and upgrades through 2023 to modernize its facilities. As part of the “EchoWater Project”, future wastewater emissions are expected to be lower than quantified here due to ammonia effluent reductions.

Projections for water used a baseline activity factor of 60.92 kWh per service population per year. This emissions factor was multiplied by service population growth through 2045 to find total kWh usage. The RPS for electricity generation was then applied to water emissions, as described in the Legislative Adjustment Section, to determine final MT CO₂e emissions as shown in Table 35 and Table 36.

Wastewater emissions are calculated from both methane as well as stationary and process nitrous oxide emissions, wastewater projections used an emissions factor of 0.028 MT CO₂e per service population per year and a growth indicator of service population to determine future wastewater emissions.

Table 34 Water and Wastewater Adjusted Scenario Forecast Methodology

Forecasted Activity Data (Scaling Factor)	Emissions Factor	Applied Legislative Reductions
Service population (population and employment growth)	SMUD electricity emissions factors, 60.92 kWh per service population per year	Assumes an electricity mix of 44 percent, 60 percent, and 100 percent GHG-free by 2025, 2030, and 2045 respectively for SMUD emission factors per RPS requirements.
Service population (population and employment growth)	0.0282 MT CO ₂ e per service person per year for wastewater	N/A

MT CO₂e = metric ton of carbon dioxide equivalent; kWh = kilowatt hour; SMUD = Sacramento Municipal Utility District; N/A = not applicable

Table 35 Water Adjusted Scenario Forecast Results by Target Year

Activity Data	2020	2025	2030	2040	2045
Service Population	832,497	896,347	960,198	1,072,719	1,119,199
kwh/Service Person	54.98	54.98	54.98	54.98	54.98
Total kWh	45,772,524.85	49,283,183.92	52,793,842.99	58,980,464.53	61,536,051.96
RPS Electricity Factor (MT CO ₂ e/kWh)	0.1872638	0.1565190	0.1192526	0.0447197	0.0000000
Emissions (MT CO₂e)	8,572	7,714	6,296	2,638	0

MT CO₂e = metric ton of carbon dioxide equivalent; kWh = kilowatt hour; RPS = renewable portfolio standard

Table 36 Wastewater Adjusted Scenario Forecast Results by Target Year

Activity Data	2020	2025	2030	2040	2045
Service Population	832,497	896,347	960,198	1,072,719	1,119,199
MT CO ₂ e/Service Population	0.025	0.025	0.025	0.025	0.025
Emissions (MT CO₂e)	21,166	22,789	24,412	27,273	28,455

MT CO₂e = metric ton of carbon dioxide equivalent; kWh = kilowatt hour;

5 Target Setting

Climate action plan GHG-reduction targets can be set as either an efficiency target (MT CO₂e per capita or per service population per year) or as a community wide mass emissions target (total MT CO₂e). With CARB's publication in 2017 of the Scoping Plan Update, the State recommended using efficiency metrics for local targets to incentivize growth in a coordinated manner and not penalize cities which are growing at significant rates.⁴⁸ Throughout this section, targets are discussed in terms of per capita metrics, however, they must occasionally be translated into absolute emissions reductions to quantify reduction measures and identify the magnitude of reductions required.

Target setting is an iterative process which must be informed by the reductions that can realistically be achieved through the development of feasible GHG reduction measures. Furthermore, as mentioned previously, changes to the General Plan Update may impact the forecast results. As such, the targets identified herein should remain provisional until the General Plan Update values are finalized and the quantification and analysis of potential GHG reduction measures completed.

The City of Sacramento has achieved both efficiency and absolute emissions reductions between 2005 and 2016 despite high population growth rates. The purpose of target setting is to develop the trajectory toward achieving the State's 2030 goal and prepare for the deep decarbonization needed by 2045 in a cost-effective manner by setting an incremental path toward achieving the EO B-55-18 goals. There are several target pathways available to be consistent with State reduction goals, discussed further below.

- **SB 32 Target Pathway** is the pathway toward achieving the minimum reductions required by State law. This will require minimal reductions until 2030 and then steep reductions from 2030 to 2045.
- **Linear Carbon Neutrality Pathway** is an incremental linear pathway from current per capita emissions levels straight to carbon neutrality in 2045. This pathway is also compliant with the 2030 State goal.
- **Mass Emissions Reduction Pathway** is the pathway determined by reducing mass emissions without consideration to population growth. This pathway will require steep reductions to 2030 and then a slightly more gradual reduction to the 2045 carbon neutrality goal. This pathway is also compliant with the 2030 goal.

At this time, the State has codified a goal of reducing emissions to 40 percent below 1990 emissions levels by 2030 (SB 32) and has developed a Scoping Plan to demonstrate how the State will achieve the 2030 goal and make substantial progress toward the State's long-term GHG reduction goals. Sufficient data does not exist to perform a full 1990 inventory, however, as discussed in the Background section, the State has indicated a 15 percent reduction from 2005 GHG emissions levels can be considered equivalent to a 1990 baseline. Consistent with this methodology, a 1990 emissions level of 3,600,213 MT CO₂e, or 9.75 MT CO₂e per capita was established for Sacramento.

The State recommends utilizing a per capita efficiency metric for SB 32 targets to account for changes in population. Therefore, a minimum target of 5.85 MT CO₂e per capita (40 percent reduction from 9.75 MT CO₂e per capita in 1990) would be needed to establish an emissions level compliant with SB 32 target levels.

⁴⁸ California Air Resources Board. 2017. California's Climate Change Scoping Plan, p. 99-102.

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While no State plan exists to achieve carbon neutrality by 2045, EO B-55-18 directs CARB to ensure future Scoping Plan updates identify and recommend measures to achieve the carbon neutrality goal. Executive Orders are binding only unto State agencies and are not binding on local governments or the private sector. However, showing progress toward this goal is expected to be a mandatory component of CEQA analyses upon publication of the next Scoping Plan.

Based on this information, establishing provisional targets for the years 2025 (interim target), 2030 (SB 32 target year), 2040 (General Plan horizon year), and 2045 (EO B-55-18 target year) is recommended. The 2045 target is intended to be a long-term commitment demonstrating the City's commitment to achieving the long-term goal presented in EO B-55-18. The City has several potential pathways to show consistency with State targets as shown in Table 37.

Based on the SB32 and B-55-18 State targets, Sacramento has established a 2030 per capita GHG reduction target that exceeds the SB32 minimum and a 2045 target consistent with B-55-18. The City of Sacramento 2030 target of 3.63 MT CO₂e per person exceeds the State minimum of 5.85 and is equivalent to a 63% reduction from 1990 levels by 2030.

Table 37 Per Capita Pathway Targets by Target Year

Year	Forecast (MT CO ₂ e/person)	City of Sacramento Reduction Targets (MT CO ₂ e/person)
2020	6.3	6.0
2025	5.5	4.7
2030	4.8	3.6
2040	3.9	1.0
2045	3.4	0

MT CO₂e = metric ton of carbon dioxide equivalent

The absolute GHG emissions gap in 2030, 2040, and 2045 between each target pathway and the forecast emissions can be found in Table 38. This gap will be bridged by local actions developed in the City of Sacramento Climate Action Plan.

Table 38 Remaining GHG Emissions Gap in 2030 and 2040 by Pathway

Year	Linear Carbon Neutral Pathway (MT CO ₂ e)
2030 Gap	543,437
2040 Gap	1,708,503
2045 Gap	2,227,322

MT CO₂e = metric ton of carbon dioxide equivalent

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City of Sacramento Climate Action and Adaptation Plan

Appendix B - CAAP Regulatory Context

prepared by

Rincon Consultants, Inc.

449 15th Street, Suite 300

Oakland, California 94609

June 2022

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Regulatory Context

As the impacts of climate change are becoming clearer, strategies to address climate change are emerging at all levels of government. This section provides an overview of the regulatory context at the international, state, and local levels relative to Sacramento's actions toward reducing 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 (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. The second commitment period set new targets and other changes but has not been entered into force (meaning it has not gone into effect).²

2015 The Paris Agreement

The Paris Agreement is the first universal, legally binding global climate agreement that was adopted in 2015 and has been ratified by 191 countries worldwide.³ The Paris Agreement establishes a roadmap to keep the world under 2 degrees Celsius (°C) of warming with a goal of limiting an increase of temperature to 1.5°C. The Paris Agreement does not dictate one specific reduction target, instead relying on individual countries to set nationally determined contributions (NDCs) or reductions based on gross domestic product 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 its mitigation and adaptation strategies. By the early 2000's, California was passing climate change bills including Senate Bill (SB) 1078 and Executive Order (EO) S-3-05 which began to require state agencies and utilities to address climate change. With the passage of Assembly Bill (AB) 32 in 2006, California became the first state in the nation to mandate GHG emission reductions across its entire economy. To support AB 32, California has enacted legislation, regulations, and executive orders (EO) that put it on course to achieve robust emission reductions and address the impacts of a changing climate. The following is a summary of executive and legislative actions most relevant to the Climate Action Plan.

2002 Senate Bill 1078

In 2002, Senate Bill (SB) 1078 established the California Renewables Portfolio Standards (RPS) Program which requires that 20 percent of retail electricity sales be composed of renewable energy sources by 2017 and was accelerated in 2006 by SB 107,⁵ which requires that 20 percent of retail electricity sales be composed of renewable energy sources by 2010, instead of 2017. 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 requiring 33 percent renewable power by 2020.⁶ SB 350, discussed further below, further accelerated the program which mandated a 50% RPS by 2030.

2002 Assembly Bill 1493

In 2002, AB 1493, also known as the 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, with the regulations 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," which 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. In

⁵ California Public Utilities Commission. 2021. Renewables Portfolio Standard (RPS) Program. <https://www.cpuc.ca.gov/General.aspx?id=6442463710>

⁶ Executive Order S-14-08. <http://www.climatestrategies.us/library/library/view/292>

addition, AB 32 requires CARB to adopt regulations to require 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,⁷ and Cap-and-Trade) have been adopted since approval of the Scoping Plan.

In May 2014, CARB approved the first update to the AB 32 Scoping Plan. The 2014 Scoping Plan update defined CARB's climate change priorities for the next five years and set the groundwork to reach post-2020 statewide goals. The update highlighted California's progress toward meeting the "near-term" 2020 GHG emission reduction goals defined in the original Scoping Plan. It also evaluated how to align the state's longer-term GHG reduction strategies with other state policy priorities, including those for water, waste, natural resources, clean energy, transportation, and land use (CARB 2014).

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 SB 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), to prepare a Sustainable Communities Strategy" that contains a growth strategy to meet these emission targets for inclusion in the MPO's Regional Transportation Plan.

⁷ On September 19, 2019, the National Highway Traffic Safety Agency and the U.S. Environmental Protection Agency issued a final action entitled the One National Program on Federal Preemption of State Fuel Economy Standards Rule. This action finalizes Part I of the Safer, Affordable, Fuel-Efficient (SAFE) Vehicles Rule. This rule states that federal law preempts State and local tailpipe GHG emissions standards as well as zero emission vehicle (ZEV) mandates. The SAFE Rule withdraws the Clean Air Act waiver it granted to California in January 2013 as it relates to California's GHG and zero emission vehicle programs.

In March 2018, CARB adopted updated regional targets for reducing GHG emissions from 2005 levels by 2020 and 2035. Each region was assigned a target for 2020 and 2035.⁸

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 higher energy efficiency, better air quality, and improved daylighting. The first CALGreen Code was adopted in 2009 and has been updated in 2013, 2016, and 2019. 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 from landfill 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.

⁸ https://ww2.arb.ca.gov/sites/default/files/2020-06/SB375_Final_Targets_2018.pdf

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

EO B-30-15 was signed in 2015, 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 to provide a pathway to achieve this goal.

2016 Senate Bill 32

In September 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).

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. SB 1383 requires achievement of 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. SB 1383 further requires 20% of edible food disposed of at the time to be recovered by 2025.

2017 Scoping Plan Update

In December 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 approved legislation, 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 (CARB 2017). As stated in the 2017 Scoping Plan, these goals may be appropriate for plan-level analyses (i.e., city, county, subregional, or regional level), but not for specific individual projects because they include all emissions sectors in the state (CARB 2017).

CARB is currently developing the 2022 Scoping Plan Update, which will focus on continuing to work towards the SB 32 target and lay out a path for achieving carbon neutrality by 2045.

2018 Senate Bill 100

Adopted in September 2018, SB 100 supports the reduction of GHG emissions from the electricity sector by accelerating the state’s RPS 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

In September 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.

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City of Sacramento Climate Action and Adaptation Plan

Appendix C – Community Measures GHG Emissions Quantification

prepared by

Rincon Consultants, Inc.
449 15th Street, Suite 300
Oakland, California 94609

June 2022

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1 Introduction

The CAAP is aligned and linked to pertinent goals and policies of the 2040 General Plan. As a complementary document, the CAAP is a tool that allows the City to consider community and municipal GHG emissions, establish targets for emissions reductions, and identify and implement specific measures that reduce GHG emissions to achieve established targets and consistent with State law.

The CAAP is structured to serve as a programmatic tiering document for the purposes of CEQA, tiering from the Master Environmental Impact Report (MEIR) developed for the 2040 General Plan. For future projects that the City determines are not exempt from CEQA and are subject to environmental review (e.g., an initial study/negative declaration or an EIR is required) and that seek to streamline the review process for analysis of GHG emissions impacts, projects can achieve streamlining pursuant to the provisions of Section 15183.5 by including all applicable GHG reduction measures in this CAAP in the project designs and/or as mitigation measures in the environmental document, thus demonstrating that the project would have a cumulatively less than significant impact on the environment.

The City will ensure the appropriate use of the CAAP for CEQA streamlining by maintaining the prerogative to use mandatory and voluntary measures as standards for new developments seeking streamlining as part of the CAP consistency review process, as appropriate. The City will work with applicants seeking GHG streamlining on a project-by-project basis regarding the CEQA benefits of the CAAP, identifying measures to integrate into a project's design or mitigation measures. This approach allows the City to ensure that new development projects can benefit from CEQA streamlining while also ensuring that the City is on target to achieve the GHG reduction targets established in the CAAP.

This technical appendix provides the information pursuant to Subsection (D) which requires "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 technical appendix is organized around three levels which include:

- **Sectors:** Sectors define where the GHG reductions will take place and include Energy and Electrification, Mobility, Waste, and sequestration
 - **Measures:** Measures are core strategies that will result in substantial reductions in GHG emissions.
 - **Actions:** Each measure is driven by sets of actions that together support and generate the GHG reductions necessary to achieve the City's goal

Measures and actions can be either quantitative or supportive and are defined as follows:

Quantitative: These measures and actions have substantial evidence including case studies, calculations, or other supporting evidence that prove that the implementation of said measure/action will have a measurable GHG reduction when applied to new development projects. These measures/actions have been quantified based on this evidence and the reductions summed to show how Sacramento will meet its 2030 and 2045 goals and exceed the with the State target (SB 32) of 40 percent below 1990 levels by 2030.

Supportive: These measures and actions may also be quantifiable and in most cases have substantial evidence to support their overall contribution to GHG reductions. However, due to one or more factors including low GHG reduction benefits, indirect GHG reduction benefits, potential for double-counting of GHG reductions, or simply a high level of difficulty in quantifying accurate GHG reductions, they have not been quantified and do not contribute directly to the expected GHG reduction goal and consistency with the state targets. However, these measures/actions are critical to the overall success of the CAAP and achieving the established GHG reduction targets.

Together the quantitative and supportive measures and actions listed below will help Sacramento reduce per capita emissions from 9.75 MT CO₂e in 1990¹ to 3.63 MT CO₂e by 2030 and net zero by 2045. This equates to a 63% reduction in per capita GHG emissions by 2030. These goals exceed the minimum requirements of SB 32 (a 40% reduction or 5.85 MT CO₂e per capita in 2030) and meet the intent of Executive Order B-55-18. The total mass emissions target which corresponds to this per capita goal (based on current population projections) is 2,160,128 MT CO₂e in 2030 and carbon neutrality in 2045. To reach this goal, Sacramento will need to reduce GHG emissions by 543,437 MT CO₂e by 2030. This technical report provides the substantial evidence that CAAP measures can be expected to achieve the 2030 goal, if fully implemented, and provide substantial progress toward achieving long-term reduction targets identified in the state's Executive Order (EO) B-55-18. Making substantial progress toward these long-term state targets is important as these targets have been set at levels that achieve California's fair share of global emissions reduction targets that will stabilize global climate change effects and avoid the adverse environmental consequences described under Section 3.1.3, *Potential Effects of Climate Change* (Executive Order B-55-18).

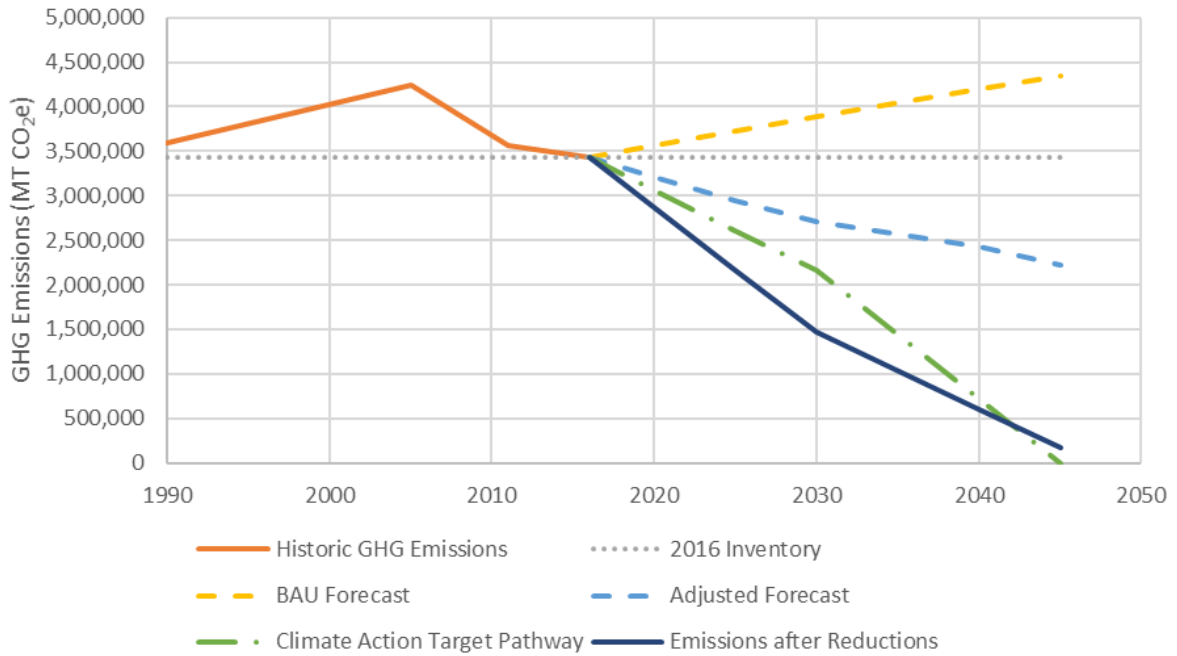
The City has also established a goal consistent with EO B-55-18 of achieving carbon neutrality by 2045. The measures identified in this CAAP will lead to a significant reduction in GHG emissions and provide a foundation for achieving net carbon neutrality. However, achieving carbon neutrality will require significant changes to the technology and systems currently in place including the electrification of all buildings and transportation systems, an increased shift to shared and active mobility, achieving carbon neutral electricity, and waste reduction and diversion. The measures and actions developed to meet the 2030 goals are the foundations and establish the trajectory for this long-term transformation. However, the 2045 GHG emissions reductions quantified in this CAAP are not yet enough to meet the long term 2045 goal. As the current measures and actions are implemented, the City will gain more information, new technologies will emerge, and current pilot projects and programs will scale to the size needed to reach carbon neutrality. Furthermore, the state is expected to continue providing updated regulations, resources, and financial support once the 2030 target is achieved. Future CAAP updates will outline new measures needed to reach the ultimate goal of carbon neutrality.

¹ Estimated 1990 levels, equivalent to a 15% reduction below baseline 2005 GHG inventory levels, the most recent year for which a complete inventory is available and consistent with state guidance.

2 GHG Reduction Summary

The City of Sacramento, in coordination with Rincon Consultants, the Mayors’ Commission on Climate Change, the Sacramento Municipal Utility District (SMUD), the Sacramento Regional Transportation Agency (SacRT), and input from the community have developed a suite of measures and specific actions to reduce GHG emissions over time. Based on these measures, the total GHG emissions reduction is expected to be 1,235,043 MT CO₂e by 2030 and 2,060,976 MT CO₂e by 2045. This exceeds the 2030 target but falls short of the 2045 target by 166,345 MT CO₂e. This is illustrated below in Figure 1.

Figure 1: Estimated GHG Reduction and Target Pathway



A summary of the GHG emissions reductions by Measure is included in Table 1. For a complete description of each measure and the contributing actions, please refer to the appropriate sector and measure below.

City of Sacramento
City of Sacramento Climate Action and Adaptation Plan

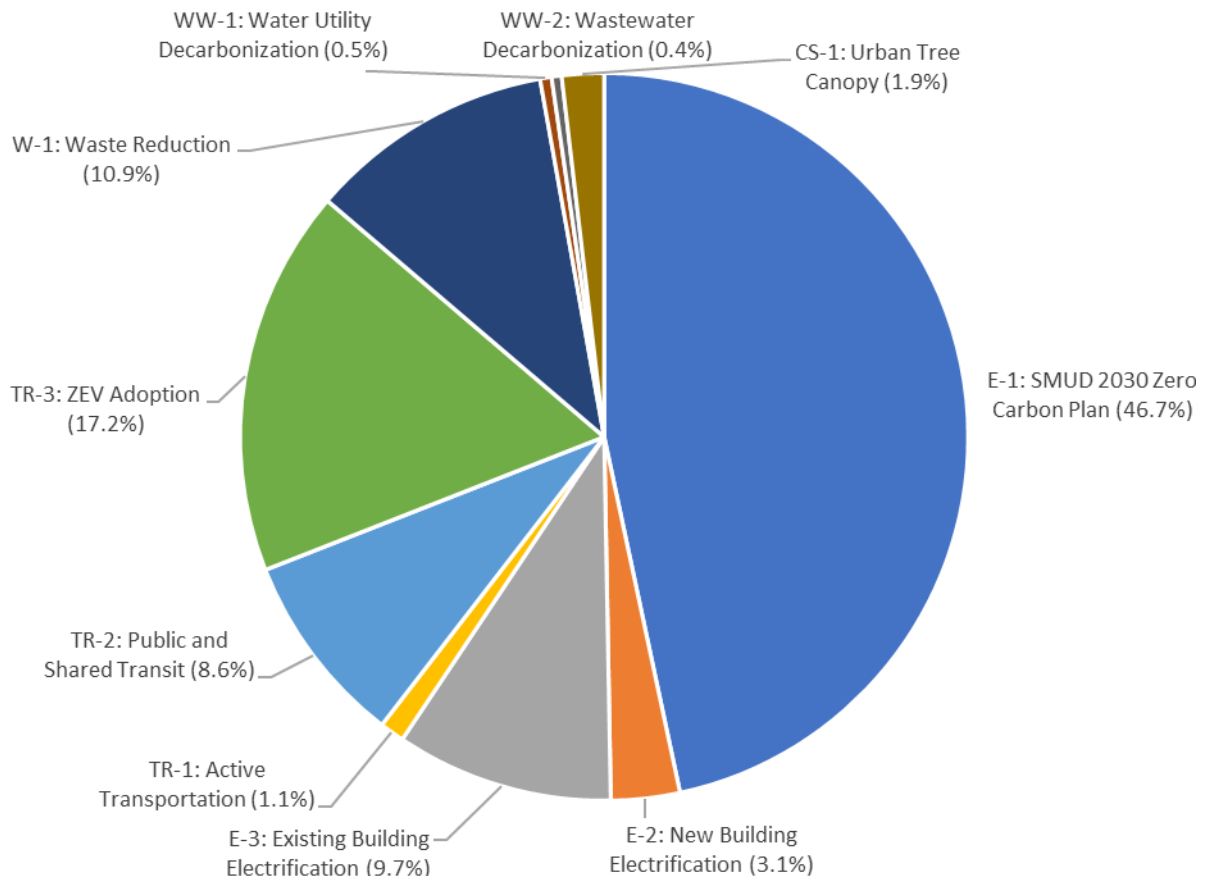
Table 1 Summary of GHG Emissions Reductions by Measure

Measure #	Measure Name	2030 Reduction MT CO ₂ e	2045 Reduction MT CO ₂ e
Built Environment (Energy and Electrification)			
E-1	Support SMUD as it implements the 2030 Zero Carbon Plan.	576,225	0
E-2	Eliminate natural gas in new construction.	37,692	134,621
E-3	Transition natural gas in existing buildings to carbon-free electricity by 2045.	119,289	402,468
E-4	Increase the amount of electricity produced from local resources and work with SMUD to install additional local storage by 2030.	Supportive	Supportive
E-5	Support infill growth with the goal that 90% of growth is in the established and center/corridor communities and 90% small-lot and attached homes by 2040, consistent with the regional Sustainable Communities Strategy. Project-level VMT should be 15% below (or 85% of) the regional average.	Supportive	Supportive
Mobility			
TR-1	Improve active transportation infrastructure to achieve 6% active transportation mode share by 2030 and 12% by 2045.	13,509	30,557
TR-2	Support public transit improvements to achieve 11% public transit mode share by 2030 and maintain through 2045.	106,035	122,371
TR-3	Achieve zero-emission vehicle (ZEV) adoption rates of 28% for passenger vehicles and 22% for commercial vehicles by 2030 and 100% for all vehicles by 2045.	212,451	1,137,071
Waste			
W-1	Work to reduce organic waste disposal 75% below 2014 levels by 2025.	134,991	160,897
Carbon Sequestration			
CS-1	Increase urban tree canopy cover to 25% by 2030 and 35% by 2045.	23,053	61,474
Water and Wastewater			
WW-1	Reduce water utility emissions (in MT of CO ₂ e per MG) by 100% by 2030 and maintain that through 2045.	6,296	0
WW-2	Reduce wastewater emissions by 22% by 2030 and 40% by 2045.	5,495	11,517
Reduction Summary			
Total Reduction Needed		543,437	2,227,322
Estimated Reductions Achieved		1,235,034	2,060,976
Gap		-691,597	166,345
Estimated Reductions Without VMT Reductions		1,115,491	1,908,048
Gap Without VMT Reductions		-572,053	319,273

As shown in Table 1, the measures adopted in this Climate Action & Adaptation Plan (CAAP) have the ability when fully implemented to reduce GHG emissions by approximately 1,235,034 MT CO₂e by 2030. This exceeds the goal reduction by 691,597 MT CO₂e. However, this assumes a very aggressive VMT reduction percentage which currently relies on unfunded transportation infrastructure projects. Furthermore, the State of California has not demonstrated success in achieving VMT reductions historically. Therefore, the most conservative approach to demonstrating

consistency with state reduction targets is to omit VMT reductions from the quantification of the GHG reduction measures when establishing consistency. When omitting the VMT reduction measures the City still exceeds its 2030 target by 572,053 MT CO₂e. There is still a gap of 166,345 MT CO₂e (with VMT reduction) and 319,273 MT CO₂e (without VMT reduction) in 2045. As new technologies develop, and the State pushes further to achieve the 2045 carbon neutrality target, the City of Sacramento will adopt new strategies to achieve this long term goal. Furthermore, the CAAP measures will create the basis for long term carbon neutrality including carbon neutral buildings, electric vehicles, and improved active transportation and transit. The major sectors for GHG reductions are transportation and building energy use. The percent of total reduction generated by each quantifiable measure is shown below in Figure 2.

Figure 2: GHG Reductions in 2030 by Measure



The following section provides the substantial evidence and quantification methodology which provides the reasonable assurance that the GHG reduction strategy adopted by the City of Sacramento will lead to the expected GHG reductions necessary to reach the City’s ambitious GHG reduction goals.

3 Built Environment

<p>Measure E-1: Support SMUD as it implements the 2030 Zero Carbon Plan</p>	<p>2030 Target 576,225 MT CO₂e</p> <p>2045 Target 0 MT CO₂e</p>
<p>Performance Metrics:</p> <ul style="list-style-type: none"> ▪ 100% carbon free electricity citywide by 2030 	

Action #	Action	Anticipated Reduction
Quantitative Actions		
E-1.1	Support SMUD in the implementation of the 2030 Zero Carbon Plan.	576,225 MT CO ₂ e (2030) 0 MT CO ₂ e (2045)

3.1 Measure E-1 Quantification

SMUD has adopted the 2030 Zero Carbon Plan which outlines their approach to achieve 100% carbon free electricity by 2030. This is 15 years ahead of the requirements identified by SB 100, which requires all electricity utilities in the state to achieve 100% carbon free electricity by 2030. Therefore, this measure quantifies the GHG reduction benefits to the City of Sacramento by having 100% carbon free electricity in 2030. To avoid double counting this measure also includes the added benefit of reducing the electricity increase caused by measures E-2, E-3, TR-2, and TR-3.

Action E-1.1

Evidence: SMUD has developed a plan to achieve carbon free electricity by 2030.² This plan, when fully implemented, would reduce the emission factor for Sacramento’s electricity to zero. It would also reduce the emissions associated with electrified vehicles and buildings to zero. Therefore, the emissions reductions in this measure are estimated by calculating the GHG emissions associated with electricity in 2030 under the SB 100 scenario compared to the SMUD 2030 Zero Carbon Plan scenario. Conversely, GHG emissions from electricity generation will decrease to zero by 2045, due to SB 100. Therefore, the SMUD 2030 Zero Carbon Plan reduces GHG emissions substantially in 2030 but goes to zero by 2045 when it aligns with SB 100.

Quantification Results Summary

Action E-1.1	2030	2045
Total kWh (without electrification measures)	4,136,524,853	4,681,771,641
MT CO ₂ e/kWh (With SB100)	0.0001193	0.0

² <https://www.smud.org/en/Corporate/Environmental-Leadership/2030-Clean-Energy-Vision#Stay-informed>

Action E-1.1	2030	2045
Emissions (MT CO ₂ e)	493,291	0
MT CO ₂ e/kWh (SMUD Zero Carbon Plan)	0	0
MT CO ₂ e savings (without electrification measures)	493,291	0
E-2 Savings (MT CO ₂ e)	10,597.88	0
E-3 Savings (MT CO ₂ e)	33,540.51	0
TR-2 Savings (MT CO ₂ e)	36.13	0
TR-3 Savings (MT CO ₂ e)	38,758.98	
Total MT CO ₂ e savings (with electrification)	576,225	0

Measure E-2: Eliminate natural gas in new construction	2030 Target
	37,692 MT CO ₂ e
	2045 Target
	134,621 MT CO ₂ e

Performance Metric(s):

- None (completed)

Action #	Action	Anticipated Reduction
Quantitative Measures		
E-2.1	Develop and adopt an electrification ordinance that requires all new construction under four stories to be all-electric by 2023 and all construction to be all-electric by 2026.	37,692 MT CO ₂ e (2030) 134,621 MT CO ₂ e (2045)

3.2 Measure E-2 Quantification

In order for Sacramento to reach carbon neutrality, the large majority of the buildings in the City will need to be carbon neutral. Electrification allows buildings to use 100% carbon neutral electricity that will be provided by SMUD by 2030. To avoid double counting with Measure E-1, emissions reductions associated with this measure were quantified by assuming electricity would be GHG-free by 2045, consistent with SB 100. To ensure new buildings won't need to be retrofitted later, this measure will ensure all new buildings are built to utilize only electricity as an energy source. The emissions savings for this measure were calculated as the difference between the projected therm consumption (based on the 2016 per capita therm usage and Department of Finance population growth) and the expected natural gas use in 2030 and 2045 under baseline conditions and Department of Finance population growth³. The forecast also included expected efficiencies due to upgrades in the Title 24 Energy Efficiency Standards.

Action E-2.1

Evidence: Continuing to allow natural gas use in new buildings would result in an increase of GHG emissions through 2045, due to increases in population and residential construction in the city projected through 2045. Conversely, GHG emissions from electricity generation will decrease to zero by 2045, due to SB 100 (which requires 100% renewable electricity by 2045) and SMUD's 2030 Zero Carbon Plan. The adoption of an electrification ordinance would lead to a mandatory reduction in natural gas consumption compared to baseline projections by replacing natural gas with electricity.

Since the 2023 ordinance would not completely ban natural gas in new buildings, an estimate of the number of 4+ story buildings permitted in Sacramento each year was made. This estimate was developed by looking at the total 4+ story buildings permitted in the 2018 and 2019 calendar year and developing a CalEEMod⁴ model for each construction project. The resulting calculations

³ See Appendix A for complete population projection numbers

⁴ CalEEMod is the State's California Emissions Estimator Model, accessed at: <https://www.caleemod.com/>

estimated that in both 2018 and 2019 ten projects were permitted. This equated to an estimated increase in natural gas demand by 61,078 therms per year from projects completed in 2018 and 64,598 therms per year in 2019. Assuming similar construction trends, an average of 62,838 therms or 333 MT of CO₂e will be added to Sacramento’s total natural gas consumption from new buildings 4 stories or taller from 2023 to 2026 for a total increase in emissions of approximately 1,000 MT CO₂e. It should be noted that emissions from construction between 2020 and 2023 are already included in the calculation by using the forecasted natural gas consumption in 2023 as the basis for the calculation.

Based on the GHG emissions forecast which is predicated on Department of Finance Population Growth and current per capita natural gas consumption, banning gas in new construction under four stories by 2023 will save an estimated 9.1 million therms of natural gas by 2030 and banning all natural gas use in buildings in 2026 will save 25.4 million therms by 2045. However, these ordinances will lead to an increase in electricity consumption because calculations assume natural gas use will be replaced by electric appliances. The conversion also assumes a 300% appliance efficiency increase due to the inclusion of modern heat pump technologies.⁵ By 2045, all emissions from electricity are eliminated by the use of 100% carbon free electricity.⁶ In spring of 2021, the City of Sacramento successfully adopted the new building electrification ordinance in line with Measure E-1. The calculation used to estimate these emissions are included below.

Quantification Results Summary

Action E-2.1	2030	2045
Total therms saved	9,099,205	25,366,596
MT CO ₂ e/therm	0.00531	0.00531
Emissions reductions MT CO ₂ e	48,290	134,621
Emissions from electricity conversion	10,598	0
Net MT CO ₂ e savings	37,692	134,621

⁵ <https://help.leonardo-energy.org/hc/en-us/articles/203047881-How-efficient-is-a-heat-pump->

⁶ Measure E-2 includes reductions associated with SMUDs accelerated decarbonization schedule.

Measure E-3:
Transition natural gas in existing buildings to carbon-free electricity by 2045

2030 Target
 119,289 MT CO₂e
2045 Target
 402,468 MT CO₂e

Performance Metrics:

- Develop and pass ordinance
- Reduce natural gas use by 28% by 2030
- Reduce natural gas use by 100% by 2045

Action #	Action	Anticipated Reduction
Quantitative Actions		
E-3.1	Develop a comprehensive Existing Building Electrification Framework that identifies associated costs and addresses potential unintended costs for underserved communities prior to implementation of mandatory requirements.	
E-3.2	Develop an electrification ordinance for existing buildings/ construction that will be implemented through the building permit process to transition fossil fuels to electric by attrition following adoption of Measure E3.1. The existing construction buildings ordinance would be implemented in phases as follows: Phase 1: No new expansions of gas appliances or gas lines at existing buildings/construction (2023). Phase 2: Require HVAC system replacements, new hot water heaters, and other appliances to be all-electric or utilize other low-carbon technologies as the market evolves. (2026). Phase 3: Provide enforcement with a permit compliance program. .	119,289 MT CO ₂ e (2030) 402,468 MT CO ₂ e (2045)
Supportive Actions		
E-3.3	Work with SMUD to expand existing low-income programs within the City to weatherize and retrofit/electrify existing buildings, with the goal of reducing energy consumption, decreasing utility bills, and converting to carbon-free energy use by 2040.	Supportive
E-3.4	Promote and educate the community about existing programs and expand electrification retrofit incentives for space and water heating to support the electrification ordinances.	Supportive
E-3.5	Provide electrification retrofit incentives for space and water heating and investigate the development of programs like financing programs or metered energy efficiency.	Supportive

Action #	Action	Anticipated Reduction
E-3.6	Continue to promote and incentivize electrification supportive energy efficiency in existing buildings including lighting, insulation, and air sealing upgrades through programs and financing mechanisms.	Supportive
E-3.7	Work with community partners to include voluntary energy efficiency and/or GHG emissions scores at time of sale and to post results on Multiple Listing Service (MLS) or other real estate app.	Supportive

3.3 Measure E-3 Quantification

SMUD incentives will support the transition of existing buildings away from fossil fuels, including significant rebates on electric appliances and infrastructure. By 2025 the city may need to adopt a mandatory phase out of gas appliances depending on the success of the voluntary program. Action E-3.2 outlines the expected sequence for phasing out gas appliances in existing buildings.

Actions E-3.1 and E-3.2

Evidence: When adopting the new building electrification strategy, Sacramento City Council directed staff to develop an existing building electrification plan to ensure that the transition to a carbon free building stock did not come at the expense of the community, particularly those community members who are most vulnerable. Building electrification has the potential to improve health outcomes, reduce energy burden, and enhance resilience within the City.⁷ However, it also comes with up-front investments that must be financed or funded in an equitable manner to avoid negative impacts. 34% of natural gas use in buildings is from residential and commercial water heating. 40% of natural gas use in buildings is from space heating.⁸ Natural gas hot water heater life expectancy is approximately 10 years.⁹ Therefore, under this ordinance the City should see a 34% decrease in natural gas use from hot water heater electrification in existing buildings by 2035. Natural gas furnace lifecycles are expected to be between 15-20 years with an average of 18 years.¹⁰ Therefore, under this program the City would expect to see an additional 40% reduction in natural gas consumption in existing buildings by 2043. Assuming a linear replacement of existing HVAC and hot water heating equipment starting in 2025, the City should expect to see a 28% decrease in natural gas emissions by 2030 and a 74% decrease by 2045 from this mandatory ordinance. This equates to approximately 25 million therms by 2030 and 72 million therms by 2045, calculated as the corresponding percent reduction from 2016 therm use.

7 https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Draft_Berkeley_Existing_Bldg_Electrification_Strategy_20210415.pdf
 8 <https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf>
 9 <https://www.lowes.com/n/how-to/when-to-replace-a-water-heater>
 10 <https://www.thisoldhouse.com/ideas/how-long-things-last>

Quantification Results Summary

Action E-3.1 and E-3.2	2030	2045
Total Therm Reduction from Electrification	28,797,447	75,836,692
MT per Therm	0.00531	0.00531
Gas Savings MT CO ₂ e	152,829	402,468
Emissions from electricity conversion (MT CO ₂ e)	33,540.51	0
Net MT CO ₂ e Savings	119,289	402,468

3.4 Measure E-3 Supportive Actions

Action E-3.3

Evidence: According to SMUD, the low-income programs are expected to reduce GHG emissions by 33,200 MT¹¹ of CO₂e by 2040 by electrifying and upgrading 100% of low-income single-family homes. However, these reductions are not applied to the overall emissions reductions (to eliminate double counting issues) and are considered supportive of the overall community electrification efforts.

Electrification programs that target low-income residents are the most cost-effective and potentially successful approach for equitable decarbonization to combat climate change.¹² For example, the Low-Income Weatherization Program (LIWP) is the state’s first energy efficiency program that targets low-income Californians and has reduced energy bills in participating multifamily buildings by 30 percent and overall energy usage by an average of 40 percent.¹³ A case study on a major energy retrofit in a Lancaster 100-unit low income multifamily complex resulted in a one-third reduction in natural gas use (approximately 145 therms per apartment).¹⁴ SMUD’s programs, which focus on electrification, could be expected to have even more pronounced GHG reduction benefits. The study also showed that such retrofits can result in increased tenant retention, improved health and comfort, and better ability to afford necessities like food, medicine, health care, and rent.

Action E-3.4

Evidence: Electrification of space and water heaters is the best and cheapest way to reduce emissions from California’s existing buildings through 2045 due to SB 100.¹⁵ The largest barrier to implementation of this is high up-front capital costs.¹⁶ Utility-offered incentives to offset these costs for the end-user are therefore among the most promising opportunities for updating this technology.¹⁷

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 has only begun to gain popularity 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

11 Scott Blunk - SMUD

12 http://greenlining.org/wp-content/uploads/2019/10/Greenlining_EquitableElectrification_Report_2019_WEB.pdf

13 California Housing Partnership Corporation and Association for Energy Affordability (2018). California’s Cap-and-Trade-Funded Low Income Weatherization Program Multifamily: Impact Report, 3.

14 <https://ww2.energy.ca.gov/2019publications/CEC-500-2019-021/CEC-500-2019-021.pdf>

15 <https://www.mdpi.com/2073-4433/10/8/435/htm>

16 California Center for Sustainable Energy. 2009. Solar Water Heating Pilot Program: Interim Evaluation Report.

17 <https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf>

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% implemented the recommended practices.¹⁸ 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% energy savings.¹⁹

Electrification is a new idea and not well understood by the community. The education associated with this action as well as the CAAP itself will facilitate adoption of all-electric technologies. The City will conduct a CAAP update between 3 and 5 years to check progress and adopt more voluntary or potentially mandatory measures if necessary.

Action E-3.5

Evidence: This measure is considered supportive to the overall electrification goals. However, using financing programs to fund energy-saving retrofits has demonstrated energy savings results in the past. A case study from affordable multi-family residential complexes in Santa Monica showed that electricity savings from the program ranged from 1,811-17,712 kWh and natural gas savings ranged from 914-2,567 therms, with overall energy improvement ranging from 10-35%.²⁰

Action E-3.6

Evidence: While the use of carbon neutral electricity by 2045 due to SB100 ensures all-electric buildings have zero energy emissions, there is still a need to reduce energy consumption within Sacramento. Reducing energy consumption will reduce stress on the electricity grid, require less renewable energy generation to meet needs thereby saving resources, and help reduce energy bills within the community.

Action E-3.7

Evidence: While this action does not itself result in any quantifiable improvements to energy efficiency in participating buildings, it would provide the initial framework to eventually require retrofits in problematic buildings at time of sale, resulting in quantifiable emissions reductions over time that would be proportional to the required retrofits. Benchmarking programs implemented in Portland, OR,²¹ Boulder, CO,²² and New York, NY²³ saw average reductions in median energy use intensity (EUI) ranging from 3.5 to 6 percent over 3 to 10 years. Overall reductions may vary depending on whether or not upgrades are mandated by the program, and to what extent. In the U.S., 31 cities/counties/states have adopted some form of mandatory energy benchmarking and transparency policies. A potential co-benefit to the energy benchmarking and disclosure policy may be a decrease in vacancy rates for participating buildings. A study of Chicago office buildings showed that ENERGY STAR-label buildings experienced decreasing trends (6.7% annual decrease) in vacancy rates, indicating that “benchmarking policy can have a positive impact on improving the real estate performance of energy-efficient buildings.”²⁴

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

19 https://aceee.org/files/proceedings/2000/data/papers/SS00_Panel8_Paper10.pdf

20 <https://1p08d91kd0c03rlxhmtydpr-wpengine.netdna-ssl.com/wp-content/uploads/2017/03/Santa-Monica-Test-Web.pdf>

21 <https://www.portlandoregon.gov/bps/article/747482>

22 <https://bouldercolorado.gov/services/building-performance-ordinance>

23 <https://www1.nyc.gov/site/finance/taxes/property-reports/nyc-energy-benchmarking-report.page>

24 <https://cerc.be.uw.edu/wp-content/uploads/sites/18/2019/12/Impact-of-Energy-Benchmarking-and-Disclosure-Policy-on-Office-Buildings.pdf>

Measure E-4:

Increase the amount of electricity produced from local resources and work with SMUD to install additional local storage by 2030

2030 Target

Supportive

2045 Target

Supportive

Performance Metrics:

- Complete a pilot local renewable energy project by 2030

Action #	Action	Anticipated Reduction
E-4.1	Continue to promote and support local energy generation and storage resources.	Supportive
E-4.2	Work with SMUD to site storage and renewable generation at locations in the City which would best support overall grid functionality while electrifying the building stock and maximizing the utilization of existing electrical infrastructure.	Supportive
E-4.3	Work alongside SMUD to promote and further incentivize battery storage and on-site solar at the planning counter and publicly as a means to maximize electrification benefits and improve resiliency.	Supportive
E-4.4	Develop a community solar and storage project of at least 1 MW as a pilot project collaboration between SMUD and the City with SMUD leading project development and the City supporting by providing a location and permitting support.	Supportive

3.5 Measure E-4 Supportive Actions

The actions in Measure E-3 have not been quantified but are key strategies in electrifying the City of Sacramento as well as allowing SMUD to reach their 2045 target of carbon neutral electricity. These actions will help SMUD balance the grid, generate more renewable electricity, harness the benefits of distributed battery storage, and create more resiliency around the electricity grid in general. Without these actions, the GHG reductions associated with E-1 and E-2 are more difficult to achieve.

Action E-4.1

Evidence: While difficult to directly quantify the effects of this action on community-wide emissions, on-site energy generation and storage can help local governments and their communities achieve substantial energy, environmental, resiliency, and economic benefits.²⁵ For example, the City of Sacramento has already installed 4.9 MW of on-site solar at City owned facilities. This results in the production of over 7,000,000 kWh of electricity per year. The City also offsets an additional 29,000,000 kWh's of electricity through SMUD's SolarShares program. In 2018, the San Francisco airport installed 72 kWh of solar photovoltaic (PV), which became the world's first Zero Net Energy certified facility at an airport, helping campus-wide electricity to decline 4.7% since 2013 and

²⁵ <https://www.energy.gov/sites/prod/files/2017/02/f34/onsiterenewables508.pdf>

supporting their goal of a Zero Net Energy campus by 2021.²⁶ The school district of Spirit Lake, Iowa currently operates and uses two wind turbines to power its elementary, middle, and high schools, and administrative buildings, meeting 46% of the district's needs.²⁷ Projects like these can also indirectly reduce community emissions by creating publicity and awareness around the issue. In 2003, Lenox, Iowa installed a 750-kW wind turbine to produce electricity for its own facilities at about the same time that the town's municipal electric utility began offering customers the option to purchase renewable energy. The opt-in response rate was 13%, almost double the typical opt-in rates seen in other jurisdictions. The success of the program was attributed to the increased public awareness generated by the new turbine.²⁸

Action E-4.2

Evidence: Distributed battery storage and renewables can be used instead of traditional transmission and distribution infrastructure upgrades to help meet the increasing demand that electrification will put on the grid. While this action will not directly reduce GHG emissions, it will support the overall transition to an electrified building stock at the lowest cost and with the most resilience.

Action E-4.3

Evidence: While it's hard to know exactly how effective promotion and incentives for residential battery storage and on-site solar will be, trends across the county indicate that these options are desirable for homeowners. This effort is expected to lead to decreased emissions in the long-term and increase community resiliency. Residential solar installations have demonstrated success in reducing emissions. A residential solar panel system has the capability of providing for the electricity needs of an entire home with about 80% lower carbon emissions than fossil fuels.²⁹ The largest barrier to residential solar is up-front installation costs³⁰, suggesting that utility-provided incentives would lead to installation increases. Battery storage can greatly maximize the benefits of renewable energy systems like solar PV. A recent 2019 study from the University of Michigan found that in California as a whole, adding 60GW of renewables could achieve 72% CO₂ reductions with close to one third curtailment.³¹ Adding energy storage technologies could increase this to 90% reduction and only 9% curtailment, under one modeled scenario.³² While industrial and commercial battery storage will drive these reductions, residential energy storage will also play an important part in the effort to increase battery storage across the state. Residential energy storage is often more flexible and resilient than larger utility-owned systems because the network is well-distributed and has buy-in from both the utility and the owners/residents.³³ Residential energy storage exceeded utility-scale storage installations in the U.S. in 2018, reflecting the high value customers are placing on having their own storage systems.³⁴

26 <https://www.flysfo.com/environment/zero-net-energy>

27 https://siouxcityjournal.com/news/local/spirit-lake-iowa-school-district-honored-for-wind-turbines/article_055c6490-cb1f-51f8-b47e-6681825de968.html

28 <https://www.energy.gov/sites/prod/files/2017/02/f34/onsiterenewables508.pdf>

29 https://nature.berkeley.edu/classes/es196/projects/2013final/ArifM_2013.pdf

30 Ibid

31 Curtailment occurs when more power is produced than needed at a given time, leading to energy losses

32 <http://css.umich.edu/publication/role-energy-storage-deep-decarbonization-electricity-production>

33 <https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/how-residential-energy-storage-could-help-support-the-power-grid>

34 Ibid

Action E-4.4

Evidence: A one megawatt solar array would generate an estimated 1.5 MWh of electricity per year in Sacramento. The GHG emissions reduction from this array would vary depending on the GHG emissions factor of SMUD electricity it was offsetting. In 2030, 1.5 MWh is estimated to reduce GHG emissions by 188 MT CO₂e.³⁵ However, in 2045 when SMUD’s electricity would have an emission factor of zero due to SB100, GHG reduction benefit would be zero. However, local solar projects will make SB100 a reality and provide additional co-benefits, including cost savings and resiliency, to the community.

In 2012, SMUD completed a 12-month 300kW microgrid demonstration and research project that involved the design, construction, and demonstration of a microgrid that was integrated with SMUD’s central heating and cooling equipment.³⁶ A microgrid can operate while connected to the main utility grid and it can immediately disconnect (“island mode”) if isolated from the utility, providing heightened reliability for users. SMUD’s microgrid was able to successfully power AC, heating, and hot water in “island mode”. According to the report, “successfully deploying microgrids could help...enable the integration of an unlimited quantity of distributed energy resources into the electricity grid. Many of these distributed resources would be renewable energy sources that would reduce the emissions of greenhouse gases.”

³⁵ <https://pwwatts.nrel.gov/pwwatts.php>

³⁶ <https://www.smud.org/-/media/Documents/Corporate/About-Us/Energy-Research-and-Development/research-microgrid-demonstration-project.ashx>

Measure E-5:

Support infill growth with the goal that 90% of growth is in the established and center/corridor communities and 90% small-lot and attached homes by 2040, consistent with the regional Sustainable Communities Strategy. Project-level VMT should be 15% below (or 85% of) the regional average.

2030 Goal

Supportive

2045 Goal

Supportive

Performance Metrics:

- 90% of infill growth occurs in established and center/corridor communities and 90% small lot and attached homes by 2040
- 30% of region’s new living-wage jobs and 30% of region’s new housing units accommodated by 2040

Action #	Action	Anticipated Reduction
Supportive Actions		
E-5.1	Adopt General Plan policies, land use designations, and implementing actions which: <ul style="list-style-type: none"> ▪ Accommodate 30% of the region's new living-wage jobs and 30% of the region's new housing units by 2040. ▪ Focus 90% of the city's infill growth into established and center/corridor communities with the goal of achieving 90% small-lot single family and attached homes by 2040. ▪ Prioritize construction of lower-cost workforce and affordable housing through modifications of land-use designations and zoning, offering ministerial/staff-level review of infill housing and continue to reduce fees and the time and expense of planning approval and building permit processes. ▪ Include anti-displacement policies and programs. 	Supportive
E-5.2	Enable development of 29,000 new high density/intensity (i.e., 30 dwelling units per net acre), and public transit accessible residences (i.e., within 0.5 mile of public transit) by 2040 through the continuation of the City’s ministerial/staff-level review of infill housing, reduced fees, and identification of local funding sources.	Supportive
E-5.3	Enable the development of 8,700 new affordable by design units by 2040 within 0.25 mile of public transit by updating the City Code to allow multi-unit housing alternative housing types (such as dormitories and smaller units) and streamlining the permit process. Couple with anti-displacement policies and programs.	Supportive

Action #	Action	Anticipated Reduction
E-5.4	Permit a greater array of housing types in existing single-family neighborhoods citywide by allowing missing middle housing types such duplexes, triplexes, and fourplexes, and bungalow courts in single-family and duplex dwelling zones. Develop tools, resources and educational materials to promote and facilitate the development of ADUs in neighborhoods throughout the City.	Supportive

3.6 Measure E-5 Supportive Actions

The City will utilize available regulatory tools to encourage compact infill development, including 2040 General Plan policies and land-use designations, ministerial/staff-level review to streamline ADU's, and reduced fees as appropriate. Encouraging infill development in the City of Sacramento will support overall VMT reduction and energy savings. According to the book *Growing Cooler, The Evidence on Urban Development and Climate Change*, compact development has the potential to reduce the total U.S. VMT by 10 to 14 percent and total U.S. transportation CO₂ emissions by 7 to 10 percent³⁷. Compact development reduces the distance traveled to access jobs and services and shifts travel to active and transit modes. In addition, compared to detached single-unit dwellings, multi-unit dwellings consume 35% less energy for space heating and 21% less energy for space cooling³⁸, decreasing per capita energy use by the built environment.

Action E-5.1 through E-5.4

Evidence: While not easily quantifiable, infill growth that increases density within areas of the community that provide multiple services and better access to jobs can help reduce per capita emissions in those areas due to reduced VMT and energy savings. This is especially effective if paired with affordable housing options such as ADUs, which allow a greater portion of the population to access high density areas and reduce their emissions. Affordable housing can therefore also help reduce suburban sprawl. A Berkeley study on carbon footprint planning suggests that a 10-fold increase in population density in central cities corresponds to 25% lower GHG emissions³⁹ due mostly to decreases in VMT. This can be substantially increased if efforts are additionally made to reduce suburban sprawl. Another study conducted by UC Davis found that a 10% increase in residential density would reduce VMT by 1.9%.⁴⁰ University of Waterloo performed a case study in Toronto to determine how quickly existing areas could be densified to meet minimum transit supportive density thresholds. The study found that 3.8 million additional residents could be residing in transit supportive environments if about 1.2 million units were added with current unit densities between 5 and 20 units per hectare. Given historic growth rates, units could be built within 34 to 95 years. Multi-unit rental units are typically more affordable than detached single-unit dwellings, and the co-benefits include increased access to services for disadvantaged communities.

³⁷ *Growing Cooler: The Evidence on Urban Development and Climate Change* <https://uli.bookstore.ipgbook.com/growing-cooler-products-9780874201789.php>

³⁸ *Growing Cooler: The Evidence on Urban Development and Climate Change* <https://uli.bookstore.ipgbook.com/growing-cooler-products-9780874201789.php>

³⁹ <https://www.cogitatiopress.com/urbanplanning/article/view/1218/1218>

⁴⁰ <https://www.sciencedirect.com/science/article/pii/S0191261510000536>

4 Mobility

Measure TR-1: Improve Active Transportation Infrastructure to Achieve 6% Active Transportation Mode Share by 2030 and 12% by 2045	2030 Target
	13,509 MT CO ₂ e
	2045 Target
	30,557 MT CO ₂ e
Performance Metrics: <ul style="list-style-type: none"> ▪ Achieve 6% active transportation mode share by 2030 and 12% by 2045 ▪ Deploy 30 miles of new bike lane by 2030 ▪ Deploy 20,000 feet of new/repaired pedestrian infrastructure by 2030 ▪ Install or improve at least 70 new pedestrian crossings by 2030 ▪ Implement the 2016 Bicycle Master Plan by constructing 40 miles of bike lanes, 48 miles of bike routes, 40 miles of buffered bike land, 18 miles of separated bikeway, and 127 miles of shared-use paths, by 2045 ▪ Construct the pedestrian network in the 2006 Pedestrian Master Plan by 2045 ▪ Collectively reduce VMT to 6,393 miles per person per year in 2030 (25% below 2016 per capita VMT levels) and to 5,625 miles per person per year in 2045 (34% below 2016 per capita VMT levels) between measure TR-1 and TR-2 	

Action #	Action	Anticipated Reduction
Quantitative Actions		
TR-1.1	Implement the 2016 Bicycle Master Plan by constructing a comprehensive, connected network of safe and accessible (low-stress) bikeways, on- and off-street, within and across neighborhoods totaling 40 miles of bike lanes, 48 miles of bike routes, 40 miles of buffered bike lanes, 18 miles of separated bikeways, and 127 miles of shared-used paths.	13,509 MT CO ₂ e (2030) 30,557 MT CO ₂ e (2045)
Supportive Actions		
TR-1.2	Implement the improvements in the 2006 Pedestrian Master Plan by providing a connected, safe and accessible (low-stress) pedestrian network, prioritized based on High Injury Network (crash data), school access, equity and community needs. Low-stress pedestrian network includes crossings, sidewalks, and other paths.	Supportive
TR-1.3	Conduct a study to identify the physical barriers to active transportation by 2025 and remove them by 2030 to support local partners and community groups.	Supportive
TR-1.4	Conduct a study to identify educational barriers and provide education and outreach to the community on active transportation options in the City including a travel training program and incentivize a spectrum of transportation options that includes public and private shared and active services.	Supportive

Action #	Action	Anticipated Reduction
TR-1.5	Identify and secure ongoing funding for and then implement active transportation programs (open streets, pilot projects, classes, etc.).	Supportive

4.1 Measure TR-1 Quantification

Reducing Vehicle Miles Traveled (VMT) means reducing the number of miles and trips taken by on-road vehicles both intercity and intracity. One-way Sacramento will reduce VMT is by moving from single occupancy vehicles to active transportation, like bicycling and walking. To do this the City must provide low stress and convenient infrastructure and prioritize active transportation movement. Infrastructure needs including bikeways, sidewalk improvements, and expansions of both kinds of infrastructure to all areas of the City. Once the infrastructure is available and stress/comfort is not an issue, comparison with other cities around the world suggest more people will choose active transportation. The following actions outline the infrastructure and supportive actions the City will take to increase bike/ped mode share. Each action is supported by case studies from other cities in California, other US states, and abroad.

Action TR-1.1

Evidence: The Bicycle Master Plan would result in a total of 464 miles of bikeways within 100 square miles for an estimated 500,000 residents. Comparably, the City of Antwerp, in Belgium, had similar bikeway buildout, with 435 miles of bike lanes within 79 square miles serving a population size of approximately 500,000 residents in 2014. The City of Antwerp reported 29% mode share for bicycles in 2014. Assuming that bike lane mileage, density, and city population are directly correlated with bicycle mode share, Sacramento could expect to see a similar level of bicycle mode share that Antwerp saw in 2014. Furthermore, the City of Copenhagen, the gold standard for bicycle use saw a 26% increase between 2012 and 2019 from 36% mode share to 62% as a direct result of a 14-year plan to improve the quality, safety and comfort of cycling.⁴¹ However, it should be noted that these European cities do not just build infrastructure. They also require car drivers to pay their own way with higher parking fees, gas taxes, and excise taxes on new vehicles. These cities also incentivize dense multifamily development. Similarly, the 2040 General Plan and implementing actions will encourage compact infill development. In the US, nearby Davis reports 15.5% of commuters get to work by bike. Santa Cruz, CA, reports 13.2% and Boulder, CO, reports 10.7% according to the Census.⁴² If Sacramento achieves an increase of 4% bicycle mode share (6% total mode share in 2030) the estimated VMT reduction in passenger VMT would be approximately 52 million VMT in 2030. By 2045 a 12% mode share (10% increase over baseline) would decrease 139 million VMT.⁴³

Quantification Results Summary

Action TR-1.1	2030	2045
Total Passenger VMT Decrease	56,188,570	148,448,882
MT CO ₂ e/VMT	0.0002404	0.0002058
Emissions reductions MT CO ₂ e	13,509	30,557

⁴¹ <https://www.latimes.com/world-nation/story/2019-08-07/copenhagen-has-taken-bicycle-commuting-to-a-new-level>

⁴² https://bikeleague.org/sites/default/files/Where_We_Ride_2017_KM_0.pdf

⁴³ VMT savings for increasing bicycle mode share were only taken from internal-internal (trips within the City).

4.2 Measure TR-1 Supportive Actions

Action TR-1.2

Evidence: Improving pedestrian networks is an important part of building Complete Streets – streets that accommodate bikes, cars, shared transit, and pedestrians in an accessible way. Nationally, 16.4% of vehicle trips were one mile or less in 2017, a distance easily travelled by foot or bicycle.⁴⁴ An improved and expanded pedestrian network is the most effective and direct approach for shifting those shorter vehicle trips to walking, and studies show that distance to destinations is one of the strongest predictors of walking as a mode choice.⁴⁵ However, not much research has been conducted to determine quantitatively how improving the pedestrian network translates to increased pedestrian mode share. This is further complicated by the fact that while improved pedestrian networks almost always have a positive correlation with increased walking, that does not always translate to decreased VMT. In other words, increased walking does not mean that walking trips are replacing driving trips. One study from 1993 looked at how improving a pedestrian network affected the number of vehicle miles travelled in Portland, OR in 1985 and found that a 1% increase in the pedestrian network was associated with a 0.14% decrease in number of vehicle trips travelled.⁴⁶

Action TR-1.3

Evidence: By leveraging community groups and local partners to get firsthand feedback from the community the City will be able to better identify and eliminate the hurdles which keep people from walking and biking. The benefits of this action will support overall VMT reduction.

Action TR-1.4

Evidence: Providing education on the benefits of active transportation as well as technical information such as trip planning, incentives and other programs will help generate momentum around active transportation and support overall VMT reduction.

Action TR-1.5

Evidence: The funding to execute Measure TR-1 related actions have not been identified by the City and current public works budget does not allow for these projects. This measure would require the City and its partners to identify and secure funding to implement these actions. A description of funding and financing strategies can be found in Appendix E.

44 <https://nhts.ornl.gov/vehicle-trips>

45 https://ww3.arb.ca.gov/cc/sb375/policies/ped/walking_brief.pdf

46 https://ww3.arb.ca.gov/cc/sb375/policies/ped/walking_brief.pdf

Measure TR-2:
Support Public Transit Improvements to Achieve 11% Public Transit Mode Share by 2030 and Maintain Through 2045

2030 Target
 106,035 MT CO₂e
2045 Target
 122,371 MT CO₂e

Performance Metrics:

- Implement new parking minimums and maximums by 2022
- Collaborate with SacRT to achieve an 11% transit mode share by 2030 and maintain this through 2045
- Continue to achieve at least 2 million miles taken by shared transportation
- Collectively reduce passenger VMT to 6,393 miles per person per year in 2030 (25% below 2016 per capita VMT levels) and to 5,625 miles per person per year in 2045 (34% below 2016 per capita VMT levels) between measure TR-1 and TR-2

Action #	Action	Anticipated Reduction
Quantitative Actions		
TR-2.1	Update and implement the City’s Transportation System Management Plan (TSMP) ordinance to shift travel behavior away from the single-occupancy vehicle.	
TR-2.2	Eliminate parking minimums Citywide, develop parking maximums and require parking management and transportation demand management plans for all areas of the City based on available transportation options, travel patterns, and land use.	
TR-2.3	Encourage SacRT to provide frequent, reliable transit in the City’s priority corridors to reduce VMT and support SacRT in implementing priority transit corridors. Coordinate transit priority corridors with consideration of transportation needs as well as land use planning to provide transit-supportive land uses. Encourage the expansion of frequent, reliable transit services throughout the City.	105,581 MT CO ₂ e (2030) 121,951 MT CO ₂ e (2045)
TR-2.4	Collaborate with SacRT in planning and implementing increased transit services with reduced headways and expanded service lines to support an 11% public transit mode share by 2030.	
TR-2.5	Work with SacRT to identify changes to signals and other technological enhancements for transit prioritization and faster transit travel times.	
TR-2.6	Continue to support electric car sharing options to offset at least 1 million VMT per year in the City through 2030.	454 MT CO ₂ e (2030)
TR-2.7	Continue to support shared rideables (bikes and scooters) to enable a reduction of 1 million VMT per year.	420 MT CO ₂ e (2045)
Supportive Actions		
TR-2.8	Support SacRT efforts to secure funding to support improved service/communications such as interactive service maps, app payments, and real time arrival info.	Supportive

Action #	Action	Anticipated Reduction
TR-2.9	Continue to implement and improve curbside management strategies to better manage and price curb space, manage transportation network companies (TNC) and prepare for autonomous vehicles.	Supportive
TR-2.10	Remove barriers to access transit stops and stations (provide low-stress connectivity) and provide enhanced, comfortable stops and stations.	Supportive
TR-2.11	Implement the City’s adopted plans including modal/Citywide plans and corridor/area plans (such as the Bicycle Master Plan, Broadway Complete Streets, and 65th Street Area Plan).	Supportive
TR-2.12	Identify an Employee Transportation Coordinator and establish an employee commute program for City staff that includes provisions for telecommuting and encourage other public and private agencies located within the City to do the same using requirements and/or incentives.	Supportive
TR-2.13	Investigate and lobby for the development of a TNC user tax which would put a small fee on the use of Uber, Lyft, and others and generate funds to pay for transit and transportation infrastructure and related programs.	Supportive

4.3 Measure TR-2 Quantification

Reducing Vehicle Miles Traveled (VMT) means reducing the number of miles and trips taken by on-road vehicles both intercity and intracity. One-way Sacramento will reduce VMT by moving from single occupancy vehicles to shared mobility like trains and buses. To do this the City must work with its partners including the Sacramento Regional Transportation District (SacRT) to expand service lines and increase the convenience of transit by reducing the time it takes to reach a destination via transit as well as reducing wait times (headways) for transit. Some of the changes Sacramento will make to prioritize transit including coordinating with SacRT to plan and implement dedicated transit lanes and setting parking maximums will also make driving single occupancy vehicles less convenient to drive. By making transit more convenient and making decisions to prioritize transit over single occupancy vehicles Sacramento will begin to shift VMT towards shared transit and significantly decreasing GHG emissions. Together these strategies are expected to decrease total VMT by 9.5% by 2030 and 9.5% by 2045. Actions TR-2.1 through TR-2.6 provide quantifiable emissions reductions due to the expected shift to transit based on available information.

Action TR-2.1 through TR-2.5

Evidence: The transportation system management plan (TSMP) is a wholistic look at how mobility is achieved in the City of Sacramento. Through Action TR-2.1, the TSMP will investigate opportunities for shifting demand away from single occupancy vehicles and may include parking pricing and availability strategies, incentives for alternative commutes, requirements for large employers and other approaches.

The Fehr and Peers Transportation Model for Sacramento suggests Action TR-2.2 will yield a 30%-50% reduction in VMT of new development for which the ordinance covers depending on reduction in parking and whether it is a suburban or urban area (or how good the alternative options are). This equates to a 2%-3.1% reduction in citywide passenger vehicle emissions compared to the 2030

forecast and a 4%-6% reduction compared to the 2045 forecast. Conservatively, a citywide VMT reduction of 2% in 2030 and 4% in 2045 is expected due to the implementation of this measure which equates to a VMT reduction of 86,881,896 miles in 2030 and 180,256,184 miles in 2045.

The recent free student ridership program demonstrated that there is an existing strong need for public transportation in Sacramento. Through the program, SacRT student ridership doubled over the course of a few months, including during weekends and after school. SacRT also saw an overall 6% increase in system-wide ridership in 2020. These trends not only suggest that SacRT service improvements would fill a real transportation gap in Sacramento, resulting in actual VMT reductions, but also those VMT reductions would be maximized through the other incentives and programs that SacRT offers.

In general, increases and improvements to public transportation systems reduce a city's dependence on fossil fuels and reduce VMT. 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% increase in transit frequency saves 0.5% in VMT.⁴⁷ Bus Rapid Transit can also yield a corridor-level VMT reduction of 1-2%.⁴⁸ Sacramento currently has a transit mode share of 1.5%. Oakland CA, by contrast has achieved a 21% mode share. Oakland also has a low difference in income between transit and non-transit users of 2%.⁴⁹ SacRT has a service area of 400 square miles (1.4 million people) and includes 80 bus routes. In comparison, AC Transit (which serves Oakland) has a service area of 368 miles (1.5 million people) and has nearly double the bus lines with 158. Ridership on AC Transit was 53 million in 2018-2019 compared to 21 million on SACRT. An increase of SACRT service of the magnitude to match AC Transit which serves a similar size and population could reasonably result in a 21% transit mode share. To be conservative, a transit mode share increase of 10% above baseline by 2030 and maintaining that increase through 2045 was estimated for Sacramento. This increase in mode share is expected to reduce VMT by 10% or 399,424,427 miles per year in 2030 and 412,188,607 miles per year in 2045.

Quantification Results Summary

Actions TR-2.1 through TR-2.5	2030	2045
Total Passenger VMT Decrease due to Actions TR-2.1 – TR-2.5	486,306,323	592,444,792
MT CO ₂ e/VMT	0.0002171	0.0002058
Emissions Reductions MT CO ₂ e	105,581	121,951

Actions TR-2.6 and TR-2.7

Evidence: Research from the Transportation Sustainability Research Center at the University of California – Berkeley shows that car share programs like in Action TR-2.6 lower vehicle ownership and overall VMT.⁵⁰ While a majority of car share members use the program to add or replace vehicle trips (leading generally to small VMT increases), a minority of members (2-5%) use car share as a replacement for vehicle ownership (leading generally to larger VMT reductions). The net effect is overall decrease in vehicle ownership, VMT, and ultimately GHG emissions. Approximately one car

47 <https://www.smartgrowthamerica.org/app/legacy/documents/smartgrowthclimatepolicies.pdf>
 48 <https://www.smartgrowthamerica.org/app/legacy/documents/smartgrowthclimatepolicies.pdf>
 49 <https://smartasset.com/mortgage/best-cities-for-public-transportation>
 50 http://innovativemobility.org/wp-content/uploads/2016/07/Impactsofcar2go_FiveCities_2016.pdf

share vehicle replaces seven to eleven cars and VMT is reduced, on average, between 6% to 16% per car share household assuming one-way usage. In approximately one year, Sacramento’s Gig electric car share program hit over 1 million miles driven providing GHG reductions as well as air quality and mobility benefits.

Shared rideables⁵¹ (Action TR-2.7) are also demonstrated to reduce VMT. In 2019, a total of 1,060,405 trips were taken on shared rideables (shared bikes and scooters) in the City of Sacramento. Success of shared rideables in replacing vehicle use is not known in Sacramento, but a 2019 report from the City of Santa Monica found that 49% of shared rideable trips replaced vehicle trips based on answers to survey questions.⁵² A 2014 study from Utrecht University suggests that the car substitution rate of shared rideables is dependent on what proportion of trips are already taken by car in a city.⁵³ In the study, Minneapolis and Melbourne had between 70% and 76% vehicle mode share in 2014 and showed high rates of car mode substitution (19% to 21%) after shared rideables were introduced. On the other hand, London and Washington DC had between 36% and 46% vehicle mode share in 2014 and showed much lower rates of car mode substitution (2% to 7%) after shared rideables were introduced. Sacramento and Santa Monica both had high vehicle mode share (83% and 72% respectively) before shared rideables were introduced, suggesting that Sacramento would see a similar if not higher car substitution rate of shared rideables as Santa Monica. Both studies previously mentioned suggest that average trip duration of shared rideable trips is about 2 miles (this is seen consistently across the six diverse cities mentioned above) and appears to be largely independent of other city metrics. VMT reductions from introduction of shared rideables in 2019 in Sacramento were therefore estimated to be approximately 1 million miles, or 342 MT CO₂e. This assumes an average trip distance of 2 miles and a car substitution rate of 49% along with the total trips recorded in 2019.

Quantification Results Summary

Actions TR-2.6 through TR-2.7	2030	2045
Total VMT reduction from shared mobility	2,039,197	2,039,197
Passenger vehicle emission factor (MT CO ₂ e /VMT)	0.000240	0.000206
Electric car emission factor (kWh/mile)	0.29	0.29
Scooter emission factor (kWh/mile)	0.0125	0.0125
Electric car share kWh used	290,000	290,000
Scooter kWh used	12,990	12,990
SMUD emission factor (MT CO ₂ e /kWh)	0.0001193	0.0000
Emissions avoided (MT CO ₂ e)	490	420
Emissions from electricity (MT CO ₂ e)	36	0.0000
Emissions saved	454	420

⁵¹ Shared rideables generally refer to rentable bicycles and scooters.

⁵² https://www.smgov.net/uploadedFiles/Departments/PCD/Transportation/SantaMonicaSharedMobilityEvaluation_Final_110419.pdf

⁵³ <http://mobility-workspace.eu/wp-content/uploads/Bike-shares-impact-on-car-use-3.pdf>

4.4 Measure TR-2 Supportive Actions

Action TR-2.8

Evidence: This is supportive to Actions TR-2.5 through TR-2.7 and the overall measure. Effective communication, especially communication that takes advantage of new and emerging technologies to accurately and easily disseminate trip planning and real-time status information, is a strong factor in helping customers decide to use transit for business or leisure trips.⁵⁴

Action TR-2.9

Evidence: Curbside management strategies can help shift cities towards sustainable citywide mobility without compromising space and business needs.⁵⁵ Sacramento has already made great strides in curbside management with their innovative dynamic parking program. In San Francisco, a parking pilot program called SFPark instituted dynamic parking pricing for on-street parking and experienced a 30% drop in VMT for the area, 8% drop in traffic volume, and improved meter compliance and parking turnover.⁵⁶ In general, increasing the price to park is one of several related factors that can reduce VMT and promote mode switching.⁵⁷ This approach is more effective when combined with infill development, investments in alternative transportation, and travel demand management programs.

Action TR-2.10

Evidence: 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.⁵⁸ While difficult to directly quantify, improving access to transit stops and stations can contribute to improved transit access, and is therefore an important component of this strategy to reduce VMT.

Action TR-2.11

Evidence: The City has adopted plans and strategies to increase transit use through planning efforts. These actions will support the overall VMT reduction quantified under Measure TR-2.

Action TR-2.12

Evidence: In light of the recent changes made to combat the spread of COVID-19, telecommuting has proven to be an implementable and effective strategy for reducing VMT. Continuing to leverage the telecommuting and remote work lessons learned during the pandemic will allow the City of Sacramento to reduce VMT well into the future.

Action TR-2.13

Evidence: The City of San Francisco was given a special variance by the State of California to implement a Traffic Congestion Mitigation tax on private transit service vehicles. The revenues of

54 <https://transitleadership.org/docs/TLS-WP-Improving-the-Customer-Experience.pdf>

55 <https://nacto.org/wp-content/uploads/2017/11/NACTO-Curb-Appeal-Curbside-Management.pdf>

56 <https://www.ite.org/pub/?id=C2D66E96%2DFF01%2D0BA8%2D68C3%2D65CC9116A5AE>

57 <https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/f0016902-final-pricing-parking-management-to-reduce-vehicles-miles-travelled-pi.pdf>

58 https://ww3.arb.ca.gov/cc/sb375/policies/transitaccess/transit_access_brief120313.pdf

this tax go to offsetting the emissions from these services through the funding of transit and VMT reducing projects.⁵⁹ The City of Sacramento will pursue a similar tax in order to help offset the impacts of Transportation Network Companies in Sacramento.

⁵⁹ <https://sftreasurer.org/business/taxes-fees/traffic-congestion-mitigation-tax-tcm#:~:text=The%20City%20imposes%20a%20Traffic,or%20private%20transit%20services%20vehicle.>

Measure TR-3:
 Achieve Zero-Emission Vehicle (ZEV) adoption rates of 28% for passenger vehicles and 22% for commercial vehicles by 2030 and 100% for all vehicles by 2045

2030 Target
 212,451 MT CO_{2e}
2045 Target
 1,137,071 MT CO_{2e}

Performance Metrics:

- 11% EVs and 3,230 public EV chargers in Sacramento by 2025
- 28% EVs and 8,150 public EV chargers in Sacramento by 2030
- 100% EVs by 2045⁶⁰

Action #	Action	Anticipated Reduction
Quantitative Actions		
TR-3.1	Amend City Building Code to require at least 20% EV-capable charging spaces and at least one installed, operational Level II EV charger in new multifamily and nonresidential development. Amend the Planning and Development Code to incentivize charging in both existing and new developments.	
TR-3.2	Continue to install and provide EV charger access at City-owned facilities and parking garages.	212,451 MT CO _{2e} (2030) 1,137,071 MT CO _{2e} (2045)
TR-3.3	Continue to support a variety of public and public/private partnerships to provide more publicly accessible chargers throughout the City. Examples include public/private partnerships on private property (Electrify America), public/private partnerships on public property (EVgo), and public investment (SMUD).	
Supportive Actions		
TR-3.4	Pursue affordable, zero-emission car share expansions to serve affordable housing, such as the Sacramento Metropolitan Air District’s Our Community Carshare program to more locations, contingent on funding.	Supportive
TR-3.5	Collaborate on e-mobility hub pilot efforts, in partnership with other agencies and local groups, with special consideration for proximity to low-income/disadvantaged communities and multifamily housing.	Supportive
TR-3.6	Continue to maintain a highly streamlined EV infrastructure permit process.	Supportive
TR-3.7	Develop and implement a fee for use of City-owned parking facilities and EV chargers to promote more efficient use and turnover and increase EV availability for people who really need it, including those without access to home charging.	Supportive
TR-3.8	Continue to implement and improve curbside management strategy to better manage and price curb space, manage TNC, and prepare for autonomous vehicles.	Supportive

⁶⁰ The number of chargers needed to meet 100% EV’s is not yet known. New technologies could significantly alter the current landscape by this time. This will be addressed in upcoming CAAPs.

Action #	Action	Anticipated Reduction
TR-3.9	Work and collaborate with major employers including the State of California and Sacramento County to promote ZEV adoption, programs, and improvements to ZEV infrastructure.	Supportive
TR-3.10	Continue to provide information and education about currently available incentives for expansion of Level II chargers on private property.	Supportive
TR-3.11	Coordinate with community-based organizations, agencies, and non-profits to conduct EV education events which would include information on costs/benefits of owning EVs, steps on how to receive incentives for EV chargers, as well as other benefits. Events will be equitably distributed across the City, focusing on disadvantaged communities.	Supportive
TR-3.12	Because zero-emission technology is improving/changing at a rapid pace, continue to monitor, test, and adapt to new and emerging zero-emission technologies and solutions.	Supportive

4.5 Measure TR-3 Quantification

The State of California has a goal of putting 5 million EVs on the road by 2030. This is approximately 1/3 of the vehicles currently on the road. Forecasting to 2030 given today’s rate of vehicle ownership, 5 million EVs in 2030 would be approximately 30% of the vehicle fleet. Therefore, the level of electrification proposed for this measure is in line with the state’s. The City of Sacramento will support the necessary infrastructure to support a fleet with 28% EV’s by 2030, with a long-term target of 100% EVs by 2045. This is equivalent to approximately 65,000 EVs in Sacramento by 2025 and 163,000 by 2030. As of October 2018, the City had 4,849 EVs registered, with 3.3% of new vehicle sales in Sacramento being EVs.⁶¹ While the City cannot require residents to buy and use ZEVs, the City will take actions to encourage this behavior change and support this level of EV adoption by improving the availability of EV charging infrastructure. The City’s primary target to achieve this measure is to provide one public EV charger for every 20 EVs, or 3,231 EV chargers by 2025 and 8,158 by 2030.⁶² The ratio of one charger per 20 EV’s is in line with the leading Cities in California (San Francisco, Los Angeles, and San Jose) when it comes to EV infrastructure and aligns with recent charging infrastructure studies through 2025. The need for charging infrastructure may change over time depending on new technologies such as smart chargers and trends in personal EV adoption. The City will continue to monitor the most recent research on EV infrastructure needs and update long term goals as necessary. The following actions are a combination of expanded public EV chargers and incentives for EV adoption.

Action TR-3.1

Evidence: This action will account for the majority of the targeted number of EV chargers in 2025 and 2030. EV-ready building codes are one of the most effective and low-cost 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.⁶³ However, new development is not projected to occur at a scale sufficient to meet the City’s charging goals. EV charger installation will therefore need to occur in existing buildings as well. Sacramento is currently 5th in the nation for the number

61 Data provided by the City of Sacramento

62 https://theicct.org/sites/default/files/publications/US_charging_Gap_20190124.pdf

63 <https://www.swenergy.org/cracking-the-code-on-ev-ready-building-codes>

of public chargers per million population (Level II and DCFC), with a total of 682 public EV connectors, including 129 public fast chargers, as of January 2020.⁶⁴ This ordinance would be in addition to Sacramento’s substantial ongoing EV programs contained in the 2017 EV Strategy and 2019 EV Blueprint.

Action TR-3.2

Evidence: As of 2020, the City of Sacramento currently operates 120 chargers at City-owned facilities, 48 of which serve the City fleet and 72 of which are available for public or employee charging. Patrons of City parking facilities can currently charge their EV at no additional cost, except when using the DCFC at the Sacramento Valley Station. The City is currently completing replacements of City-owned chargers to upgrade to newer, networked electric vehicle supply equipment (EVSE) and increase charging connector availability at City facilities. This investment will nearly double the number of Level II EVSE connectors in the first phase, going from 61 to 103 at the first seven sites by spring of 2020.⁶⁵ The next phases for City-owned EVSE expansion will support planned EV purchases in the City’s fleet and will likely include many public-facing community locations. A key priority for the EVSE expansion plan is to increase charging access in low income and disadvantaged communities. Providing public charging in these communities will help to increase the viability of EV technologies, improve consumer awareness, and ensure charging options for a range of housing types.

Action TR-3.3

Evidence: The City of Sacramento has been a state and national leader in building electric vehicle partnerships and infrastructure since its first EV program in 1994. The City already hosts 682 public EV charging stations and connectors. Volkswagen subsidiary, Electrify America, designated Sacramento as the first Green City in its Zero-Emission Vehicle (ZEV) Investment Plan in 2017. Under this initiative, also known as “Sac-to-Zero”, Electrify America invested \$44 million in Sacramento between 2017 and 2020, part of which was allocated to installing new charging infrastructure. In addition, the City launched its first curbside charging pilot in May 2019 in partnership with EVgo, which offers fast charging in the right-of-way at Southside Park. The chargers are owned and operated by EVgo and available to any member of the public. Over 700 vehicles have used the chargers, resulting in an estimated 400,000 EV miles powered and more than 19,000 gallons of gasoline avoided.⁶⁶ The City is currently working with EVgo on a second curbside charging pilot with an anticipated launch date by Fall 2020.

Since 2017, the City’s public/private partners have installed or will install by 2025 75 Level II, DC fast chargers, and high-power chargers through Electrify America, three EVgo curbside charging stations, and 42 new Level II connectors through the City itself, for a total of 123 new chargers. Through these existing programs and new opportunities, the City and its partners will continue to install new chargers to meet the 2025 and 2030 targets.

Quantification Results Summary

In order to calculate the GHG reductions associated with achieving a 28% EV adoption level in 2030 and 100% in 2045 the following calculations were conducted. For 2030 the difference in total EV adoption (28%) and projected EV adoption (by EMFAC) was calculated to be 23%. A 23% reduction

⁶⁴ Data provided by the City of Sacramento

⁶⁵ Data provided by the City of Sacramento

⁶⁶ Data provided by the City of Sacramento

in 2030 VMT was then calculated and multiplied by the 2030 EMFAC emission factor. For commercial vehicles EMFAC does not project commercial EV adoption, so no adjustment was necessary. Finally, emissions associated with the electricity consumed by the EV's was calculated by using an estimated EV efficiency.⁶⁷ The resulting kWh estimate was multiplied by the SMUD projected emission factor. The impacts of the SMUD 2030 Zero Carbon Plan are quantified in E-1.

Actions TR-3.1 through TR-3.3	2030	2045
Passenger Vehicles		
Percent Passenger EV's	28%	100%
Forecasted EV's	4.58%	7.25%
Net Increase	23%	100%
VMT driven by EV	890,832,307	3,924,599,639.72
MT CO2e/VMT (Adjusted to include emissions from electric car)	0.0002139	0.0002058
Passenger MT CO2e Savings	190,563	807,854
Commercial Vehicles		
Percent Commercial Vehicle EV's ⁶⁸	22%	100%
Forecasted EV's	0%	0%
VMT driven by EV	69,050,601	331,756,294.30
MT CO2e/VMT (Adjusted to include emissions from electric car)	0.0008783	0.0009923
Commercial MT CO2e Savings	60,647.31	329,216.91
Gross MT CO2 Savings	251,210	1,137,071
Electricity Emissions Adjustment		
MT CO2e/VMT EV (passenger)	0.000027	0.000027
MT CO2e/VMT EV (commercial)	0.000219	0.000219
Emissions from EV's	38,759	0
Total MT CO2 Savings	212,451.08	1,137,070.81

4.6 Measure TR-3 Supportive Actions

Action TR-3.4

Evidence: The City was an early partner for the Sacramento Metropolitan Air Quality Management District's Our Community CarShare program, California's first all-electric carsharing program targeted for low-income communities. Our Community CarShare offers a free membership transportation service located in low-income and affordable housing communities throughout the City of Sacramento. Residents can reserve clean zero emission vehicles to run errands, get to appointments, and take local trips. The program has successfully launched two phases, and as of January 2020 the program offers 14 vehicles at 7 sites that have delivered over 470,000 electric miles driven and more than 19,000 gallons of gasoline avoided (169 MT CO₂e). The project is currently building out its third phase for expanded service at four additional sites.

⁶⁷ <https://cleantechnica.com/2018/06/30/what-are-the-most-efficient-electric-cars/>

⁶⁸ Commercial vehicles refers to vehicles in EMFAC classes LHD1, LHD2, T6, T7, PTO, UBUS, Motor Coach, All Other Buses, MH, T71S, OBUS, MH

Other notable car share programs in the City of Sacramento include Envoy and GIG Car Share, both of which received funding in Sacramento from Electrify America's Sac-to-Zero initiative. Envoy is a round-trip ZEV care share service located at 40+ multifamily apartment complexes, with a majority serving low income or disadvantaged residents. GIG Care Share is the nation's largest free-floating ZEV car sharing program, with 260 all-electric vehicles in Sacramento. Recent data from GIG for the Oakland area in 2017 found that GIG cars were used 2.7 times more than privately-owned cars, based on the National Household Travel Survey's estimate that privately-owned cars are idle 94.3 percent of the time.⁶⁹

Action TR-3.5

Evidence: The Sacramento EV Blueprint evaluated examples of e-mobility hubs from other cities and created recommendations for an e-mobility hub in Sacramento, including a preliminary design concept and list of potential locations to consider. This action would take further advantage of the City's work to date and would lead to increased support for EVs within the City of Sacramento. Additionally, data collected from the development of a mobility hub pilot project in the City of Austin in 2018 suggested that mobility hubs can shift mode-share from single-passenger vehicles to walking or biking.⁷⁰ Efforts to evaluate and seek funding for e-mobility hubs are underway in collaboration with the Sacramento Metropolitan Air Quality Management District, the Sacramento Municipal Utility District, and other local partners.

Action TR-3.6

Evidence: In 2016, the City passed ordinance 15.08.190 to expedite the application process for EV charging station installation in accordance with Assembly Bill (AB) 1236. The City of Sacramento is one of only 40 cities and counties to have effectively developed and implemented a streamlined EVCS permitting process in accordance with AB 1236 to date. All application materials and requirements can be found on the City's website, including a simple checklist that applicants use to ensure they have all required materials included in the application. Applications can be submitted via e-mail providing additional convenience to applicants. If all required documents are submitted, applicants can expect to have their expedited EVCS building permits reviewed and approved within 24 hours for residential applications and approximately five business days for non-residential applications – both exceeding the best practices recommended by the Governor's office. Expedited implementation is supported by ongoing collaboration across the departments of Community Development and Public Works. It has further demonstrated the City's dedication to improving local air-quality, achieving community-wide climate and energy goals, and ensuring that zero-emission vehicles can be accessible and utilized by all community members.

Evidence: SMUD has a long history of supporting EV charging infrastructure in the City of Sacramento. SMUD also owns and operates 6 DCFC stations in Sacramento County.⁷¹ SMUD's past and ongoing work to bring public EV chargers to Sacramento will be supplemented by this action to provide substantial incentives for EV owners to install their own chargers at home, where a majority of EV charging occurs. As of 2020, SMUD will offer \$500 for each new electric circuit and up to

69 file:///C:/Users/ajared/Downloads/2018-10-30%20Item%2032%20One-Way%20Car%20Share%20%E2%80%93%20Mid-Pilot%20Program%20Report.pdf

70 <https://rmi.org/wp-content/uploads/2018/12/rmi-mobility-hub-report-2018.pdf>

71 http://www.cityofsacramento.org/-/media/Corporate/Files/Public-Works/Electric-Vehicles/EVStrategy_171212_FINAL_CityOfSacramento.pdf?la=en

\$2,500 if a panel upgrade is also required, as well as a free Level II charger⁷². SMUD also offers a \$1,500 incentive for each Level II charger port at businesses, with up to 20 incentives available per business.⁷³

Action TR-3.7

Evidence: While not directly quantifiable, EV charging fees will increase turnover at charging stations, helping to promote equitable access to EV charging infrastructure and encourage widespread EV adoption across a greater demographic range. This will be coupled with increased parking fees for non-EV, encouraging use of both EVs and/or active transit.

Action TR-3.8

Evidence: Curb space is a major resource within the City serving multiple functions relating to mobility. By continuing to price curb space appropriately and preparing for a change to autonomous vehicles, the City of Sacramento can ensure the highest and best use of this limited resource.

Action TR-3.9

Evidence: The State of California is the City's largest employer and has implemented various initiatives to increase its ZEV fleet and available ZEV charging infrastructure for employees.⁷⁴ This action would also benefit other major employers interested in providing workplace charging. Sacramento City Unified School District (SCUSD), for example, has an EV workplace charging program and offers 6 charging stations available for employees.⁷⁵

Action TR-3.10

Evidence: The countywide CALeVIP incentive is anticipated to bring additional public DCFC and L2 workplace or fleet chargers. Rebates are reserved for at least 400 new or replacement L2 chargers, and additional community wide L2 chargers, and 76 new DCFC units.⁷⁶ SMUD incentives are detailed under Action TR-3.6. The City of Sacramento is in the top three of California cities for EV promotion activities. As the City's EV programs continue to expand, outreach surrounding incentives for installing Level II chargers on private property will support the City's targets and this overall measure.

Action TR-3.11

Evidence: Providing information on existing and future programs, incentives, resources, and benefits of electric vehicle adoption to the community will increase adoption and contribute to the overall goal of electrified VMT in the City.

Action TR-3.12

Evidence: City staff are continuously evaluating emerging opportunity areas including:

- Expanded EVSE at City facilities

72 <https://www.smud.org/en/Rebates-and-Savings-Tips/Improve-Home-Efficiency/Go-Electric-Bonus-Package>

<https://www.smud.org/en/Rebates-and-Savings-Tips/Improve-Home-Efficiency/Go-Electric-Bonus-Package>

73 <https://fundingwizard.arb.ca.gov/rebates/11363>

74 <https://www.green.ca.gov/fleet/about/initiatives/>

75 <https://www.scusd.edu/ev-workplace-charging-program>

76 Data provided by City of Sacramento

City of Sacramento Climate Action and Adaptation Plan

- Workforce development and job training for emerging ZEV industries
- E-Mobility hubs that connect multiple modes of transportation
- Community incentive programs and resources for low-income and disadvantaged communities
- Education and outreach
- Operationalizing equity & flexibility
- Public-private partnerships for acceleration of shared mobility programs and transit

While not directly quantifiable, this action will help ensure the City prioritizes the most impactful technologies and solutions as the ZEV landscape changes, maximizing on benefits from other actions and supporting the overall measure.

5 Waste

<p><i>Measure W-1</i></p> <p><i>Work to reduce organic waste disposal 75% below 2014 levels by 2025</i></p>	<p><i>2030 Target</i></p> <p><i>134,991 MT CO₂e</i></p> <p><i>2045 Target</i></p> <p><i>160,897 MT CO₂e</i></p>
<p>Performance Metrics:</p> <ul style="list-style-type: none"> ▪ Compliance with SB 1383 requirements by 2025 ▪ Compost or otherwise divert at least 75% of organic waste in 2025 relative to 2014 ▪ Recover 20% of edible food by 2025 ▪ Maintain or improve these metrics through 2030 	

Action #	Action	Anticipated Reduction
Quantitative Actions		
W-1.1	Implement the requirements of SB 1383 to compost or otherwise divert 75% of organic waste compared to 2014 levels by: <ul style="list-style-type: none"> ▪ Providing organic waste collection to all residents and businesses. ▪ Establishing an edible food recovery program that recovers edible food from the waste stream and redistributes the food to local community organizations to be used or eaten. ▪ Conducting outreach and education to affected parties, including generators, haulers, facilities, edible food recovery organizations, and city/county departments. ▪ Conducting capacity planning and evaluate your jurisdiction's readiness to implement SB 1383. ▪ Procuring organic waste products like compost, mulch, and RNG. ▪ Inspecting and enforcing compliance with SB 1383. 	134,991 MT CO ₂ e (2030) 160,897 MT CO ₂ e (2045)
Supportive Actions		
W-1.2	Work with regional partners (other municipalities) and the private sector to assess the feasibility of siting long term organics processing facilities in or near Sacramento County.	Supportive
W-1.3	Continue to provide backyard compost education and reduced-cost compost bins as well as kitchen-top food waste containers to participating residents.	Supportive
W-1.4	Implement a food waste diversion program for single-family residential customers by 2022.	Supportive
W-1.5	Enforce new commercial waste code which requires businesses to subscribe to organics recycling collection service through the City's franchised commercial haulers starting July 1, 2021.	Supportive

Action #	Action	Anticipated Reduction
W-1.6	Serve as a regional partner in the development and implementation of an edible food recovery program which connects commercial edible food generators with local food banks, to recover at least 20% of the edible food that is currently disposed of for human consumption, consistent with SB 1383.	Supportive
W-1.7	Explore the feasibility of capital improvement projects for reducing organics in the waste stream, such as organics extraction presses and anaerobic digesters.	Supportive
W-1.8	Consider adopting, if needed, an ordinance that aligns with AB 827, the state law that requires most restaurants to have front-of-house composting.	Supportive

5.1 Measure W-1 Quantification

SB 1383 was adopted in 2016 and is a landmark waste mandate that requires the state to reduce organic waste disposal by 75% by 2025, or by about 20 million tons annually. The law also requires the state to increase edible food recovery by 20 percent by 2025. Since the requirements of SB 1383 fall on the City in many regards, the impacts of SB 1383 were not included in the adjusted forecast. Instead, they are accounted for here as actions for the City to complete as part of the CAAP implementation. CalRecycle describes the requirements of local governments in meeting these targets as follows⁷⁷:

- Provide organic waste collection to all residents and businesses
- Establish an edible food recovery program that recovers edible food from the waste stream
- Conduct outreach and education to affected parties, including generators, haulers, facilities, edible food recovery organizations, and city/county departments
- Capacity Planning: Evaluating your jurisdiction's readiness to implement SB 1383
- Procure recycled organic waste products like compost, mulch, and renewable natural gas (RNG)
- Inspect and enforce compliance with SB 1383
- Maintain accurate and timely records of SB 1383 compliance

Action W-1.1

The actions listed above for the CAAP are a summary of the complete list of actions required to comply with SB 1383. More information on the requirements of SB1383 which the City would adopt in some form are included below:

Expand local organics collection program: Increase organics collection by offering technical assistance and outreach to commercial and residential accounts and planning for expanded processing capacity.

- Desired Result
 - 50% reduction in landfilled organic waste by 2020
 - 75% reduction in landfilled organic waste by 2025
 - Reduce greenhouse gas emissions by 4 million metric tons statewide by 2030

⁷⁷<https://www.calrecycle.ca.gov/organics/slcp/education#:~:text=The%20SB%201383%20draft%20regulations,and%20other%20food%20recovery%20organizations.>

- Benefits
 - Compliance with SB1383 state regulation
 - Public health benefits
 - Green economy (expanded organics processing facilities and jobs)
- Key Steps
 - As stated in CalRecycle’s SB 1383 regulations⁷⁸, the City of Sacramento must engage in organic waste recycling capacity planning by supporting Sacramento County in executing the following actions:
 - Estimate Sacramento’s disposal of organic waste (tons)
 - Identify and verify amount of available organic waste recycling infrastructure
 - Estimate the amount of new or expanded capacity needed to process organic waste
 - If existing and planned capacity is insufficient based on this process, the City of Sacramento shall support Sacramento County efforts to:
 - Develop and submit an implementation schedule highlighting planning effort to provide enough new or expanded organics capacity, including timelines and relevant milestones, by the end of the report period
 - Identify proposed new or expanded facilities that could be used for additional capacity
 - Expand organic waste collection for all commercial and residential generators
 - Require organics generators to subscribe to organics collection programs or alternatively report organics self-hauling and/or backhauling
 - Work with the City of Sacramento’s Recycling and Solid Waste Division and franchise waste haulers to collect organic waste and verify facility where they will transport organic waste (with exclusions of haulers transporting source-separated organic waste to a community-scale composting site and haulers transporting construction and demolition (C&D) waste in compliance with CALGreen)
 - Allow limited waivers and exemptions to generators for *de minimus* volumes and physical space constraints and maintain records for waivers/exemptions
 - Standardize all colors and labels for carts, dumpsters, debris boxes, compactors for garbage, recycling, and organics based on SB 1383 statewide requirements
 - Develop and implement an education and outreach program that provides compliance assistance to organics generators.
 - Identify percentage of organics generators who are “limited English-Speaking households” or “linguistically isolated.” If more than five percent (5%) of Sacramento’s organics generators are defined as “limited English-speaking households” or linguistically isolated,” provide education and outreach in a language or languages that will assure the information is understood by that community
 - Prior to February 2022 and annually thereafter, provide organics generators the following information:
 - Requirements to properly separate materials
 - Organic waste prevention and on-site recycling

⁷⁸ Key actions are extracted from the second draft of the proposed SB 1383 regulations text.

- Methane reduction benefits
- How to implement organic waste collection services with AVI
- Information related to edible food donation
- Implement inspection and compliance program with defined enforcement mechanisms and penalties by January 31, 2022 and annually thereafter
 - Perform compliance review of all commercial garbage accounts that generate 2 cubic yards or more per week of organics and solid waste
 - Conduct annual contamination inspections and route reviews on randomly selected accounts and waste containers or conduct waste evaluations twice a year that meet the guidelines outlined in Article 3 of SB 1383
 - Enforce penalties for noncompliant entities as required by Article 16 of SB 1383.
- Maintain records, including an initial compliance report, annual report, and implementation record as required by Articles 3, 14, and 16 of SB 1383.

Increase edible food recovery: Develop and implement an edible food recovery program which connects large food generators with local food banks, to recover at least 20% of the edible food that is currently disposed of for human consumption, consistent with SB1383.

- Desired Result
 - 20% increase in recovery of currently disposed edible food from large food generators to food banks and hunger relief organizations
 - Reduction in landfilled organic waste
- Benefits
 - Compliance with SB1383 state regulation.
 - Reduction in food insecurity.
 - New or enhanced community connections via more active and/or extensive donation networks.
 - Support for businesses, which may receive tax incentives for donations.
- Key Action
 - Recover at least 20% of the edible food that is currently disposed of for human consumption by 2025, consistent with SB1383
 - Conduct edible food recovery capacity planning by executing the following actions:
 - Estimate the amount of edible food that will be disposed by organics generators in Sacramento
 - Identify the minimum capacity required to recover 20% of edible food that is estimated to be disposed
 - Work with commercial food generators to reduce excess edible food generation:
 - Connect large food generators to food banks and food recovery organizations
 - Consider the adoption of an edible food recovery ordinance or similarly enforceable mechanism to ensure that large edible food generators connect with local food recovery programs
 - Implement an inspection and compliance program with defined enforcement mechanisms and penalties targeted towards food generators and food recovery agencies as required by SB 1383

- Maintain an initial compliance report, implementation record, and annual report as required SB 1383

Implement organics procurement: Increase municipal procurement of recovered organic waste products and post-consumer fiber products.

- Desired Result
 - Reduction in landfilled organics via bolstering the market for recycled organics products.
- Benefits
 - Carbon sequestration through use of purchased compost
 - Beautified landscapes through application of purchased compost
 - Public health benefits (Reduced particulate emissions from fossil fuels via increased use of clean energy sources)
- Key Actions
 - As stated in CalRecycle’s proposed SB 1383 regulations, the City of Sacramento must procure a quantity of recovered organic waste that meets or exceeds the organic waste product procurement targets for the City of Sacramento. Recovered organic waste products that a jurisdiction may procure to achieve compliance are: 1) compost, 2) renewable natural gas for transportation, electricity, heating applications, 3) pipeline ejection, or 4) electricity from biomass conversion
 - Ensure that at least 75% of City of Sacramento’s annual purchase of paper products, printing paper, and writing paper is paper with a at least 30 percent post-consumer fiber paper. Require paper suppliers to certify minimum percentage of post-consumer material
 - Procure and use compost to meet California Model Water Efficient Landscape Ordinance (WELO) requirement for incorporating compost into new and renovated permitted landscapes (at least four cubic yards per 1,000 sq. ft. to a depth of six inches of compost)
 - Implement an inspection and compliance program with defined enforcement mechanisms and penalties, as required by Article 16 in SB 1383
 - Maintain records, including an initial compliance report, annual report, and implementation record as required by Articles 3, 14, and 16 of SB 1383

Evidence: The requirements and actions associated with SB 1383 have been developed to produce a 75% reduction in organics by the State of California.⁷⁹ Therefore, by taking the actions required, the City of Sacramento can expect to achieve a similar reduction level. The emissions reductions associated with a 75% reduction in organics was calculated using the 2014 waste characterization study for the County of Sacramento pursuant to the SB 1383 guidelines. A 75% reduction was applied in 2025 and continued through 2030 and the reduced amount was multiplied by CARB’s emission factor for mixed organics (.31 MT/short ton).⁸⁰ Total emissions reductions are estimated to be 51,429 MT of CO₂e in 2030.

⁷⁹ https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383

⁸⁰ https://www.epa.gov/sites/production/files/2019-06/documents/warm_v15_organics.pdf

Quantification Results Summary

Action W-1.1	2030	2045
Percentage of waste that is organics	27%	27%
Total Waste (tons) ⁸¹	704,696	839,935
Organic tons	188,506	224,683
Organics reduced by SB 1383 (75%)	141,380	168,512
Organics Emission Factor ⁸²	0.364	0.364
Emissions Saved (MT CO ₂ e)	51,429	61,298

5.2 Measure W-1 Supportive Actions

Action W-1.2

Evidence: Identifying a regional organics processing facility is a key step in diverting the required organics specified by SB 1383. Having a close facility will also reduce VMT compared trucking waste to a less local destination. Permitting is currently a hurdle for facilities in Sacramento County due local quality challenges and standards; however, other nearby regional areas may be identified.

Action W-1.3

Evidence: Sacramento currently provides backyard composting education, reduced-cost compost bins, and kitchen-top food containers to residents.⁸³ Providing compost buckets to residents will remove barriers to composting and allow for more organics to be diverted from the waste stream. Providing free buckets is also an equity benefit.

Action W-1.4

Evidence: The implementation of a food waste diversion program for all residents is a key action in achieving the SB 1383 goals. However, it is only a portion of the SB 1383 strategy and is not quantified here in order to avoid double counting.

Action W-1.5

Evidence: This measure would increase organics diversion and contribute to the overall SB 1383 reduction target.

Action W-1.6

Evidence: This action is required by SB 1383. Diverting edible food waste will both reduce GHG emissions and potentially reduce hunger and improve equity in the City.

Action W-1.7

Evidence: Continuing to explore new technologies in waste diversion may allow Sacramento to better reach its long-term waste goals.

⁸¹ See Community Inventory and Forecast in Appendix A

⁸² <https://ww3.arb.ca.gov/cc/waste/cerffinal.pdf>

⁸³ <https://www.cityofsacramento.org/Public-Works/RSW/Collection-Services/Garbage/Composting>

Action W-1.8

Evidence: Some cities have introduced ordinances to mandate commercial compost collection, including San Francisco, Portland, Seattle, and Boulder, among others. Boulder approved a Universal Zero Waste Ordinance in 2015, which requires that every home, business, and apartment have recycle and composting services, including front of house composting at restaurants. A waste audit study conducted by Eco-Cycle at food service establishments in Boulder found that food establishments of all types can achieve food waste capture rates (57-98%) through FOH collection with minimal contamination rates (1-22%).⁸⁴ This suggests that FOH collection can be a key source of compost material for composting facilities. The study also found that clear signage improved contamination rates for compost collection. FOH composting may also be more successful at establishments that offer compostable service ware or durable service ware.

Composting not only reduces methane emissions from decomposing food scraps in the landfill, but can also increase carbon sequestration when the compost is applied to soil.⁸⁵ Increasing compost added to soil has the additional indirect benefits of decreasing the need for fertilizers (reducing GHGs produced from their production) and improving tillage and workability of soil (reducing GHG produced from working the soil). CARB estimates that approximately 0.69 MT CO₂e is avoided per ton of food waste, arising from decreased methane emissions, soil erosion, and fertilizer usage.⁸⁶ In addition, the US EPA estimates that approximately 183 kg (0.183 MT) of CO₂ is sequestered by one ton of wet compost,⁸⁷ suggesting an overall emissions reduction of 0.873 MT CO₂e per ton of composted waste.

84 <https://www.ecocycle.org/files/pdfs/Reports/front-of-house-composting-study-ecocycle.pdf>

85 [sciencedirect.com/science/article/pii/S0960852408010572](https://www.sciencedirect.com/science/article/pii/S0960852408010572)

86 <https://ww3.arb.ca.gov/cc/waste/cerffinal.pdf> (see Table 10)

87 <https://www.ncurproceedings.org/ojs/index.php/NCUR2016/article/download/1698/893>

6 Carbon Sequestration

Measure CS-1:

Increase urban tree canopy cover to 25% by 2030 and 35% by 2045

2030 Target

23,053 MT CO₂e (Sequestered)

2045 Target

61,474 MT CO₂e (Sequestered)

Performance Metric(s):

- Achieve 25% urban tree canopy cover by 2030 consistent with the Urban Forestry Master Plan
- Achieve 35% urban tree canopy cover by 2045

Action #	Action	Anticipated Reduction
Quantitative Actions		
CS-1.1	Implement the Urban Forest Master Plan with a goal to achieve 25% urban canopy cover by 2030 and 35% by 2045. Prioritize tree planting in areas with the lowest average tree canopy cover and explore strategies to reduce barriers to tree planting in disadvantaged areas and improve tree health.	23,053 MT CO ₂ e (2030) 61,474 MT CO ₂ e (2045)
Supportive Actions		
CS-1.2	Utilize compost and mulch for application to City-owned trees and planters to increase the carbon sequestration potential of tree plantings.	Supportive
CS-1.3	Develop online educational materials about tree species that are adapted to Sacramento's climate and resilient to drought and climate change.	Supportive
CS-1.4	Continue to support the SMUD/Sacramento Tree Foundation program which provides free shade trees for residents and businesses and support increased plantings on private property in areas that are under-canopied through new partnerships and programs.	Supportive

6.1 Measure CS-1 Quantification

Carbon sequestration is the process by which carbon is taken out of the atmosphere and sequestered in soil, vegetation, or manmade structures. This measure deals with the carbon sequestration achieved by plants through photosynthesis whereby trees and other green plant pull CO₂ out of the atmosphere, use the carbon to grow, and release oxygen. According to the City of Sacramento's Urban Tree Canopy Assessment the current urban forest sequesters 73,000 MT of CO₂e per year and covers 19% of the City.⁸⁸ Expanding the urban forest to cover 25% of the City would be equivalent to an expansion of 6%.

⁸⁸ <https://www.cityofsacramento.org/-/media/Corporate/Files/Public-Works/Maintenance-Services/Urban-Forest-Master-Plan/Copy-of-Sacramento-UTC-Assessment-20180515.pdf?la=en>

Action CS-1.1

Evidence: The growth of trees and other vegetation sequesters carbon.⁸⁹ According to the 2018 Urban Tree Canopy Assessment which mapped urban tree canopy using high-resolution aerial imagery and infrared technology to remotely map tree canopy and land cover in the City of Sacramento approximately 19% of the City has tree canopy cover. This vegetation sequesters approximately 73,000 MT of CO₂e per year. If the City were to increase the tree canopy cover to 25% it would increase total sequestration by 32%.

Quantification Results Summary

Action CS-1.1	2030	2045
Total tree canopy coverage in 2018	19%	19%
Total tree canopy coverage goal	25%	35%
Annual sequestration in 2018	73,000	73,000
Percent increase in canopy coverage	6%	16%
Net MT CO ₂ e Savings	23,053	61,474

6.2 Measure CS-1 Supportive Actions

Action CS-1.2

Evidence: This action will help Sacramento meet the compost procurement goals of SB 1383 and increase the carbon sequestration potential of the land in Sacramento. Compost application is associated with increased carbon sequestration.⁹⁰

Action CS-1.3

Evidence: This supportive action will help the community better understand the impacts of climate change as well as identify which tree species will be best suited to Sacramento's future climate.

Action CS-1.4

Evidence: Providing the community with free trees to plant will provide multiple benefits including education on the benefits of trees in Sacramento, increased tree canopy, and increased awareness of climate change and climate adaptation and mitigation actions.

⁸⁹ https://www.nrs.fs.fed.us/pubs/jrnl/2002/ne_2002_nowak_002.pdf

⁹⁰ <https://www.calrecycle.ca.gov/organics/compostmulch/toolbox/carbonsequest>

7 Water and Wastewater

<i>Measure WW-1</i>	<i>2030 Target</i>
<i>Reduce water utility emissions (in MT of CO₂e per million gallon delivered) by 100% by 2030 and maintain that through 2045</i>	<i>6,296 MT CO₂e</i>
	<i>2045 Target</i>
	<i>0 MT CO₂e</i>

Performance Metrics:

- Utilize carbon neutral power for 100% of water utility electricity demands by 2030

Action #	Action	Anticipated Reduction
Quantitative Actions		
WW-1.1	Reduce GHG emissions associated with the water utility by procuring 100% carbon neutral electricity by 2030.	6,877 MT CO ₂ e (2030) 0 MT CO ₂ e (2045)
Supportive Actions		
WW-1.2	Investigate the feasibility of allowing on-site non potable treatment and distributed water resources in new development.	Supportive
WW-1.3	Continue to implement the Model Water Efficient Landscape Ordinance each year.	Supportive
WW-1.4	Continue to require the use of low impact development (LID) strategies for new construction and development.	Supportive
WW-1.5	Continue to investigate the landscaping/irrigation use of non-potable reclaimed water from regional sanitation at parks.	Supportive
WW-1.6	Increase the use of renewable energy and storage to reduce GHG emissions and increase resiliency for critical infrastructure.	Supportive
WW-1.7	Continue to encourage efficient water use by residents and businesses through expanded education, incentives and assistance services in compliance with Assembly Bill 1668 and Senate Bill 606, which help reduce the City's water demand and related energy use.	Supportive

7.1 Measure WW-1 Quantification

GHG emissions from water treatment and distribution are 100% attributable to electricity generation. Therefore, the primary measure for reducing GHG emissions is to reduce the emissions associated with electricity used to pump and treat water within the City of Sacramento. By 2030 the water utility will procure 100% carbon free electricity and reduce GHG emission on a per acre foot basis to zero. Additional supportive measures such as water conservation, greywater, and stormwater management will further this goal and reduce the amount of electricity needed by reducing overall water demand as the City continues to grow.

Action WW-1.1

Evidence: Reducing the emission factor of electricity used to pump and treat water to zero would increase the expected reductions from SB 100 by 6,877 MT of CO₂e per year. By 2045, SB 100 will be fully implemented and therefore, procuring carbon neutral electricity will no longer provide a benefit above and beyond the adjusted forecast from which GHG emission reductions are calculated. This measure was not included in Measure E-2 to avoid double counting.

Quantification Results Summary

Action WW-1.1	2030	2045
Projected Electricity Use (kWh)	52,793,843	0
Projected Emission Factor (MT CO ₂ e/kWh)	0.000119	0.0
Projected Emissions (With SB 100)	6,296	0
Emission Factor with Measure E-1 (MT CO ₂ e/kWh)	0.0	0.0
GHG Emissions with Measure E-1 (MT CO ₂ e/kWh)	0	0
GHG Emissions Savings (MT CO ₂ e)	6,296	0

7.2 Measure WW-1 Supportive Actions

Action WW-1.2

Evidence: As part of SB 966, the City of Sacramento is investigating the feasibility of on-site treatment and reuse of non-potable water use in multifamily residential, commercial, and mixed-use buildings. When enacted, a policy of this kind could greatly decrease the amount of potable water consumption.

Action WW-1.3

Evidence: The City will continue to report for the Model Water Efficient Landscape Ordinance on an annual basis and investigate areas for enhanced landscape water conservation.

Action WW-1.4

Evidence: When new projects are permitted in the City of Sacramento, the City will review and encourage applicants to use green infrastructure and low impact development strategies. These strategies can increase stormwater retention and groundwater infiltration.

Action WW-1.5

Evidence: The City will continue to investigate the efficacy of reclaimed water application for non-potable uses at area schools. Reclaimed water use reduces the consumption of potable water both protecting a limited resource and reducing the energy needed to pump and treat potable water.

Action WW-1.6

Evidence: Installing renewable energy and battery storage projects to support the City's water services will improve local grid resiliency and reduce GHG emissions associated with those services.

Action WW-1.7

Evidence: Improving water use efficiency decreases the energy need per person associated with water conveyance and treatment. Reducing energy demand helps reduce associated GHG emissions.

<p>Measure WW-2 Reduce wastewater emissions by 22% by 2030 and 40% by 2045</p>	<p>2030 Target 5,495 MT CO₂e</p> <p>2045 Target 11,517 MT CO₂e</p>
<p>Performance Metrics:</p> <ul style="list-style-type: none"> None – projects to reduce wastewater emissions were completed before release of the CAAP 	

Action #	Action	Anticipated Reduction
Quantitative Actions		
WW-2.1	Regional San implements biogas recovery and improvement projects.	993 MT CO ₂ e (2030) 1,171 MT CO ₂ e (2045)
WW-2.2	GHG Emissions Reductions from SB 100 implementation by Regional San.	4,572 MT CO ₂ e (2030) 11,681 MT CO ₂ e (2045)
WW-2.3	Regional San implements solar PV generation project.	389 MT CO ₂ e (2030) 0 MT CO ₂ e (2045)

7.3 Measure WW-2 Quantification

Although GHG emissions from wastewater are generated by the Sacramento Community, operational control of the wastewater treatment facility is covered by Regional San. This means the City of Sacramento has no direct levers to reduce these emissions. However, since the GHG emissions associated with wastewater are included in the GHG emissions inventory, several of the GHG reducing activities which Regional San has undertaken are included here. The City of Sacramento and SMUD will continue to support Regional San in these and future partnerships to further reduce emissions from the wastewater sector.

Action WW-2.1

Evidence: Regional San has operated a biogas recovery project which collects digester gas and utilizes it to generate electricity in a SMUD-owned cogeneration facility. The combustion of the biogas reduces methane emissions, a powerful short-lived climate pollutant able to trap over 25 times more heat in the atmosphere than carbon dioxide does over a 100-year period, meaning that it has a much higher climate change impact. The biogenic CO₂⁹¹ created in the biogas recovery and combustion process has a much smaller impact on global warming. This program has reduced methane emissions from the facility by 96% to 0.454 tons per year.⁹² Sacramento’s GHG inventory estimated methane emissions at 32 tons in 2016. To calculate the expected reduction in methane

⁹¹ Biogenic CO₂ is CO₂ released as the result of the combustion or decomposition of organic material (biomass), as opposed to anthropogenic or fossil CO₂ which results from the combustion of fossil fuels.

⁹² <https://www.regionalsan.com/biogas-recycling>

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emissions from the biogas program into the future, a per service person⁹³ methane value was calculated (0.000040 MT CH₄/person) and the service person forecast for each target year was applied.

Quantification Results Summary

Action WW-2.1	2030	2045
2016 estimated methane production	32	32
Estimated CH ₄ emissions per service person	0.000040	0.000040
MT CH ₄ in target year	38.7	45.1
Estimated BAU emissions	967	1,127
96% reduction in emissions	47	64
GHG Emissions Savings (MT CO ₂ e)	920	1,063

Action WW-2.2

Evidence: Because a majority of emissions associated with wastewater are from process emissions, specifically the generation of CH₄ and N₂O, SB 100 impacts were not included in the adjusted forecast. However, a projected 40,108 MWh of electricity are expected to be used to treat Sacramento's wastewater in 2030 and 46,749 MWh of electricity in 2045.⁹⁴ Emissions associated with this electricity are expected to go to zero by 2045.

Quantification Results Summary

Action WW-2.2	2030	2045
Projected electricity use (MWh)	40,108	46,749
BAU emission factor (MT CO ₂ e/MWh)	0.2236	0.2236
Projected emission factor (MT CO ₂ e/kWh)	0.000119	0.0
Emissions under BAU scenario	8,968	10,453
Emissions with SB 100	4,783	0
GHG emissions savings (MT CO ₂ e)	4,185	10,453

Action WW-2.3

Evidence: In 2018 Regional San installed a 4.2-megawatt solar array which provides an estimated 10% of its operational electricity. In 2016 it was estimated that approximately 32,645 MWh were used to treat wastewater from the City of Sacramento. Offsetting 10% of this usage would reduce GHG emission by approximately 389 MT of CO₂e. However, by 2045, due to SB 100 (calculated in Action 2) reduces the GHG benefit of the solar array to zero to avoid double counting.

⁹³ Service person counts both residents and employees (i.e., population + jobs) to account for activities associated with both. Per service person metrics are calculated as the metric divided by the service population (e.g., community GHG emissions divided by service population).

⁹⁴ See Community Inventory and Forecast in Appendix A.

Quantification Results Summary

Action WW-2.3	2030	2045
Projected offset of electricity use (kWh)	10%	10%
Estimated electricity use attributable to Sacramento in 2016 (kWh)	32,645	32,645
Electricity offset by solar PV (kWh)	3,264.5	3,264.5
Emission Factor from SMUD (MT CO ₂ e/kWh)	0.000119	0.0
GHG emissions savings (MT CO ₂ e)	389	0



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Appendix D – Funding and Financing Strategy Administrative Draft

prepared by

Rincon Consultants, Inc.
449 15th Street, Suite 300
Oakland, California 94609

and

BAE Urban Economics
803 2nd Street, Suite A
Davis, California 95616

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1 Introduction

Recognizing the importance of Climate Action and Adaptation Plan (CAAP) implementation, the Sacramento City Council allocated approximately \$4.5 million in one-time money to seed near-term CAAP activities in its 2020-21 budget. However, full implementation will require a substantial long-term commitment on the part of the City and other entities to fund necessary CAAP investments. This appendix presents a summary of the anticipated costs to the City of Sacramento to implement the CAAP and a strategy to approach funding Priority City-led CAAP Measures that require City funding over the next 20 years (i.e., through 2040).

Complete implementation of the CAAP is estimated at a minimum of \$3.2 billion in direct City investments, investments from private citizens, businesses, and other agencies will also be needed, as well as substantial commitment of staff time. Though many of these investments will provide substantial savings to Sacramento and the community over time, full implementation will require the City to consider funding from a wide range of potential sources. This Appendix provides a starting point of the high-level¹ costs associated with the measures and actions in the CAAP, as well as a strategy of how the City could focus its efforts on securing the funding for the approximately \$616 million in primary CAAP actions. These strategies include various new funding options including development impact fees, grant funding from various sources, motor vehicle registration surcharges, and a tax on transportation network company (TNC) operations. Most of these would require voter approval and/or legislative actions.

Section 2 of the document organizes the specific actions in the CAAP into three categories of high, moderate, and low costs. Those actions that are expected to be either moderate or high cost are then provided with a high-level cost estimate and potential funding and financing sources. As actions are further defined and implemented, additional funding options are expected to be identified. Estimates have not been provided for low-level cost actions.

Section 3 provides additional information on the potential funding and financing strategies that the City has access to as it further defines and implements the actions in the CAAP. This guide is a starting point for the City and its partners to identify the resources required to reach its greenhouse gas (GHG) reduction targets. Finally, Section 3 also provides a more detailed financing plan for several core CAAP implementation strategies that have more well-defined project specifics and also provide significant GHG reductions.

¹ This is a high-level estimate which does not include an estimate of low-cost measures.

2 Measure Costs

As part of its updated CAAP, the City has developed a comprehensive strategy for reducing community-wide GHG emissions over time. However, bringing the City to carbon neutrality requires significant, strategic investments into many elements of the community, including new policies, infrastructure, and behavior change on the part of the community. In order to develop transparency around the prioritization of these aforementioned measures, this technical appendix details the estimated cost to the City associated with the implementation of many of the City's most impactful measures.

This document focuses on the cost of implementation to the City and not on the potential costs and savings to the community in general. While the CAAP focused on cost-effective and even cost-saving actions, such as new building electrification (which costs less to both build and operate)² or owning electric vehicles which have lower lifecycle costs than internal combustion vehicles³, the details of upfront costs and lifecycle savings for individual community members will be identified during implementation. One example of this is the Existing Building Electrification Strategy that will provide a deep dive on community costs and savings associated with existing building electrification. Costs associated with many of the other actions in the CAAP, such as new bike lanes and expanded transit, will have major benefits for community members and costs that will ultimately depend on how they are funded and financed.

The measures listed below have been broken down into three cost segments which include:

- 1. Low-Cost.** Low-cost measures are the low-hanging fruit for the City to reduce emissions, generally delineated as measures associated with relatively low-upfront costs. These actions are assumed to be handled through existing resources or through smaller low-cost changes, such as policies and ordinance.
- 2. Moderate-Cost.** This segment includes measures with an intermediate level of costs for implementation. These measures will require additional funding or increase short-term costs to the City and community (e.g., electric vehicle [EV] charging infrastructure and program development)
- 3. High-Cost.** This segment includes longer term projects that require substantial investments over time to reduce emissions, (e.g., new infrastructure and transit). These measures will require significant investment that cannot be paid for by the City alone. Funding and financing will be key to the implementation of these measures.

While many of the low-cost items listed below could be covered by current staff time on an individual basis, the cumulative impact of the CAAP and its many actions will likely necessitate additional sustainability staff. Hiring additional staff results in long-term costs that are not covered by grants. In addition to the need for additional staff resources, one potential opportunity that is not tied to any single CAAP action is to apply to host a Civic Spark Fellow who could work under the direction of the City's sustainability staff to help with CAAP implementation activities. Civic Spark Fellows are provided through an AmeriCorps program that places Fellows with local governments and other entities that are engaged in sustainability projects. Most of the cost of the Fellows is

² <https://explorer.localenergycodes.com/jurisdiction/sacramento-city/summary>

³ <https://advocacy.consumerreports.org/wp-content/uploads/2020/10/EV-Ownership-Cost-Final-Report-1.pdf>

covered by the Civic Spark program, meaning that a General Fund allocation to cover the City's required local fiscal contribution could leverage the Civic Spark program to secure more staffing than the City could otherwise afford to support.

Table 1 below includes each measure and the corresponding cost bucket. For measures falling into the moderate or high-cost bucket, costs have been estimated, and funding and financing strategies have been provided. A more detailed funding analysis has been completed for a subset of key CAAP measures and is included in Section 3 - Funding Strategy.

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Table 1 Measure Cost and Funding Strategies

Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Built Environment	E-1.1	Support SMUD in the implementation of the 2030 Zero Carbon Plan.		SMUD Zero Carbon Plan	Carbon free electricity through SMUD by 2030.	1	Low (through rates)	https://www.smud.org/en/Corporate/Environmental-Leadership/2030-Clean-Energy-Vision
Built Environment	E-2.1	Develop and adopt an electrification ordinance that requires all new construction under four stories to be all-electric by 2023 and all construction to be all-electric by 2026.		SMUD Advanced Commercial Solutions Program	SMUD Advanced Commercial Solutions currently provides assistance and incentives of up to \$5,000 per unit to private individuals and the building industry for new buildings (electrification and energy efficiency).	1	No/Low Upfront Costs to Developers, Cost Savings Over Lifecycle	In-kind staff time to develop and adopt Ordinance. Assumes that SMUD will continue to provide incentives for new development to incorporate electric appliances. https://explorer.localenergycodes.com
				SMUD All Electric Smart Home Program	Currently SMUD provides incentives up to \$5,000 per unit.			
Built Environment	E-3.1	Develop a comprehensive existing building electrification strategy that identifies associated costs and addresses potential equity impacts prior to implementation of mandatory requirements.	City	City	–	1	One time consulting fee budget of \$130,000 established with existing funding allocations.	Cost of implementing existing building electrification strategy is TBD.
Built Environment	E-3.2	Develop an electrification ordinance for existing buildings/construction that will be implemented through the building permit process to transition fossil fuels to electric by attrition following adoption of Measure E3.1. The existing construction buildings ordinance would be implemented in phases as follows: Phase 1: No new expansions of gas appliances or gas lines at existing buildings/construction (2023). Phase 2: Require HVAC system replacements, new hot water heaters, and other appliances to be all-electric or utilize other low-carbon technologies as the market evolves. (2026). Phase 3: Provide enforcement with a permit compliance program.	City Building Permit/Plan Check/Inspection Fees	SMUD Residential and commercial rebates/incentives	Rebates and incentives for energy efficient equipment. Recoup the cost of reviewing and approving construction plans and conducting inspections to ensure compliance.	1-2	Phase 1: Low Cost (See E-1-1) Phase 2: Low Cost Phase 3: To be determined through development of an existing building electrification plan.	Assumes that phases 1 & 2 are ordinances. FTE for enforcement program depends on what it is. Permit compliance would require ~seven administrative staff. SMUD Rebates and Incentives: https://www.smud.org/Rebates-and-Savings-Tips/Rebates-for-My-Home/#Home-Rebates
Built Environment	E-3.3	Work with SMUD to expand existing low-income programs within the City to weatherize and retrofit/electrify existing buildings, with the goal of reducing energy consumption, decreasing utility bills, and converting to carbon-free energy use by 2040.	Potential in-kind city staff time	SMUD Energy Assistance Program Rate (EAPR)	SMUD currently funds weatherization and energy efficiency and electrification for qualifying low-income households.	2	TBD based on results of existing building electrification strategy.	Assumes that SMUD continue to implement low-income retrofits, with support from the City with implementation and locating additional grant funding to expand programs.
				Home Energy Assistance Program (HEAP)	Provides financial assistance to qualified low-income residents as a credit on their utility bills.			Community Resource Project, Inc
				Low-Income Weatherization Program	Free energy efficiency and weatherization services and equipment for low-income households.			Community Resource Project, Inc and Grid Alternatives are SMUD's contracted service providers.

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Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Built Environment	E-3.4	Promote and educate the community about existing programs and expand electrification retrofit incentives for space and water heating to support the electrification ordinances.	TECH Switch is On	SMUD Residential and commercial rebates/incentives	SMUD Rebates and incentives for energy efficient equipment.	1	Low cost to City	Assumes that most of additional outreach and education will be by SMUD, and that any additional outreach and education can be done on an as-needed basis by existing City staff.
			Existing City resources	CDD operating budget	Links to SMUD educational materials on City websites, or inclusion of SMUD staff at City events when appropriate,		Low cost to the City	Assumes that the City will leverage existing City resources when appropriate to raise public awareness about the existence of SMUD incentives. Assumes that City staff will not advise the public about the specifics of SMUD programs or create educational content.
Built Environment	E-3.5	Provide electrification retrofit incentives for space and water heating and investigate the development of programs like financing programs or metered energy efficiency.		SMUD's Advanced Homes Program	Central air conditioner, heat pumps and induction cooking.	1	Low cost to City	Assumes that this will continue to be implemented by SMUD and that City staff will get involved when SMUD makes a specific request.
Built Environment	E-3.6	Continue to promote and incentivize electrification supportive energy efficiency in existing buildings including lighting, insulation, and air sealing upgrades through programs and financing mechanisms.		Multiple SMUD programs: Express Energy Solutions, Complete Energy Solutions, Custom Retrofit, Integrated Design Solutions	lighting, refrigeration, food service equipment, HVAC, industrial equipment, retro-commissioning, etc.	1	Low cost to City	Assumes that incentives and promotion of incentives will continue to be implemented primarily by SMUD and that City staff will get involved when SMUD makes a specific request. SMUD Rebates and Incentives: https://www.smud.org/en/Rebates-and-Savings-Tips
Built Environment	E-3.7	Work with community partners to include voluntary energy efficiency and/or GHG emissions scores at time of sale and to post results on Multiple Listing Service (MLS) or other real estate app.	New program - primarily staff time to develop and implement - could be funded with re-sale inspection type fees, or in-kind partnership with local and regional partners.			1	Low cost to City	Please note that MLS already has a "green fields" option for MLS listings. More info here: https://green.realtor/sites/files/2020-07/gdbp2018.pdf
Built Environment	E-4.1	Continue to promote and support local energy generation and storage resources.	Potential in-kind city staff time	SMUD Solar and Battery Storage Incentives		1	Low cost to City	Assumes that SMUD will promote and support local on-site energy storage and implement SMUD's IRP, but that SMUD may request in-kind staff time. SMUD Solar and Battery Storage Incentives: https://www.smud.org/en/Going-Green/Solar-for-Your-Home
Built Environment	E-4.2	Work with SMUD to site storage and renewable generation at locations in the City that would best support overall grid functionality while electrifying the building stock and maximizing the utilization of existing electrical infrastructure.	Potential in-kind city staff time	SMUD Solar and Battery Storage Incentives		1	Low cost to City	Assumes SMUD will fund and lead the development of this plan and request in-kind staff time from the City if needed. SMUD Solar and Battery Storage Incentives: https://www.smud.org/en/Going-Green/Solar-for-Your-Home

Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Built Environment	E-4.3	Work alongside SMUD to promote and further incentivize battery storage and on-site solar as a means to maximize electrification benefits and improve resiliency.	Potential in kind City staff time	Multiple SMUD Programs: Neighborhood SolarShares, Community SolarShares, Residential and Commercial Greenergy Programs.	Title24 new construction solar requirement, clean energy offsets	1	Low cost to City	Assumes that SMUD will fund and implement programs and the Building Division will support with streamlined permit processing and provide related educational materials to customers.
Built Environment	E-4.4	Develop a community solar and storage project of at least 1 MW as a pilot project collaboration between SMUD and the City with SMUD leading project development and the City supporting by providing a location and permitting support.	Potential in-kind staff time, Potential General Fund money allocated to solar and storage project			1	Low cost to City	Assumes that SMUD will determine criteria for a potential site for a 1 MW pilot project, and Public Works Department will provide in-kind staff time to identify a list or map of suitable City-owned properties, and that SMUD will support project development.
Built Environment	E-5.1	Adopt General Plan policies, land use designations, and implementing actions which: <ul style="list-style-type: none"> Accommodate 30% of the region's new living-wage jobs and 30% of the region's new housing units by 2040. Focus 90% of the city's infill growth into established and center/corridor communities with the goal of achieving 90% small-lot single family and attached homes by 2040. Prioritize construction of lower-cost workforce and affordable housing through modifications of land-use designations and zoning, offering ministerial/staff-level review of infill housing and continue to reduce fees and the time and expense of planning approval and building permit processes. Include anti-displacement policies and programs. 	CA Housing and Community Development Infill Infrastructure Grant Program	In-kind staff time	Infill Infrastructure Grant Program could potentially provide funding for capital improvement projects.	1	No/Low cost to City	Assumes in-kind staff time to develop policies and changes to City Code and that new development will be funded by private businesses and private sector housing producers.
Energy	E-5.2	Enable development of 29,000 new high density/intensity (i.e., 30 dwelling units per net acre), and public transit accessible residences (i.e., within 0.5 mile of public transit) by 2040 through the continuation of the City's ministerial/staff-level review of infill housing, reduced fees, and identification of local funding sources.		In-kind staff time	Planning activities	1	Low cost to City	Assumes in-kind staff time to develop policies and changes to City Code, and that new development will be funded by private sector housing producers.

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Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Energy	E-5.3	Enable the development of 8,700 new affordable by design units by 2040 within 0.25 mile of public transit by updating the City Code to allow multi-unit housing alternative housing types (such as dormitories and smaller units) and streamlining the permit process. Couple with anti-displacement policies and programs.		CA Housing and Community Development: SB2 Formula Funds	Technical assistance to local governments	1	Low cost to City	Assumes in-kind staff time to develop policies and changes to City Code, and that new affordable dwellings will be funded by private sector housing developers and individual landowners.
Energy	E-5.4	Permit a greater array of housing types in existing single-family neighborhoods citywide by allowing missing middle housing types such as duplexes, triplexes, and fourplexes, and bungalow courts in single-family and duplex dwelling zones. Develop tools, resources and educational materials to promote and facilitate the development of ADUs in neighborhoods throughout the City.		CA Housing and Community Development SB2 Formula Funds	Technical assistance to local governments	1	Low cost to City	Assumes in-kind staff time to develop policies and changes to City Code and that new affordable dwellings will be funded by private sector housing developers and individual landowners.
Transportation	TR-1.1	Implement the 2016 Bicycle Master Plan by constructing a comprehensive, connected network of safe and accessible (low-stress) bike paths, on- and off-street, within and across neighborhoods totaling 40 miles of bike lanes, 48 miles of bike routes, 40 miles of buffered bike lane, 18 miles of separated bikeway, and 127 miles of shared-used paths.	New transportation funding sources TBD; and grants.			3	\$510	Public Works Cost Estimate New transportation funding sources will be necessary for CAAP implementation. City staff evaluating options, and direction to be confirmed with the City Manager
Transportation	TR-1.2	Implement the improvements in the 2006 Pedestrian Master Plan by providing a connected, safe and accessible (low-stress) pedestrian network, prioritized based on High Injury Network (crash data), school access, equity and community needs. Low-stress pedestrian network includes crossings, sidewalks, and other paths.	Improvements made as part of new development projects New transportation funding sources TBD; and grants.			3	\$300	Public Works Cost Estimate New transportation funding sources will be necessary for CAAP implementation. City staff evaluating options, and direction to be confirmed with the City Manager.
Transportation	TR-1.3	Conduct a study to identify the physical barriers to active transportation by 2025 and remove them by 2030 to support local partners and community groups.	New transportation funding sources TBD; and grants.			2	\$510	Public Works Cost Estimate to study and remove barriers. Final costs will be identified after study. New transportation funding sources will be necessary for CAAP implementation. City staff evaluating options, and direction to be confirmed with the City Manager.

Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Transportation	TR-1.4	Conduct a study to identify educational barriers and provide education and outreach to the community on active transportation options in the City including a travel training program and incentivize a spectrum of transportation options that includes public and private shared and active services.	New transportation funding sources TBD; and grants.			1	\$0.25	New transportation funding sources will be necessary for CAAP implementation. City staff evaluating options, and direction to be confirmed with the City Manager.
Transportation	TR-1.5	Identify and secure ongoing funding for and then implement active transportation programs (open streets, pilot projects, classes, etc.) quality and healthy opportunities for parts of the community workforce most impacted by climate change.	New transportation funding sources TBD; and grants.			1	\$0.2 (recurring, per year)	
Transportation	TR-2.1	Update and implement the City's Transportation System Management Plan (TSMP) ordinance to shift travel behavior away from the single-occupancy vehicle.	Public Works Funding	Public Works Funding		2	\$0.2	
Transportation	TR-2.2	Eliminate parking minimums citywide, develop parking maximums and require parking management and transportation demand management plans for all areas of the City based on available transportation options, travel patterns, and land use.	In-kind city staff time Parking Demand Management Program		Mini-grants to fund pilot projects that change travel behavior.	1		Assumes that in-kind city staff time will support making changes to City Code.
Transportation	TR-2.3	Encourage SacRT to provide frequent, reliable transit in the City's priority corridors to reduce VMT and support SacRT in implementing priority transit corridors. Coordinate transit priority corridors with consideration of transportation needs as well as land use planning to provide transit-supportive land uses. Encourage the expansion of frequent, reliable transit services throughout the City.	Sacramento Transportation Authority		Transportation improvement projects. Specific projects and programs to be determined.	3	\$1-\$2 million per mile	
Transportation	TR-2.4	Collaborate with SacRT in planning and implementing increased transit services with reduced headways and expanded service lines to support an 11% public transit mode share by 2030.	New transportation funding sources TBD and grants			3	Approximately \$1 Billion - 3\$ Billion (City's portion of costs only to fund signal prioritization, bus lanes, bus bulbs, and light rail enhancement in City ROW.)	New transportation funding sources will be necessary for CAAP implementation. City staff evaluating options, and direction to be confirmed with the City Manager.
Transportation	TR-2.5	The City will work with SacRT to identify changes to signals and other technological enhancements for transit prioritization and faster transit travel times.	New transportation funding sources TBD and grants			1		New transportation funding sources will be necessary for CAAP implementation. City staff are evaluating options, to be confirmed with the City Manager for direction from the City Council.

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Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Transportation	TR-2.6	Continue to support electric car sharing options to offset at least 1 million VMT per year in the City through 2030.	Regulatory fees for service providers; see Action TR-2-13			1		
Transportation	TR-2.7	Continue to support shared rideables (bikes and scooters) to enable a reduction of 1 million VMT per year.	Regulatory fees for service providers; see Action TR-2-13			1		This assumes the ongoing service of shared-mobility services in the City through partnerships with private mobility providers.
Transportation	TR-2.8	Encourage SacRT to secure funding to support improved service/communications such as interactive service maps, app payments, and real time arrival info.	In-kind staff time			1		
Transportation	TR-2.9	Continue to implement and improve curbside management strategy to better manage and price curb space, manage transportation network companies (TNC) and prepare for autonomous vehicles.	General Fund or fees on service providers; see action TR-2-13			1		
Transportation	TR-2.10	Work with SacRT to remove barriers to access transit stops and stations (provide low-stress connectivity) and provide enhanced, comfortable stops and stations.	State Funding	Transit Stop Improvement Program		3	\$50	
Transportation	TR-2.11	Implement the City's adopted plans including modal/Citywide plans and corridor/area plans (such as the Bicycle Master Plan, Broadway Complete Streets, and 65th Street Area Plan).	Impact fees/VMT mitigation bank fees and other local funds			3	Covered in other measures	
Human Resources	TR-2.12	Identify an Employee Transportation Coordinator and establish an employee commute program for City staff that includes provisions for telecommuting and encourage other public and private agencies located within the City to do the same using requirements and/or incentives.	General Fund – In-kind staff time			1		
Transportation	TR-2.13	Investigate and lobby for the development of a TNC user tax which would put a small fee on the use of Uber, Lyft, and others and generate funds to pay for transit and transportation infrastructure and related programs.	In-kind staff time			1		

Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Transportation	TR-3.1	Amend City Building Code to require at least 20% EV-capable charging spaces and at least one installed, operational Level II EV charger in new multifamily and nonresidential development. Amend the Planning and Development Code to incentivize charging in both existing and new developments.	In-kind staff time	SMUD Commercial charging incentives	Incentives for the purchase and installation of EV charging infrastructure. Incentives range from up to \$6,500 per connector for a Level 2 charger and up to \$80,000 per DC Fast Charger	1		SMUD's Commercial EV Charging Incentives: https://www.smud.org/en/Going-Green/Electric-Vehicles/Business
			SMAQMD, Carl Moyer Program and Community Air Quality Incentive Program		Funding for hydrogen fueling and electric charging stations; may be combined with SMUD funding.			
Transportation	TR-3.2	Continue to support a variety of public and public/private partnerships to provide more publicly accessible chargers throughout the City. Examples include public/private partnerships on private property (Electrify America), public/private partnerships on public property (EVgo), and public investment (SMUD).		SMUD/Cal eVIP Electric Vehicle Supply Equipment Rebates	Installation of chargers at workplaces.	2	\$4.4	Based on recent construction and installation costs for installation in existing parking lots, to complete the remaining ~200 connectors to achieve the EV Strategy goal for City facilities of 300 ports
Transportation	TR-3.3	Continue to install and provide EV charger access at City-owned facilities and parking garages.		SMUD/Cal eVIP Electric Vehicle Supply Equipment Rebates		1		The City already provides multiple EV charging stations at City-owned facilities and parking garages.
Transportation	TR-3.4	Pursue affordable, zero-emission car share expansions to serve affordable housing, such as the Sacramento Metropolitan Air District's Our Community Carshare program to more locations, contingent on funding.	In-kind staff support			1		
Transportation	TR-3.5	Collaborate on e-mobility hub pilot efforts, in partnership with other agencies and local groups, with special consideration for proximity to low-income/disadvantaged communities and multifamily housing.	In-kind staff support; regional funding - See Action TR-2-13.			1		
Transportation	TR-3.6	Continue to maintain a highly streamlined EV infrastructure permit process.	In-kind staff support; potential support from regulatory fees - See Action TR-2.13.			1		
Transportation	TR-3.7	Develop and implement a fee for use of City-owned parking facilities and EV chargers to promote more efficient use and turnover and increase EV availability for people who really need it, including those without access to home charging.	User Fees			1		

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Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Transportation	TR-3.8	Continue to implement and improve curbside management strategy to better manage and price curb space, manage TNC, and prepare for autonomous vehicles.	General Fund – In-kind staff support to establish; program could be self-supporting from user fees.			1		
Transportation	TR-3.9	Work and collaborate with major employers including the State of California and Sacramento County to promote ZEV adoption, programs, and improvements to ZEV infrastructure.	Regulatory fees - See Action TR-2.13			1		
Transportation	TR-3.10	Continue to provide information and education about currently available incentives for expansion of Level II chargers on private property.	In-kind staff support			1		Partnership will be needed to continue to significantly expand EVSE in places like downtown, where existing parking garages are maxed out for electrical capacity. To be tackled in partnership with state and SMUD, with existing City staff time, and state grants/rebates.
Transportation	TR-3.11	Coordinate with community-based organizations, agencies, and non-profits to conduct EV education events with would include information on costs/benefits of owning EVs, steps on how to receive incentives for EV chargers, as well as other benefits. Events will be equitably distributed across the City, focusing on disadvantaged communities.	In-kind staff support			1		
Transportation	TR-3.12	Because zero-emission technology is improving/changing at a rapid pace, continue to monitor, test, and adapt to new and emerging zero-emission technologies and solutions.	In-kind staff support			1		
Waste	W-1.1	Implement the requirements of SB 1383 to compost or otherwise divert 75% of organic waste compared to 2014 levels by: <ul style="list-style-type: none"> Providing organic waste collection to all residents and businesses. Establishing an edible food recovery program that recovers edible food from the waste stream and redistributes the food to local community organizations to be used or eaten. Conducting outreach and education to affected parties, including generators, haulers, facilities, edible food recovery 	Recycling and Solid Waste User fees and City Franchise Fees and charges			2	\$3-5 Per Month (Residential) \$70-\$90 Per Month (Commercial)	https://www2.calrecycle.ca.gov/Docs/Web/115980

Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
		<p>organizations, and city/county NC waste products like compost, mulch, and RNG.</p> <ul style="list-style-type: none"> Inspecting and enforce compliance with SB 1383. 						
Waste	W-1.2	Work with regional partners (other municipalities) and the private sector to assess the feasibility of siting long-term organics processing facilities in or near Sacramento County.	User Fees - Solid waste program fees	Recycling and Solid Waste User Fees and City Commercial Franchise Fees and Charges		2		
Waste	W-1.3	Continue to provide backyard compost education and reduced-cost compost bins, as well as kitchen-top food waste containers to participating residents.		Recycling and Solid Waste User Fees		2	See W-1-1	
Waste	W-1.4	Implement a food waste diversion program for single-family residential customers by 2022.		Recycling and Solid Waste User Fees		2	See W-1-1	
Waste	W-1.5	Enforce new commercial waste code which requires businesses to subscribe to organics recycling collection service through the City's franchised commercial haulers starting July 1, 2021.		City Commercial Franchise Fees and Charges		2	See W-1-1	
Waste	W-1.6	Serve as a regional partner in the development and implementation of an edible food recovery program that connects commercial edible food generators with local food banks, to recover at least 20% of the edible food that is currently disposed of for human consumption, consistent with SB 1383.	CalRecycle Food Waste Prevention and Rescue Grant Program	Food Waste Prevention and Rescue Grant Program and City Commercial Franchise Fees and Charges	Supports new or expanding existing food waste prevention projects (source reduction or food rescue for people) in California to reduce the amount of food being disposed in landfills.	2	See W-1-1	
Waste	W-1.7	Explore the feasibility of capital improvement projects for reducing organics in the waste stream, such as organics extraction presses and anaerobic digesters.	CalRecycle Grant Programs, Public-Private Partnership	Recycling and Solid Waste User Fees				Development of new capital improvement projects to support organic waste diversion will be pursued as needed, primarily through the City's contract services for the provision of organic waste diversion.
Waste	W-1.8	Consider adopting, if needed, an ordinance that aligns with AB 827, the state law that requires most restaurants to have front-of-house composting.	Recycling and Solid Waste Fees and Charges, Grants	City Commercial Franchise Fees and charges		2		

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Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Carbon Sequestration	CS-1.1	Implement the Sacramento Urban Forest Plan with a goal to achieve 25% urban canopy cover by 2030 and 35% by 2045. Prioritize tree planting in areas with the lowest average tree canopy cover and explore strategies to reduce barriers to tree planting in disadvantaged areas and improve tree health.	CalFire’s Urban and Community Forestry Grant Programs City Statewide Park Development and Community Revitalization Program Urban Greening Grant Sacramento Tree Foundation; in-kind tree donations New funding streams – to be determined	City Department of Youth, Parks, & Community Enrichment	Urban forest expansion and improvement; urban forest management activities; all must include tree planting component. Create, expand, or improve parks in under-served communities as part of a capital improvement project; Participate in tree planting projects at park sites with community partners and consider tree acquisition, planting, and irrigation (including hand-watering). New funding sources are needed to support ongoing maintenance and irrigation of trees, overcome barriers to planting in low-income areas and support expanded tree canopy on private property Continue to enforce zoning standards for shading in private parking lots to protect trees in existing parking lots	2	\$6-\$10 million additional annual cost for annual maintenance of city-managed trees.	There is not nearly enough space to achieve 35% tree canopy coverage on City-owned/controlled land alone. Tree planting on private property will need to double. New funding sources for urban forestry expansion and management are TBD, including but not limited to grants funding. City staff are evaluating options, and direction is to be confirmed with the City Manager
Carbon Sequestration	CS-1.2	Utilize compost and mulch for application to City-owned trees and planters to increase the carbon sequestration potential of tree plantings.	CalRecycle			1		See Measure W-1.1 for SB1383 requirements
Carbon Sequestration	CS-1.3	Develop online educational materials about tree species that are adapted to Sacramento’s climate and resilient to drought and climate change.	City CalFire’s Urban and Community Forestry Grant Programs		Urban forest expansion and improvement; urban forest management activities; all must include tree planting component.	1		
Carbon Sequestration	CS-1.4	Continue to support the SMUD/Sacramento Tree Foundation program, which provides free shade trees for residents and businesses and support increased plantings on private property in areas that are under-canopied through new partnerships and programs.	SMUD CalFire Urban and Community Forestry Grant Programs		Urban forest expansion and improvement; urban forest management activities; all must include tree planting component.	1	–	
Water and Wastewater	WW-1.1	Reduce GHG emissions associated with the water utility by procuring 100% carbon-free electricity by 2030.				1		Assumes that electricity from SMUD will be carbon-free (2030 Zero Carbon Plan)
Water and Wastewater	WW-1.2	Investigate the feasibility of allowing on-site non potable treatment and distributed water resources in new development.		In-kind staff time and consultant services		1		On-site non-potable water reuse study has been funded, Standards for on-site non-potable treatment will be incorporated into City Code if feasible.
Water and Wastewater	WW-1.3	Continue to implement the Model Water Efficient Landscape Ordinance each year.		In-kind staff time		1		

Sector	Measure + Action #	Action(s) Required	Potential Funding Sources	Confirmed Funding Source	What Funding Source Program Can Fund	Cost to City Operations	Estimated Cost (Cost to City \$ millions)	References and Assumptions
Water and Wastewater	WW-1.4	Continue to require the use of low impact development (LID) strategies for new construction and development.		Utilities operating budget		1		Assumes that this action is a continuation of the City's regulatory role that will be implemented by existing staff. Installation of LID in new construction and redevelopment will be paid for by developers. New LID infrastructure does, however, increase maintenance costs for the City.
Water and Wastewater	WW-1.5	Continue to investigate the landscaping/irrigation use of non-potable reclaimed water from regional sanitation at parks.	A source of funding would be needed to conduct a pilot	In-kind staff time.		1		Assumes that service provider is Regional Sanitation District if implemented.
Water and Wastewater	WW-1.6	Increase the use of renewable energy and storage to reduce GHG emissions and increase resiliency for critical infrastructure.	California Public Utilities Commission's Self-Generation Incentive Program (SGIP)		SGIP provides incentives for new and emerging distributed energy resources.	2	\$1-5M	https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/self-generation-incentive-program
Water and Wastewater	WW-1.7	Continue to encourage efficient water use by residents and businesses through expanded education, incentives and assistance services in compliance with Assembly Bill 1668 and Senate Bill 606, which help reduce the City's water demand and related energy use.	Additional funding will be required for expansion.	Utilities operating budget	City Water Conservation Office	1		www.sacwaterwise.com Confirmed funding is for ongoing education. Newer state regulations on water conservation are under development and will require additional funding sources.

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3 Funding and Financing Strategy

Full implementation of the CAAP will require significant investments on the part of the City of Sacramento, other governmental agencies, local households and businesses, and property owners. This Appendix outlines the estimated capital costs for actions to be taken by the City of Sacramento itself, which are approximately \$3.2 billion. Other costs associated with key CAAP actions will be covered by SMUD, Sacramento Regional Transit (Sacramento RT), and private businesses and households.

The CAAP is an ambitious project and will require substantial commitment of City staff time to implement. City staff have reviewed the CAAP measures listed in Table 1 and estimated new ongoing City staff requirements for implementation. City staff estimate the need for approximately six new full-time staff. Considering salary, benefits, City overhead, etc., the approximate annual costs to the City would be around \$960,000, or about \$19.2 million over 20 years. This does not include additional staff who would be required to implement a building electrification monitoring and enforcement program (see Energy Measure E-2-1). This is because user fees, such as building permit fees charged to program participants, would be designed to recover costs, so these additional staff would not have a net impact on the City's budget.⁴ This would be in addition to existing City staff positions that are already funded to support CAAP implementation in the normal course of operations.

In addition, the above estimates do not include capital costs for Sacramento Regional Transit to improve transit services, nor do they include maintenance costs for new public infrastructure, or costs to businesses and households to make changes to buildings and vehicles that are envisioned in the CAAP. Some expenditures will not represent net cost increases but instead will involve substituting investments that would otherwise have been made on less climate-friendly options into climate-friendly equipment, materials, and technologies for expenditures. Furthermore, the City and local partners such as SMUD can help households and businesses make these transitions by promoting available low-cost financing programs or providing incentives.

In some cases, expenditures may represent net cost increases compared to a "status quo" approach to climate change. As such, these costs represent an accounting for the costs to address the negative externalities⁵ associated with current practices that are now recognized as not sustainable.

Below are general descriptions of principles that will guide the City's approach to funding the CAAP measures that require an outlay of City funds and descriptions of key funding sources that the City may use. A more detailed matching of specific CAAP actions with potential funding sources and tools is included in Table 1 with columns identifying potential funding sources, programs, and what items can be funded.

3.1 Priority City-Led CAAP Measures

As previously mentioned, this Appendix provides an estimate of high-cost CAAP measures and actions but does not provide cost estimates for low- and moderate-cost actions. Given the

⁴ Based on City staff estimate of \$160,000 per year average cost, including salary and benefits, per full-time equivalent employee.

⁵ "A negative externality is a cost that is suffered by a third party as a result of an economic transaction. In a transaction, the producer and consumer are the first and second parties, and third parties include any individual, organization, property owner, or resource that is indirectly affected." Accessed 6/13/19 at: https://www.economicsonline.co.uk/Market_failures/Externalities.html

magnitude of the costs, the City will likely struggle to identify all the necessary funding for timely implementation of the CAAP. Recognizing this, it will be important for the City to direct its available financial resources to low- and moderate-cost CAAP actions and those high-cost CAAP actions that are most critical to achieving community goals and most effective in contributing to GHG reductions. As shown in Table 2 below, City staff have reviewed the list of high-cost CAAP measures that require direct City investment and identified those that are most critical to achieving the overall community and CAAP goals (Priority City-Led CAAP Measures), not including ongoing annual staffing costs. It is important to remember that this is a short-term priority list of only high-cost measures, many other moderate- and low-cost measures will also be implemented in the short term.

Table 2 Estimated Costs for Short-Term Priority City-Led CAAP Measures

Measure/ Action # -	Description	Estimated Cost
TR-1.1	2045 Implement 2016 Bicycle Master Plan	\$510,000,000
TR-2.1	2025 Update and Implement Transportation System Management Plan	\$200,000
TR-3.2	Ongoing EV chargers at City-owned buildings	\$4,400,000
CS-1.1	Ongoing Implement Sacramento Urban Forestry Plan ⁶	\$100,000,000
TOTAL COSTS, PRIORITY CITY-LED CAAP MEASURES		\$614,600,000

The short-term priority City-led CAAP measures represent a more manageable 19 percent of the total estimated CAAP Measures but still total to approximately \$615 million. This listing of Priority City-led CAAP Measures provides important direction for prioritization of available City funding to invest in CAAP implementation. Other projects that do not involve direct City funding for capital costs, primarily investments in improving the public transit system, will also need to move forward, along with these Priority City-led CAAP Measures over the next 20 years.

In many cases, the expenditures will not only help to reduce GHG emissions but will bring other valuable co-benefits, such as cleaner air, water conservation, savings on energy and utility costs, more robust and flexible transportation systems, improved public health, greater resiliency to climate change, and enhanced local quality of life.

Some investments will not represent net cost increases, but instead will involve substituting expenditures on climate-friendly equipment, materials, and technologies for expenditures that would otherwise have been made on less climate-friendly options. For example, when a building owner, such as the City, a household, or a business, makes investments in building electrification, the initial expenditure on the improvements may be offset by long-term savings from reduced energy usage. Replacing a less-efficient central air conditioning and gas furnace system that it is at the end of its useful life with a new energy-efficient electric heat pump, should produce long-term savings in energy costs compared to replacing the system with conventional but less efficient equipment. Furthermore, the City and local partners, such as SMUD, can help households and businesses make these transitions by promoting available low-cost financing programs or providing incentives.

Some CAAP expenditures may represent net cost increases compared to a “status quo” approach to climate change. As such, these costs represent an accounting for the costs to address the negative

⁶ This assumes City costs growing to an additional \$6.5 million annually over 20 years to maintain and irrigate beyond current levels of \$6.5 million per year. It does not include the costs for trees on private property.

externalities⁷ associated with current practices that are now recognized as not sustainable. Following below are general descriptions of principles that will guide the City's approach to funding the CAAP measures that require outlay of City funds and descriptions of key funding sources that the City may use. A more detailed matching of specific CAAP Measures with potential funding sources and tools is included in Table 1, with columns identifying the CAAP Measures, potential funding sources, estimated costs to the City, and estimated requirements for new City staff.

3.2 Funding Principles

The CAAP is targeted for implementation over the next 20 years. Funding sources for some actions can be identified at the outset, while the best means to fund other actions will be determined at the time the City is ready to implement them, depending on the resources available at the time. Several principles will help the City to determine the best approach to funding various actions, as follows.

Equity

The costs of implementing the CAAP should be spread as equitably as possible, taking care to limit the imposition of new costs on the segments of the community that have the least ability to shoulder increased costs. Where certain segments of the community will benefit disproportionately from an action, the costs should be spread accordingly. Where funding options involve establishing new local taxes, the discussion of funding options in Section 4 identifies those that are more or less equitable.

Leveraging City Resources

Leveraging will involve using outside sources of funding to augment City resources to fund implementation of the CAAP. General Fund resources are extremely limited, so the City will leverage in-kind staff time and local matching funds that can be provided by impact fee programs to aggressively seek grants (e.g., state and federal transportation infrastructure grants), in-kind contributions from partners such as SMUD, and other resources from state, federal, and philanthropic sources (e.g., Sacramento Tree Foundation) to help pay for actions and limit the cost to the City, local residents, and businesses. The CAAP also includes actions through which City staff will monitor and publicize grants and incentives that will help households and businesses make the necessary climate-friendly investments.

Long-Term Cost Savings

While some actions may require initial capital outlays, whenever possible these actions should generate long-term cost savings that will repay and even generate a return on investment (ROI). For example, Measure E-2-5 promotes private investments in energy efficiency that will yield property owners long-term savings on energy costs and offset initial capital costs.

⁷ "A negative externality is a cost that is suffered by a third party as a result of an economic transaction. In a transaction, the producer and consumer are the first and second parties, and third parties include any individual, organization, property owner, or resource that is indirectly affected." Accessed 6/13/19 at: https://www.economicsonline.co.uk/Market_failures/Externalities.html

3.3 Prioritization Strategy for Available City Funds

The City of Sacramento can consider two primary strategies for the prioritization of funds available to implement the CAAP. The first strategy is to focus available funds on those CAAP actions that will have the greatest impact on GHG reductions. The second strategy is to strategically utilize funds that the City of Sacramento controls to leverage other sources of funding that may be available from other sources.

Prioritization of Funds Towards Actions with the Greatest GHG Impacts

Whenever possible, the City should try to direct funds that become available for CAAP implementation towards low- and moderate-cost measures and actions and the Priority CAAP Actions listed in Table 2.

Prioritization of Funds to Leverage Outside Sources

The City should also be alert to opportunities to include priority CAAP projects in any new funding programs that may be developed, such as a regional VMT-mitigation bank (provided the City can eventually obtain regional support), or newly authorized local funding programs such as congestion management fees, curbside management fees, and/or sources that would be overseen at a statewide level, such as proceeds from a surcharge on property hazard insurance.

3.4 Conceptual Funding Approach for Priority City-Led CAAP Implementation Actions

With an overall City cost likely in excess of \$3.2 billion for implementation of all City-led CAAP measures, it is clear that full implementation will require that the City of Sacramento consider funding from a wide range of potential sources. This is made more challenging by the fact that the City of Sacramento's tax base is constrained because of the substantial amount of property in the city that is owned by the State of California, which does not pay property taxes and certain other taxes and fees that private property owners, households, and businesses pay.

New funding sources will be needed to implement the CAAP. Below is a high-level overview of potential new funding sources. City staff are evaluating options that will be confirmed with the City Manager for direction from the City Council.

Development Impact Fees – Consistent with the priority of using local funds to leverage outside funding sources, the City may be able to modify its TDIF (Transportation Development Impact Fee) program to include Priority City-Led CAAP Measures in the list of eligible TDIF expenditures.

Grant Funding – City staff estimate that based on historic grant funding, it may be feasible to obtain approximately \$5 million per year in transportation infrastructure grant funding that could be used to help implement Priority City-Led CAAP Measures, or approximately \$100 million over the next 20 years. State and federal transportation infrastructure grant programs typically require between 11.5 percent and 50 percent of project costs come from local matching funds, and this match is currently unfunded.

Motor Vehicle Registration Surcharge – State law allows a countywide transportation planning agency to place a ballot measure before the voters of the county to authorize an annual fee increase of up to \$10 on each motor vehicle registered in that county, to fund transportation related

projects. Through a potential Sacramento County motor vehicle registration fee, motor vehicle owners could contribute to helping the City reach its GHG reduction targets.

Tax on Transportation Network Company Trips – A new tax on TNCs such as Uber and Lyft trips would require local voter approval. If the City was successful in obtaining voter approval, this new funding source could generate revenues for multiple years.

Local Parcel Tax – Combined, the above sources could potentially fund about \$266 million in costs through 2040. This would leave about \$368 million that would need to be covered from other sources. In addition, the City would also need to consider the cost of debt service payments. This amount translates to the need for about \$20 million in annual debt service payments. Roughly translated, this would equate to an annual cost of about \$63 per household and a cost to non-residential properties of about \$12 per employee per year. As a new parcel tax would be needed to repay the green bond, this strategy to fill the funding gap would require voter approval.

A voter-approved parcel tax is another method to raise funding for implementation of the CAAP and could be used for a bonding or grant match.

3.5 Summary

The magnitude of costs in Table 2 illustrates that the City of Sacramento will need to seriously consider establishment of new funding sources to enable implementation of the CAAP. While the City may not be able to afford the full benefits of a plan that requires nearly \$3.2 billion, a minimum level of commitment of an estimated \$634 million to fund the Primary CAAP Measures, has potential to be funded. If \$100 million in grant funding can be obtained, the funding gap is about \$534 million. Success in funding this gap will likely require considerable political leadership and broad-based public support for the City’s CAAP goals. This would require a collective willingness of the Sacramento community to tax itself in various new forms in order to generate the funds necessary to cover even the priority City-led projects and staff support for CAAP implementation.

Table 3 Funding Gap for Priority City-Led CAAP Measures

Cost of Priority City-Led CAAP Measures	\$615,000,000
Cost of Ongoing Staffing to Support CAAP Implementation (a)	\$19,200,000
Total Cost for priority City-Led CAAP Measures	\$634,200,000
Likely grant funding over 20 years	\$100,000,000
Funding Gap*	\$534,000,000
*Table does not include the cost of debt service	

The City of Austin’s Project Connect Measure A provides a case study to help put the CAAP funding challenge facing the City of Sacramento into perspective and suggests that it could be achievable. In 2020, voters in the city of Austin, Texas approved property tax increases that will fund a \$7 billion transit system and \$460 million in new bicycle and pedestrian infrastructure. This success came after two previous failed attempts at similar transportation funding initiatives. Like Sacramento, Austin is another state capitol city; however, it is approximately twice the population of Sacramento. Although aspirational, local funding needed to support Sacramento’s CAAP does not appear disproportionately high in comparison to Austin’s funding measure.

The Austin measure expected federal transportation grants to cover 45 percent of the transit capital costs and the approved property tax increase would provide the remaining capital costs, as well as necessary funding for operations and maintenance of the transit system once built. Voters approved the property tax increase, which the City of Austin estimated would cost the owner of a home valued at \$325,000 approximately \$284 per year in additional taxes. The City of Austin indicated that the median taxable home value in Austin was \$326,368.⁸ An analysis of Sacramento's needs and funding potential will be conducted.

3.6 Other Actions Critical to CAAP Success

In addition to the priority City-led CAAP measures, the expansion of the RT transit system is a critical component of the CAAP. The City of Sacramento will need to work closely with RT to lobby and secure the necessary funding to increase transit service and reduce headways in the city. The total funding that RT would need to make the service and system expansions necessary to achieve an 11 percent mode share is not known, because RT has not yet designed the system expansions nor estimated the costs. City staff, however, have estimated that the City's related costs would be between \$1 billion and \$3 billion.

⁸<https://austintexas.gov/2020PropA#:~:text=The%20City%20of%20Austin%20is,fund%20implementation%20of%20Project%20Connect>.

4 Types of Funding Sources

The CAAP will rely on a variety of funding sources for implementation. Following are general descriptions of some key funding sources identified that can be used to pay for climate-friendly actions.

4.1 Grants

From time to time, the City is able to secure funds for specific projects through grant programs provided by state and federal agencies. This includes various grant programs funded through the State of California's Cap and Trade program, which generates money for the State's Greenhouse Gas Reduction Fund, some of which is granted to local governments. Moving forward, state and federal grants may be a useful source of funding to pay for the portion of mitigation programs or actions that is attributable to the City's existing residential and non-residential development, which cannot be funded through impact fees collected on new development. State and federal grants can also be used to fund climate-friendly actions and programs that have broad community benefits, or to help defray costs that might otherwise have been too burdensome for lower-income households or small businesses. From time to time, utility companies also provide grants in their service areas through various programs designed to incentivize energy conservation.

Grants are beneficial, because they represent an opportunity to reduce the cost burden for implementation programs and projects on the City itself and the burden on local residents and businesses. Grants are one funding source that the City can use to pay existing development's share of project costs when the costs must be split between new development and existing development. The primary disadvantages of grants are that funds availability is not certain due to competition for limited funds, timing of funds availability may not match with necessary implementation timelines, and grants are not always available for the types of projects that need funding. Typically, grants require local matching funds for which the City would need to identify new or redirected sources of funds. In addition, preparation of grant applications and grant administration is very time-consuming and costly, so funding will need to be reserved for staff or consultants to prepare such grant applications.

4.2 City General Fund Monies

The City's General Fund receives the revenues over which the City Council exercises discretionary funding authority. The General Fund receives major funding sources including sales tax revenues, property tax revenues, property tax in-lieu of vehicle license fees, and many other smaller revenue streams. The City Council spends these monies on public services that broadly benefit the community at large. While balancing all of its budgetary needs, the City Council may elect to spend some General Fund money on CAAP implementation. It is most important that the City utilize General Fund money to support staffing required to implement and administer the CAAP, including preparing and submitting grant applications for CAAP projects and working to foster partnerships that will support CAAP implementation. This would include working with key outside agencies and organizations such as Sacramento RT, SMUD, and SACOG that will support the City's efforts by providing grant funding and in-kind support for City of Sacramento actions and undertaking other actions that support the City's CAAP. Given the many competing demands for General Fund monies,

it should not be anticipated that the General Fund will be a major source of capital funding for CAAP projects.

The CAAP contains numerous actions that are likely to be implemented through in-kind City staff efforts. However, it is not likely that existing City staff will have adequate capacity to take on all the responsibilities of CAAP implementation that are identified in as “Staff In-Kind”. To leverage the available staff resources, the City often partners with other agencies and/or contracts out certain services, such as using consultants for specialized studies, when that is more cost-effective. One such opportunity the City is already using is partnership through the CivicSpark Program, operated by the Local Government Commission, to host CivicSpark Fellows who work under the direction of the City’s sustainability staff to help with CAAP implementation activities. Civic Spark Fellows are provided through an Americorps program that places fellows with local governments and other entities that are engaged in sustainability projects. The cost of the Fellows is comparatively affordable. The City’s fiscal contribution could leverage the Civic Spark program to aid and support with climate programs and help build staff capacity.

A benefit of using General Fund monies to fund climate-friendly actions is that the City Council already has control and the authority to allocate General Fund monies to implement climate-friendly actions, meaning implementation of items to be funded with General Fund dollars does not have to wait for funding decisions from other governmental or private entities. However, it must also be recognized that the General Fund supports many other critical public services, such as law enforcement and fire protection, as well as parks and roadway maintenance. The City likely has little ability to allocate General Fund monies to new programs without impacting existing programs.

4.3 Restricted Funds

Restricted funds are monies that the City receives but which can only be used for specified purposes. This is often the case with funds that are passed through to the City from other governmental entities, such as state or federal agencies. Relevant examples of such restricted funds are money allocated to the City projects from Sacramento County Measure A (sales tax measure for transportation projects), Transportation Development Act (TDA) pedestrian and bicycle facilities funds, and development impact fees.

A benefit of restricted funds is that they could help pay for projects that otherwise might require General Fund support. The challenge with using these funds is that they are typically fully allocated and directing funds towards CAAP projects will require prioritizing CAAP projects over other potentially worthy uses of the funds. In the case of development impact fees, it may be possible to add certain new projects to the capital projects list that forms the basis for the fee program and then adjust the impact fee schedule to capture the additional costs.

A limitation of impact fees is that they are only paid by new development and thus can only be used to pay for new development’s “fair share” of project costs. Another limitation is the legal requirement for a “rational nexus” between the fee and the needs created by new development and the benefits incurred by new development. Development impact fees can only be used to support the needs created by the new development. Thus, they are spent only in the areas where new development is occurring and cannot provide source of funding for infrastructure or projects to support existing developed areas.

The City is sensitive to the need to not overly burden new development with costs that may create feasibility challenges for desirable projects.

City staff indicate that the City of Sacramento has among the lowest impact fee rates in the region. While comparatively low impact fee rates may indicate that there may be some room to increase fees to help pay for some CAAP project costs, impact fees typically can only fund a small share of the cost of capital projects that support the need created by new development in the city.

4.4 Fees for Service/User Fees

The City operates some services on a cost recovery basis. The City collects funds in the form of user fees to provide specific services to various user groups, and the fees charged are designed to offset the cost of the services provided. An example of user fees that support services provided to a specific segment of the community includes building permit fees, which are charged to cover the cost of reviewing plans and conducting inspections to verify that buildings are constructed properly. To the extent that these types of services incorporate climate-friendly actions, the costs of these actions can be recovered through user fees. User fees and ratepayer charges can also be applicable to utilities such as SMUD, water and sewer system operators, and the City's solid waste program. For example, the City's costs for overseeing the implementation of CAAP Measure E-3-2 (Building Electrification) might be re-couped through building permit and/or inspection fees charged to contractors or property owners. In addition, the City currently collects regulatory fees from car share companies and from companies providing "shared rideables" (e.g., bike share, scooter share). According to City staff, these fees cover only a small part of the overall costs of overseeing these programs. There may be an opportunity for the City to build more costs of supporting these private businesses that rely on city roadways (see CAAP Measures TR-3.8 and TR-2-13) by establishing a TNC (such as Uber and Lyft) trip tax. Another opportunity to fund CAAP improvements would be to charge users of EV chargers installed at City-owned facilities a fee (see Measure TR-3-2).

These types of fees/surcharges may represent an opportunity for the City to help fund staff time needed for work on CAAP implementation, and City staff indicate that Sacramento is typically understaffed relative to other cities. At the same time, the City will also be mindful that implementation projects and actions that are funded via fees for service, user fees, or ratepayer charges are similar to actions that are funded directly via household or business income and a disadvantage is that they could disproportionately burden lower income households or small and disadvantaged businesses that have more limited resources. The City will want to be particularly careful where users of affected services have limited ability to change their behavior to limit their exposure to increased costs. For example, some utility incentive programs can be structured to provide relatively low rates for "baseline" consumption but to charge higher rates for consumption above baseline levels that would be considered discretionary, as an incentive to minimize consumption.

4.5 Financing Tools

Financing tools are not funding sources per se; however, while many climate-friendly actions may generate long-term cost savings, they may also require significant up-front expenditures that could be a challenge for the City, households, or businesses to finance. There are various financing tools that can be used to essentially borrow the funds needed "up front" for CAAP implementation and paid back over time using one or more funding sources that will generate money over time.

Examples of such tools that could be used by homeowners or businesses include:

- Home mortgages and equity lines

- Property Assessed Clean Energy (PACE) programs, which the City has already established
- On-bill financing and similar programs sponsored by utilities, which are not currently offered by SMUD or PG&E, but could be considered
- Private financing innovations, such as the Metered Energy Efficiency Transaction Structure (MEETS)⁹ pioneered in Seattle

The City may be able to use a range of tools to help finance investments in public buildings and infrastructure. Various federal and state programs provide financing to public agencies for capital investments when funds are not provided as grants.

A financing option that the City currently uses is “interfund borrowing” whereby the City self-finances certain improvements by using money from idle fund balances, and then repaying those funds over time with other revenue streams. The City’s current program is called the Energy Efficiency Reinvestment Program. According to City staff, the program is relatively modest and is providing about \$62,000 per year in repayments that will be diminishing over time. This program is suitable for smaller municipal capital projects.

Other financing tools available to the City of Sacramento include Mello-Roos Community Facilities Districts (CFD) and Enhanced Infrastructure Financing Districts (EIFD), which are both discussed briefly in the section below regarding potential new funding sources and tools. In particular, the City should consider using financing mechanisms to pay for up-front costs of large capital projects that will yield long-term annual budget savings that can offset the annual debt service from the financings.

The City could consider the possibility of undertaking a “green bond” issuance using its authority to take on municipal debt in various forms to finance a package of capital investments included in the CAAP. Any green bond would need to be considered in the context of the City’s available remaining bonding capacity, considering other City Council priorities and commitments. If bonding capacity is available, green bonds could be an option to provide the City with revenue to fund investments to be repaid using annual budget expenditures that otherwise would have been spent in the absence of the cost savings created by the investments. In this way, the City can benefit from long-term cost savings from investments in CAAP projects. For example, if the City issued a green bond to finance the development of solar power generation facilities on City property, this would reduce the City’s energy costs and the savings on energy costs could be used to repay the bonds. Other types of cost-saving projects could include electrification of City buildings and/or energy conservation improvements in City buildings and infrastructure operations (e.g., water and sewer).

As described above, various financing tools can be beneficial, because they can help make large expenditures achievable by providing funds up front and then allowing the cost to be repaid over an extended period of time. The disadvantage of most financing programs is that the cost of financing (e.g., interest charged on the outstanding balance while the financing is being repaid), adds to overall project costs. It will be preferable for the City to fund its CAAP implementation activities on a pay-as-you-go basis whenever practical, reserving financing techniques for those situations where funds are needed up front, but not available without using financing tools, or where long-term annual operational cost savings are sufficient to offset the necessary debt service payments.

⁹ See: <http://www.meetscoalition.org/>

4.6 Potential New Funding Sources and Tools

Even if the City of Sacramento is able to maximize the use of all existing funding sources, full implementation of the CAAP will require establishing new funding sources, particularly for the long-term buildout of large public works projects that have price tags in the tens or hundreds of millions of dollars featured in the transportation sector of CAAP measures. A characteristic that is common to many of these projects is that they are public infrastructure projects, and it will be difficult and/or politically infeasible to charge user fees to the general public for access/use of these facilities. Given their broad public use, and the fact that in most cases it will not be desirable to create a financial disincentive for the public to use these facilities, it may be most appropriate to fund them using revenues from sources that are more broadly based.

Funding Measures Requiring Local or Regional Actions

There are some funding options available to the City of Sacramento that can be enacted under the authority of the City Council.

Development Impact Fee Updates/VMT Mitigation Bank

The City can review the capital improvement lists for its development impact fee program to consider if new CAAP implementation projects have a rational nexus for inclusion. CAAP projects in the Transportation Sector that involve public transportation infrastructure improvements such as new pedestrian, bicycle, and transit capital projects, are the most likely candidates to be included in development impact fee updates.

It should be noted that, according to City staff, the City's existing transportation impact fees are currently set about 10 percent of the maximum justifiable amount out of concern for the financial feasibility of new development projects. Updating the City's transportation impact fees to collect the maximum justifiable amount for CAAP projects would require a major City policy shift and could also have a significant impact on the economic feasibility of development projects. Modifications to the impact fee schedule would need to be considered in relation to other City goals as well, such as mitigating impediments to housing development.

A funding opportunity that is related to development impact fees is a VMT mitigation bank. Currently, regional support for a VMT mitigation bank does not exist. If support can be obtained in the future, a VMT mitigation bank would identify a series of projects and programs that would help regional goals for VMT reduction under SB 743 and new development projects that create excess VMT would have the option to pay into a VMT mitigation bank to provide funds that the City would spend on projects that would mitigate those impacts. Examples would primarily include projects listed under the Transportation Sector of the CAAP that would help to increase bicycle, pedestrian, and transit mode shares and reduce auto usage.

If a VMT mitigation bank is implemented at a regional scale, some projects in the Sacramento CAAP might be eligible for funding from the VMT bank. Project costs that are included in a local impact fee program, a local VMT mitigation bank, or a regional VMT mitigation bank should not be included in any of the other of these related programs, to ensure against "double dipping".

The concept of a VMT mitigation bank is similar to the Emissions Banking Program operated by the Bay Area Air Quality Management District, which facilitates the exchange of emissions credits between businesses that are awarded credits for emission reduction projects and businesses that need credits to offset impacts of new or expanded activities that generate increased emissions. In

this case the City would be delivering GHG-reducing projects through implementation of the CAAP that receive credits and the City would receive payment from other organizations that undertake projects that increase emissions.

Parking Fees

Increasing parking fees to help pay for GHG-reduction projects may be another locally available but limited option to raise funds. (For example, see Measure TR-3-7, which calls for developing and implementing a fee for use of City-owned parking facilities and EV chargers to encourage more efficient use and turnover and increase EV availability.) It should be noted however, that parking fees are driven by market demand and are constantly monitored and adjusted to maximize revenue within the limits that the market will bear. Increasing fees above the market risks loss of customers and revenue. Furthermore, the City uses existing parking fees to cover General Fund obligations, such as payment on the bonds for the Golden 1 Arena, so certain levels of growth in fees are already assumed and obligated.

CFD/EIFD Financing

As mentioned above, the City has the authority to utilize state law that allows formation of Mello-Roos Community Facilities Districts (CFD) and Enhanced Infrastructure Financing Districts (EIFD) to generate funding that could be used to support CAAP project implementation and to provide financing tools to help spread the costs over time. Bond financing supported by revenues from a CFD or EIFD would be most appropriately used to pay for large public capital improvement projects that have useful lives that would match or exceed the term of the bonds issued; most likely involving projects in the CAAP Transportation Sector.

Most likely, a CFD would involve establishing a new special tax on properties located within the district, requiring authorization by a 2/3 super-majority vote. A CFD special tax would be collected annually, and the City could bond against the annual tax levies. Because a CFD is approved by a 2/3 vote, it is considered a special tax. If approved, the City would have flexibility to use the funds for a broad range of voter-authorized purposes, and the City would not be held to the same strict standards of proportionate benefit that apply with property assessments that are approved by a simple majority.

An EIFD does not require voter approval unless it is used for a bond issue. To generate revenues that would help to fund CAAP implementation, the City Council would need to agree to divert a portion of the City's future property tax increment generated within the district that would have otherwise accrued to the City General Fund. Both CFDs and EIFDs are able to issue bonds to be repaid by future revenues collected by the district, so the mechanisms can both provide a potentially useful mechanism to finance CAAP investments. There are challenges for EIFDs that include the need for 55 percent voter approval, high-administrative costs, and the potential need for a Joint Powers Authority.

Other Voter-Approved Funding Measures

There are a variety of other types of voter-approved funding measures that could generate funds to support CAAP implementation by creating new taxes in the City. Funding measures that would specifically earmark new tax revenues for CAAP projects would most likely constitute new special taxes, requiring 2/3 super-majority voter approval.

Motor Vehicle Registration Surcharge

Another possibility of a voter-approved funding measure that aligns well with CAAP goals is a motor vehicle registration surcharge. A number of California air quality management districts have approved these surcharges. State law enacted in 1990 (AB 2766) authorizes local agencies to assess annual motor vehicle registration fee surcharges of up to \$5 per vehicle to generate funds to "to reduce air pollution from motor vehicles and for related planning, monitoring, enforcement, and technical studies necessary for the implementation of the California Clean Air Act of 1988. This would be viewed as a special tax, requiring approval by a 2/3 super-majority of the voters. In addition, this authority expires January 1, 2025, unless it is extended by state law. This funding option would need to be coordinated with the Sacramento Metropolitan Air Quality Management District to ensure coordination of efforts to ensure a collaborative and mutually beneficial approach.

According to the City of Sacramento's EV Implementation Blueprint Study, approximately half of the 1.1 million vehicles registered in Sacramento County were registered in the City of Sacramento. If City of Sacramento voters approved a \$5 per vehicle surcharge, this would raise approximately \$2,750,000 per year in annual revenues (assuming extension of the surcharge authority beyond January 2025).

Parcel Tax

In addition to other tax measure examples discussed above, a parcel tax charged to owners of real estate in the city of Sacramento is another example of a funding opportunity that would require voter approval, either majority or 2/3, depending on how structured. Because the revenues from a parcel tax are secured by liens on the property in the area subject to the parcel tax, the annual revenue flow from a parcel tax approved to provide CAAP funding would be bondable, creating the opportunity to finance CAAP projects over time.

In 2020, voters in the city of Austin, Texas, approved property tax increases that will fund a \$7 billion transit system and \$460 million in new bicycle and pedestrian infrastructure. Like Sacramento, Austin is another state capitol city; however, it is approximately twice the population of Sacramento. Thus, if Sacramento sets its sights on a parcel tax to fund similar GHG-reducing projects, it may be appropriate for the City to target more modest dollar amounts.

In the California context, depending on the way the parcel tax is structured, it could require either a majority or 2/3 voter approval. If the ballot measure names specific allowable uses of the funds, it would be considered a special tax requiring 2/3 voter approval. Some jurisdictions choose to structure a ballot measure as a general tax that does not name specific allowable uses for the funds, and then the ballot measure is accompanied by a second advisory ballot measure that outlines recommended, but not required, uses of the parcel tax proceeds.

4.7 Funding Measures Requiring State Legislation/Action

The Sacramento/West Sacramento Mayors' Commission on Climate Change identified and discussed a range of potential funding options for climate mitigation investments, including many of those discussed above. In addition, the Commission identified some "big idea" funding options that would require not only support at the local level but also enable state legislation as well. Two such examples were:

- a tax/surcharge on property hazard insurance premiums on property in the local area that could be used to fund climate resiliency projects; and
- congestion management fees that would be charged to drivers using specified local roadways at certain times as a way to manage demand for roadway facilities and reduce associated congestion and pollution.

Another example of a potential local funding measure that would require state authorization is taxes on TNC users. In 2018, California Assembly Bill 1184 confirmed that the City of San Francisco (only) had authority to place Measure D on its November 2019 ballot, and it was subsequently narrowly approved by the voters. This measure assesses a tax on ride share companies (car, bike, scooter, etc.) to raise funds for transit, pedestrian, and bicycle services. The rate is 1.5 percent for rides in zero emission vehicles and 3.25 percent on private rides, such as Uber and Lyft. The City of San Francisco expects to generate from \$30 million to \$35 million per year from this program. Along these lines, Measure TR-2-13 calls for the City to investigate and lobby for the development of a TNC user tax.

If the City of Sacramento sought and gained approval for such a program, it could provide a useful source of annual revenue to support CAAP projects. This funding source would most appropriately be used to fund projects that support TNC functioning in the City, including providing space for TNCs to use for parking of shared bicycles and scooters, providing bike lanes for bicycles and scooters, providing curb space and parking space for TNC vehicle parking, waiting, and pick-up/drop-off, and related signage and other infrastructure.

City staff estimate that the process of obtaining enabling legislation at the state level, placing a local measure on the ballot, and then implementing the program would take a minimum of approximately 5 years. Thus, if successful, this would represent a medium- to long-term funding opportunity.

After adjusting for the City of Sacramento's smaller population and a generally lower market share for TNCs versus San Francisco, an equivalent tax level in Sacramento might raise around \$6 million per year. Although this is a modest amount of money in comparison to San Francisco's estimate, a steady, predictable stream of revenues that is at least partially generated by visitors as opposed to residents and local property owners and businesses can be an important piece of the total revenue package for CAAP implementation.

Carbon Offset Credits

The California Air Resources Board administers the State of California's carbon Cap and Trade program. To date, the program has provided limited opportunities for entities that undertake GHG-reduction actions to monetize carbon offset credits. However, in the future, there may be opportunities to do so.

With GHG reduction as a central focus, many of Sacramento's CAAP actions, such as its aggressive plan to expand the urban forest, could potentially qualify for carbon credits which, if sold, could provide funding for additional CAAP investments. However, the ability to do so would depend on the particular carbon offset protocols that are established and a determination as to whether the GHG reductions represent net new reductions that would not have happened in absence of the ability to sell the credits.

As mentioned previously, the Bay Area Air Quality Management District administers a regional Emissions Banking Program. One potential advantage of a program administered by the Air

Resources Board would be a much larger (potentially statewide) pool of potential buyers who need to obtain emissions credits. This could support higher values for emissions credits than if the buyers were limited to those in the Sacramento area.

4.8 Federal Funding

From time to time, the federal government appropriates funds to be distributed to states and local governments to fund various types of infrastructure investments. Although unpredictable, it is possible that some such funds could be utilized to help implement certain CAAP projects that align with the federal program criteria. Depending on the priorities of the administration following from the 2020 presidential and congressional elections, there may be renewed focus on investments in climate change-related programs and projects and/or investments in infrastructure as a component of stimulus programs to aid in recovery from the COVID-19 epidemic. These funds would most likely flow to the local level through programs administered by federal agencies that pass grant funding through to state, regional, and local governments, such as the Department of Transportation and the Department of Housing and Urban Development.



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City of Sacramento Climate Action and Adaptation Plan

Appendix E – Municipal Inventory and Forecast Methodology

prepared for

City of Sacramento
915 I Street
Sacramento, California 95814

prepared with the assistance of

Rincon Consultants, Inc.
4825 J Street, Suite 200
Sacramento, California 95819

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RINCON CONSULTANTS, INC.

Environmental Scientists | Planners | Engineers

rinconconsultants.com

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1 Introduction

California considers greenhouse gas (GHG) emissions and the impacts of climate change to be a serious threat to public health, the environment, economic well-being, and natural resources of the State, and has taken an aggressive stance to mitigate the impact on climate change at the State-level through the adoption of legislation and policies. Many cities have developed local climate action plans and aligned goals to correspond with State emissions reduction targets. The two major State GHG-related goals are established by Assembly Bill (AB) 32 and Senate Bill (SB) 32. AB 32 required State agencies to reduce State GHG emissions to 1990 levels by 2020; SB 32 requires a 40 percent reduction below 1990 levels by 2030. The goals set by AB 32 were achieved by the State in 2016¹ and many local jurisdictions are completing GHG inventories to quantify progress toward their own 2020 goals as well as develop targets to align with the requirements of SB 32.

GHG inventories and targets are generally established at the community-level, to capture the full picture of GHG emissions for the jurisdiction. To this end, a 2016 community-wide GHG inventory and forecast was completed for the City of Sacramento and methodologies and results of that inventory are contained in a separate technical appendix (Appendix A). This document by contrast contains methods and results of a municipal-level GHG inventory for the City of Sacramento. The municipal inventory complements the community-wide inventory, with a narrower focus on GHG emissions for City programs, buildings, and staff. While the municipal inventory is a subset of the community inventory, the increased resolution at the municipal level allows the City to take exemplary action in reducing its own GHG emissions and act as a leader for the much larger community-wide effort to achieve substantial GHG reduction targets. Emissions contained within the municipal inventory include activities under direct control of the City of Sacramento.

This technical appendix provides a complete analysis of the previous municipal inventories completed for the City of Sacramento in 2005 and 2013 as well as details on the methodology used by Rincon for the 2016 inventory update, which is also used as the baseline for GHG forecast. Municipal emissions are forecast for the years 2020, 2030, and 2045 to align with State and City targets.

Emissions inventories are an iterative process and each year must be viewed in the context of other inventories and relative trends of each sector to maintain consistency with the emissions inventory methods and factors.

¹ California Air Resources Board. California Greenhouse Gas Emissions Inventory. Accessed at: <https://ww3.arb.ca.gov/cc/inventory/inventory.htm>. Accessed on: July 2019

2 Municipal Inventory

The methodologies, data sources, calculations, and results associated with the 2016 municipal GHG inventory are included in this section. The municipal inventory is considered a subset of the community inventory (see Appendix A) and has therefore already largely been accounted for in the community inventory.² The GHG emissions below are included in this appendix to inform the development of climate action plan strategies that will reduce emissions in internal government operations.

The ICLEI Local Government Operations Protocol³ (referred to hereafter as ICLEI LGOP) recommends local governments examine their emission sources in the context of operational control when determining whether to include in their inventory. The 2016 municipal GHG inventory is based on this recommendation and for consistency with previous GHG inventory methods and reporting (2005 and 2013).

The 2016 inventory reports the following emission sectors as recommended by ICLEI LGOP:

- City-owned buildings and facilities
- Streetlights and traffic signals
- Water and wastewater treatment and conveyance
- Vehicle fleet
- Solid waste facilities (waste-in-place)

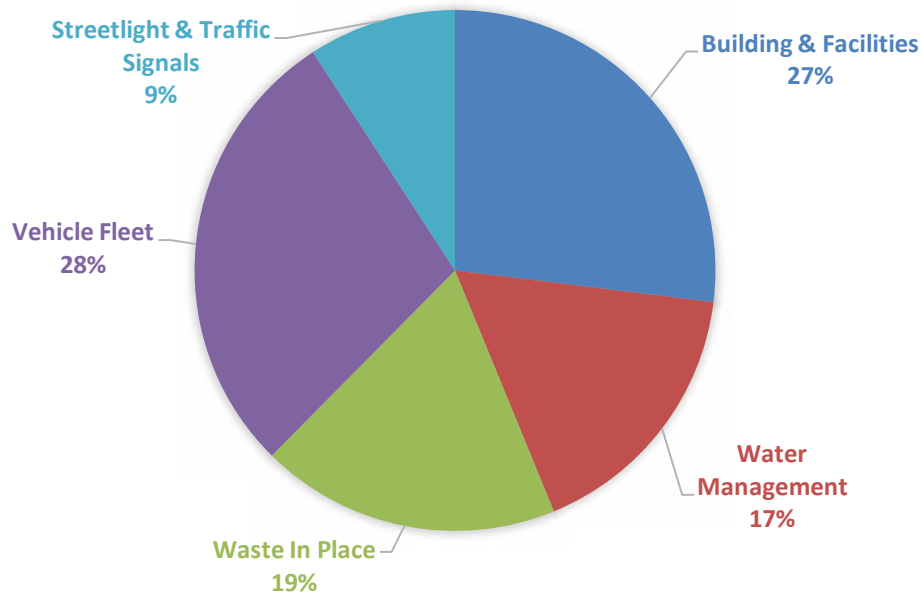
In 2016, municipal operations resulted in 56,463 metric tons of carbon dioxide equivalent (MT CO₂e). The largest emissions sector was vehicle fleet (28 percent) followed by buildings and facilities (27 percent) and waste-in-place (19 percent) emissions. Detailed results can be found in Table 1 and Figure 1. The following sections discuss each emissions sector of the municipal inventory.

Table 1 2016 Municipal Emissions by Sector

Sector	Emissions (MT CO ₂ e)
Vehicle Fleet	16,035
Building & Facilities	15,214
Waste-in-Place	10,512
Water Management	9,516
Streetlight & Traffic Signals	5,186
Total	56,463

² The municipal inventory captures a small amount of GHG emissions that are not captured in the community inventory. This includes GHG emissions from off-road equipment (e.g., from heavy-duty equipment used at City parks or other City land) and fuel use for building needs not supplied by the grid (e.g., fuel in emergency generators or backup equipment). However, all other GHG emission sources captured by the municipal inventory are already captured in the community inventory. The municipal inventory is therefore considered, effectively, to be a subset of the community inventory and the two inventories should not be “added” together.

³ https://ww3.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf

Figure 1 2016 Municipal GHG Emissions (MTCO₂e)

2.1 Previous Inventories and Emissions Reduction Progress

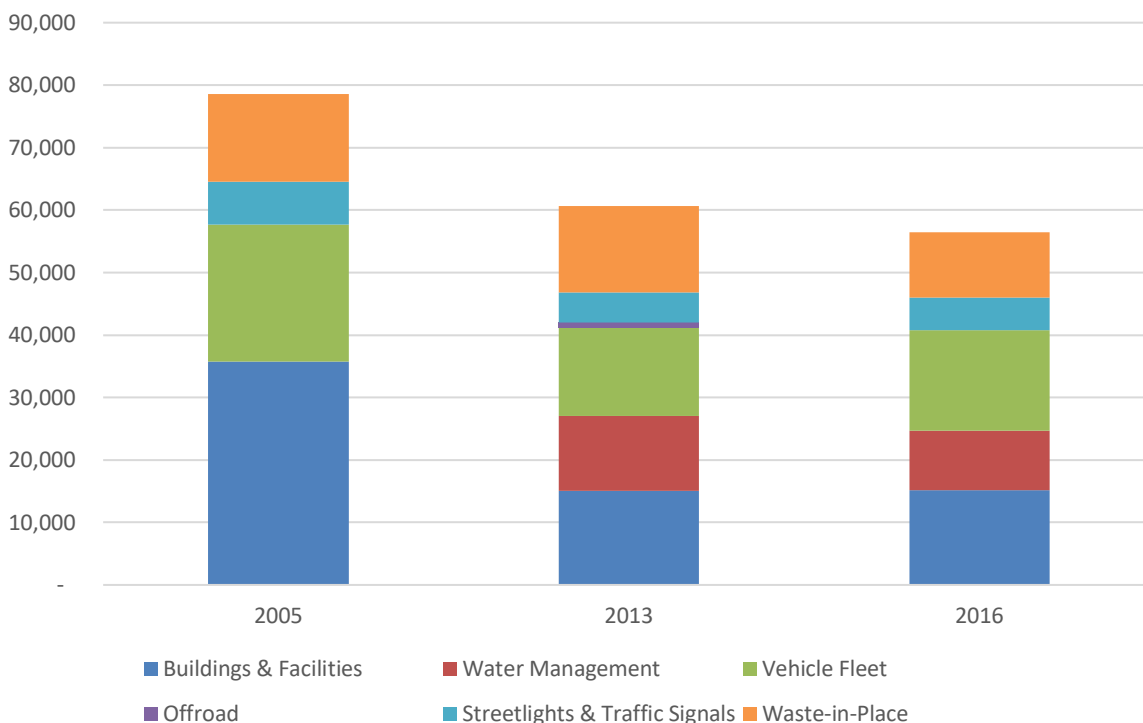
The City of Sacramento has conducted two previous GHG inventories for internal government operations, one for the calendar year 2005 and another for the calendar year 2013. Since 2005, overall GHG emissions have decreased by 22,121 MT CO₂e or 28 percent. An accounting of the methodological changes between each inventory is included in the following section. The building and water management sectors and the waste sector decreased each year from 2005 to 2016. The transportation sector decreased from 2005 to 2013 but increased again in 2016 by 1,092 MT CO₂e. Streetlights and traffic signals followed a similar trajectory, decreasing from 2005 to 2013 but seeing a slight rise in 2016. However, changes to streetlight calculation methodologies could be the cause of this change. A summary of each inventory year are included below in Table 2 and Figure 2.

Table 2 Municipal Inventory Comparison

Sector	2005 (MT CO ₂ e)	2013 (MT CO ₂ e)	2016 (MT CO ₂ e)
Building & Facilities	35,773	15,011	15,214
Water Management		12,043	9,516
Vehicle Fleet	21,927	14,081	16,035
Off-road	N/A	862	
Streetlights & Traffic Signals	6,872	4,870	5,186
Waste	14,012	13,750	10,512
Total Emissions	78,584	60,617	56,463

MTCO₂e: metric tons of carbon dioxide equivalent

Figure 2 Municipal Inventory Comparison (MTCO_{2e})



Methodology Changes

The data sources and emissions factors used for the 2005, 2013, and 2016 inventories are summarized in Table 3. Several minor changes are apparent between each year as methods evolved. One minor change made in the 2013 inventory was the breakout of water management emissions from overall building and facilities use. Notable changes to methods in the 2016 inventory include electricity data for all libraries, inclusion of regional pumping electricity data not included in 2013, and a better breakdown of energy data by building/facility.

Table 3 Municipal Data Sources and Emissions Factors by Year and Sector

Data	2005	2013	2016
Data Sources			
Building and Facilities	City energy use from Keith Roberts, included water management energy use. Streetlight and Traffic Signals not included. Included propane but not diesel.	Energy use from EnergyCAP, excludes propane and Library electricity from Pocket-Greenhaven and North Sacramento libraries. Includes diesel generator. May not include all City-operated buildings.	Energy use from EnergyCAP, excludes propane. Includes gasoline and diesel generators.
Water Management		Electricity use by water management system (water, sewer, drainage) from EnergyCAP. Excludes electricity from regional pumping.	Electricity use by water management system (water, sewer, drainage) from EnergyCAP.
Vehicle Fleet	Vehicle fuel use by vehicle type and fuel type. Reported four vehicle types.	Detailed data by vehicle mileage, fuel consumption, and model year. Includes 14 vehicle types.	Utilimarc detailed data by fuel consumption, vehicle mileage, and model year. Includes 31 vehicle types.
Off-road Fleet	Data included in vehicle fleet data from City.	Data broken out from vehicle fleet and reported separately.	Data included in vehicle fleet data from City.
Streetlights and Traffic Signals	Total energy use from SMUD.	Streetlight and traffic signal energy totals from EnergyCAP, extrapolated by light type.	SMUD-owned streetlight and traffic signal energy totals from EnergyCAP, extrapolated by average light use. City-owned streetlight energy totals based on number of streetlights and estimated 4,000 hours of nighttime operation. ¹
Waste-in-Place	Waste in-place tonnage.	Total CH ₄ captured at 28th Street Landfill	Total CH ₄ captured at 28th Street Landfill.
Emissions Factors			
Building and Facilities	SMUD ² 2005	SMUD 2013	SMUD 2016, PG&E 2016, EPA eGRID 2016, TCR 2016 (generators)
Water Management		SMUD and PG&E 2013	SMUD 2016, EPA eGRID 2016
Vehicle Fleet	Fuel-based	Fleet fuel consumption, EMFAC 2014 ³ , TCR 2013 for non-gasoline fuel	Fleet fuel consumption, mileage and TCR ⁴ 2016 for CH ₄ , N ₂ O, non-gasoline fuel
Off-road Fleet	N/A	Fuel-based	Fuel-based (TCR 2016)
Streetlights and Traffic Signals	SMUD 2005	SMUD 2013	SMUD 2016, EPA eGRID 2016

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Data	2005	2013	2016
Waste-in-Place	ARB FOD	ICLEI LGOP 9.1	ICLEI LGOP 9.1
GWP	IPCC SAR (21, 310)	IPCC SAR (21,310)	IPCC AR4 (25, 298)

¹ https://www.smud.org/-/media/Documents/Rate-Information/Rates/01_SLS.ashx

² Sacramento Municipal Utilities District

³ https://www.arb.ca.gov/emfac/2014/?_ga=2.188515880.1044032860.1584991585-988399991.1554499524

⁴ 2016 The Climate Registry Emissions Factors, <https://www.theclimateregistry.org/wp-content/uploads/2014/11/2016-Climate-Registry-Default-Emission-Factors.pdf>

As noted earlier, the internal operations emissions data presented above are a subset of the communitywide inventory (see Appendix A). These emissions are not added to the community inventory and therefore, no “double-counting” is occurring between community-wide and internal operations. Additional information regarding the 2005 and 2011 Sacramento GHG inventories can be found in the previous 2016 IO CAP Update.⁴

2.2 Inventory Data Sources

The data used to complete the 2016 GHG inventory and forecast came from multiple sources, as summarized in greater detail in Table 4. Data for the 2016 municipal GHG inventory calculations were provided by City staff via personal communication with Helen Selph, Jennifer Venema, John Febbo, and Mark Stevens⁵.

⁴ City of Sacramento. Climate Action Plan for Internal Operations, 2016 Update. https://www.cityofsacramento.org/-/media/Corporate/Files/Public-Works/Facilities/CityOfSacramento_1606_ClimateActionPlan_InternalOps_FINAL.pdf?la=en Accessed: November 2019.

⁵ Helen Selph, Associate Planner; Jennifer Venema, Sustainability Manager; John Febbo, Integrated Waste Planning Superintendent, Mark Stevens, Fleet Manager.

Table 4 Inventory and GHG Emission Factors Sources

Sector	Data	Unit	Source
Activity Data			
Building Energy	Electricity Consumption	kWh	EnergyCAP
	Natural Gas Consumption	Therms	EnergyCAP
Transportation	Fuel Usage, Annual Mileage	Gallon, GGE, VMT	Utilimarc
Streetlights	Electricity Consumption	kWh	EnergyCAP City of Sacramento
Water	Electricity Usage	kWh	EnergyCAP
Solid Waste	Landfill Gas, Methane Content	cf	Sacramento Public Works Department
Emission Factors			
Electricity	SMUD, PG&E, and eGRID electricity emissions factors	CO ₂ /MWh, CH ₄ MWh, N ₂ O/MWh	The Climate Registry 2016 Reported Emissions Factors, EPA eGRID
Natural Gas	PG&E natural gas emissions factor	CO ₂ /therm, CH ₄ /therm, N ₂ O/therm	The Climate Registry 2016 Reported Emissions Factors
Transportation Fuels	Diesel, Gasoline, CNG, LNG, E85, and Propane emission factors	CO ₂ /gal or mi, CH ₄ /gal or mi, N ₂ O/gal or mi	The Climate Registry 2016 Default Emissions Factors
Streetlights and Traffic Signals	SMUD and EGRID electricity emissions factors	CO ₂ /MWh, CH ₄ MWh, N ₂ O/MWh	The Climate Registry 2016 Emissions Factors, EPA eGRID
Water Management	SMUD and EGRID electricity emissions factors	CO ₂ /MWh, CH ₄ MWh, N ₂ O/MWh	The Climate Registry 2016 Reported Emissions Factors, EPA eGRID
Waste	N/A (constants)	N/A	N/A

cf: cubic feet; CO₂: carbon dioxide; CH₄: methane; CNG: compressed natural gas; EPA: Environmental Protection Agency; kWh: kilowatt hours; gal: GGE: gasoline gallon equivalent; LNG: liquid natural gas; MWh: megawatt hour; N₂O: nitrous oxide; PG&E: Pacific Gas & Electric; SMUD: Sacramento Municipal Utility District; VMT: vehicle miles traveled; N/A: not applicable

2.3 Building and Facilities

In 2016, municipal building and facility energy use resulted in 15,214 MT CO₂e, comprising the second largest emissions source after the vehicle fleet. Energy use consisted primarily of electricity and natural gas, as well as diesel and gasoline which is used to power emergency generators.

Electricity, natural gas, and generator fuel for building and facilities were provided by SMUD, Tesla/Solar City (on-site solar), Public Works Department fuel contracts, and PG&E. Grid-supplied building and facility energy data were collected by the City of Sacramento staff using EnergyCAP software, run through internal analysis, and provided to Rincon (as summarized in Table 5).

Table 5 Municipal Building and Facilities Energy Use

Emission Source	Energy Usage	Unit	Emissions Factor	Emissions (MT CO ₂ e) ¹	Percent (%) of Total
SMUD Purchased Electricity (except H2O management)	40,323.72	MWh	0.2236 MT CO ₂ /MWh	9,053	59%
PG&E Purchased Electricity ²	86	MWh	0.1332 MT CO ₂ /MWh	12	0.08%
Solar City Purchased Electricity	4,353	MWh	0.0 MT CO ₂ /MWh	0	0%
PG&E Natural Gas Use	900,788	therms	0.0053 MT CO ₂ /therm	6,130	40%
Gasoline Generators	44	gallons	0.0088 MT CO ₂ /gal gasoline	0.4	0.0025%
Diesel Generators	1,661	gallons	0.0102 MT CO ₂ /gal diesel	19	0.13%
Total Emissions	–	–	–	15,214	–

¹ MT CO₂e: metric tons of carbon dioxide equivalent

² PG&E electricity provided for Camp Sacramento operations only.

Buildings and facilities in this sector include City-owned and operated offices, corporation yards, parking lot facilities, and irrigation systems at City-owned facilities. Electricity use includes lighting, appliances, and equipment in City buildings and facilities.⁶ Natural gas was most often used for space heating and water heating. Diesel and gasoline fuel were used for City-operated back-up generators, which are used intermittently during power outages and for regular testing. Generator fuel use was provided by the City of Sacramento's Utilimarc program for tracking fuel purchases. Electricity use for water supply and management by the Department of Utilities is included in a separate section and has been removed from the Buildings and Facilities category. Electricity for vehicle charging has not been broken out and is included in overall building electricity.⁷ A detailed breakdown of building energy use by emission source and building type can be found in Table 6.

The 2016 inventory likely includes more buildings than the 2013 inventory. At a minimum, the 2016 inventory includes the Pocket-Greenhaven Library electricity consumption which was not included in the 2013 inventory (approximately 523,823 kWh or 117 MT CO₂e). The 2013 inventory noted that data from this library was not available at the time of inventory creation. Additional buildings may also be an addition to the 2016 inventory. However, because the 2013 inventory does not include a detailed list of buildings accounted for in the analysis, it is not possible to identify if the library was accounted for in a different portion of the building inventory. However, all future inventories will provide a complete list of building-by-building end uses to avoid this issue.

Table 6 Municipal Buildings and Facilities Emissions

Facility Type	Energy Consumption	CO ₂ (MT)	CH ₄ (MT)	N ₂ O (MT)	CO ₂ e (MT)	Fuel Type
Electricity (kWh)						
Camp Sac	85,960	11.45	0.00	0.00	12	Electricity
Solar City (Purchased)	4,353,000	0.00	0.00	0.00	0	Electricity
Police	6,319,471	1,413.03	0.09	0.01	1419	Electricity

⁶ Electricity use for streetlights and traffic signals is accounted for in a separate sector. Refer to Section 2.7.

⁷ At the time of report preparation, data was unavailable for all electricity related to EV charging; as of late 2019, only one City facility had a separate submeter for EV charging, City Hall Parking Garage.

Facility Type	Energy Consumption	CO ₂ (MT)	CH ₄ (MT)	N ₂ O (MT)	CO ₂ e (MT)	Fuel Type
Fire	2,147,681	480.22	0.03	0.00	482	Electricity
Public Works	10,495,687	2,346.82	0.16	0.02	2356	Electricity
Libraries ¹	3,331,210	744.85	0.05	0.01	748	Electricity
Parks & Recreation	5,890,602	1,317.13	0.09	0.01	1323	Electricity
Cultural and Community Services	11,075,055	2,476.37	0.17	0.02	2487	Electricity
Youth Parks and Community Enrichment	34,862	7.80	0.00	0.00	8	Electricity
Community Development Department	356,474	79.71	0.01	0.00	80	Electricity
Other-City-Related-Accounts	300,243	67.13	0.00	0.00	67	Electricity
Unknown Accounts	3,366	0.75	0.00	0.00	1	Electricity
Downtown Plaza- Central Garage (Lot U)	136,758	30.58	0.00	0.00	31	Electricity
Old Sac Waterfront	111,726	24.98	0.00	0.00	25	Electricity
1109 2nd St. Building	37,154	8.31	0.00	0.00	8	Electricity
1115 2nd St. Building	3,791	0.85	0.00	0.00	1	Electricity
Old Sac Promenade	48,342	10.81	0.00	0.00	11	Electricity
1012 2nd St. Building	31,298	7.00	0.00	0.00	7	Electricity
Total	44,762,680	9,027.8	0.60	0.07	9,065²	--
Diesel and Gasoline (Gallons)						
Generators	1,661	16.96	0.0009	0.0069	19	Diesel
Generators	44	0.39	0.0000	0.0000	0	Gasoline
Total	1,705	17.35	0.00095	0.0069	19	--
Natural Gas (Therms)						
Police	78,736	417.85	3.78	0.079	536	Natural Gas
Fire	75,832	402.44	3.64	0.076	516	Natural Gas
Utilities	205,861	1,092.51	9.88	0.206	1401	Natural Gas
Public Works	141,931	753.23	6.81	0.142	966	Natural Gas
Libraries ¹	68,891	365.61	3.31	0.069	469	Natural Gas
Parks & Recreation	54,074	286.97	2.60	0.054	368	Natural Gas
Convention and Cultural Services	249,902	1,326.24	12.00	0.250	1701	Natural Gas
Community Development Department	25,389	134.74	1.22	0.025	173	Natural Gas
Old Sac Waterfront	172	0.91	0.01	0.000	1	Natural Gas
Total	900,788	4,780.5	43.2	0.9	6,130	-
¹ Includes activity data for all libraries in City limits that are City-owned buildings.						
² Numbers may not sum due to rounding						
MT = metric tons						

Approximately 60 percent of building and facility emissions occurred from electricity usage, while 40 percent were attributable to natural gas and generator emissions. Overall, buildings and facilities were 27 percent of total municipal operations emissions.

2.4 Water Management

The City provides water-related utility services to residents and businesses in the form of water intake, treatment, and distribution; wastewater collection and conveyance; and stormwater drainage. In 2016, pumping and other activities associated with these water-related services (referred to hereafter as the “water management” sector) produced 87,811 acre-feet of water. This sector comprised 17 percent of the City’s total municipal GHG emissions in 2016. Water management activity represented the fourth largest sector of emissions in the city after the vehicle fleet emissions, building and facility energy use, and waste. More detail on the sector is available in Table 7.

Table 7 Municipal Water Management Emissions

Activity	Electricity (kWh)	CO ₂ (MT)	CH ₄ (MT)	N ₂ O (MT)	Emissions (MT CO ₂ e)
Water Supply Conveyance	35,190,068	7,868.45	0.527	0.064	7,901
Wastewater Conveyance	2,551,344	570.48	0.038	0.005	573
Stormwater Drainage	4,645,541	1,038.74	0.070	0.008	1,043
Total	42,386,953	9,477.66	0.63	0.08	9,516

2.5 Vehicle Fleet

The City’s 2016 vehicle fleet consisted of a variety of vehicle types using both conventional and alternative fuels. Fuel consumption from vehicle fleet operations contributed to approximately 16,035 MT CO₂e in 2016, comprising 28 percent of the City’s annual operational GHG emissions (Table 8). This sector captures fuel usage for both on-road and off-road vehicle activities. All fuel use is presented by fuel type for this sector.

Table 8 Municipal Fleet Emissions

Fuel Type	Units (Gallons)	CO ₂ Factor	CO ₂ (MT)	CH ₄ (MT)	N ₂ O (MT)	Total (MT CO ₂ e)
Gasoline	1,146,935	0.00878	10,070	0.12	0.2	10,125
Diesel	5,173	0.01021	53	0.003	0.022	59
Biodiesel	512,081	N/A	0	0.29	2.1	643
CNG	67,880	0.006896	468	0.53	0.05	495
RNG	18,228.30	N/A	0	0.14	0.05	18
Propane	7,538	0.00568	43	0.02	0.0	44
LNG	945,258	0.00446	4,216	1.86	0.17	4,312
E-85	53,808	0.0062651	337	0.01	0.0	340
Total	–	–	15,187	2.97	2.60	16,035

In 2016, the City operated 2,330 vehicles including maintenance trucks, vans, solid waste collection vehicles, police and fire vehicles, and light duty passenger vehicles. This included 38 CNG, 461 diesel, 222 E85, 90 LNG, 45 propane, and 1,474 unleaded gasoline vehicles.

Fleet emissions were calculated using the LGOP recommended methodologies 7.1.1 and 7.1.3 for CO₂, CH₄, and N₂O in mobile combustion. The LGOP recommends quantifying CO₂ levels through total annual fuel consumption by fuel type and appropriate emissions factors for each. Annual fuel use was provided by the City of Sacramento while emissions factors utilized were identified by The Climate Registry (TCR)⁸, an industry-standard independent third-party verifier for reporting GHG emissions. CH₄ and N₂O levels were calculated either by using the same methodology when emissions per gallon emission factors were available (Gasoline, Diesel, and Propane) or by mileage of each vehicle type when mileage-based emission factors were available (CNG, RNG, LNG, and Ethanol). This method was used for all fleet fuel consumption, both on-road and off-road.

2.6 Waste-in-Place

Waste-in-place emissions are inventoried under LGOP recommended Calculation 9.1 for landfills with landfill gas collection systems. In 2016, the 28th Street Landfill collected 243,718,413 cubic feet of gas with an average methane content of 29.10 percent. Total emissions from the 28th Street Landfill were 10,512 MT CO₂e. This value differs from the community-wide inventory for the same year because it includes only the 28th street landfill which is under the City's direct control. The method for calculation is also different and leverages actual measures CH₄ emissions at the site as well as several assumptions defined by Calculation 9.1 of the LGOP.

GHG emissions in the waste category are attributed to waste-in-place emissions at the City-owned-and-operated 28th Street Landfill. Waste-in-place emissions are the result of anaerobic decomposition of organic material from the existing accumulated waste in a landfill. The anaerobic decomposition occurs at covered landfills where the deposited waste is not exposed to the oxygen in the atmosphere. Previously, the 28th Street Landfill served as the disposal location for solid waste generated within the City between 1968 and 1994. Since the 28th Street Landfill's permanent closure in 1997, a methane gas recovery system was installed and operated by a third-party contractor that collects and disposes of much of the gas that is generated from the closed landfill. From the early 1990s until 2010, the City sold a portion of the captured landfill gas to Blue Diamond Almond for their industrial operations, flaring the remaining captured CH₄. However, in 2013, due partially to the declining quality of landfill gas, the landfill flared all CH₄ that was captured through its landfill gas (LFG) collection system, rather than sell it for combustion. Fugitive CH₄ emissions which were not flaring in 2016 resulted in an estimated 10,512 MTCO₂e. The IPCC considers any CO₂ (non-methane) emissions from flaring or fugitive emissions from landfills to be of biogenic origin and not significant to overall solid waste emissions.

2.7 Streetlights and Traffic Signals

Electricity in this sector falls into three categories, traffic signals, City-owned streetlights (metered and non-metered), and SMUD-owned streetlights. Electricity usage for traffic signals and SMUD owned streetlights was provided by with the EnergyCAP data. Electricity data for unmetered

⁸ The Climate Registry. 2016 Default Emission Factors. <https://www.theclimateregistry.org/wp-content/uploads/2014/11/2016-Climate-Registry-Default-Emission-Factors.pdf> Accessed: Oct. 2019

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streetlights was not available through EnergyCAP. Instead, the City provided a comprehensive list of all City-owned streetlights and wattage estimates. This information along with a SMUD-provided operational assumption of approximately 4,000 hours of streetlight use per year was used to estimate unmetered streetlight electricity use.⁹

In 2016, the operation of streetlights and traffic signals in the City required approximately 23,097,333 kWh of electricity and resulted in 5,186 MTCO₂e, contributing 9 percent of the City's total annual GHG emissions (Table 9). In 2016 the City operated 41,591 streetlights and at least 631 traffic signals.¹⁰ This sector captures electricity for all streetlights and traffic signals operated by the City, including both City-owned and SMUD-owned streetlights.

Table 9 Streetlight and Traffic Signal Emissions

Source (Number)	Electricity (kWh)	CO ₂ (MT)	CH ₄ (MT)	N ₂ O (MT)	Emissions (MT CO ₂ e)
Traffic Signals (631)	1,995,276	446.1	0.0299	0.0036	448
City-Owned Streetlights (38,135)	19,348,584	4326.3	0.2896	0.0351	4,344
SMUD-Owned Streetlights (3,456)	1,753,473	392.07	0.0262	0.0032	394
Total	23,097,333	5164.5	0.35	0.0419	5,186

⁹ https://www.smud.org/-/media/Documents/Rate-Information/Rates/01_SLS.ashx

¹⁰ 630 traffic signal accounts were registered with SMUD with one additional Master Account with an unknown number of associated signals. 631 is used here as the minimum value.

3 Municipal Forecast

A baseline municipal GHG emissions inventory (i.e., the City of Sacramento’s 2016 municipal inventory) sets a reference point for municipal emissions for a single year. As the demographics of the City change, municipal emissions may change as well, such that municipal emissions in the future may be quite different. A municipal GHG emissions forecast attempts to quantitatively capture these future changes and is based primarily on projected population growth within the City, as well as existing programs and regulations at the City and State level as of the 2016 inventory. The projections from the municipal emissions forecast provides the basis for determining the City’s Climate Action Plan policies on a municipal level. Municipal policies are developed based on the difference or gap between the municipal forecast and the municipal reduction targets set by the City.

This section quantifies the projected municipal GHG emissions for the City of Sacramento in the horizon years 2030 and 2045. The forecast additionally includes reductions from State regulations in order to provide a more accurate picture of future emissions growth and highlight the City’s responsibility for achieving further reductions necessary for attainment of municipal GHG emissions targets. This “gap analysis” provides the City with the total municipal emissions reductions that would be necessary to achieve goals, as well as information on the emissions sectors and sources which have the most GHG reduction opportunities. Further details on State regulations and programs aimed at reducing GHG emissions are provided in Appendix B.

3.1 Forecast Methods and Results Summary

The driving factor for the municipal forecast was population growth, as an increasing population is anticipated to lead to increased municipal staff and increased usage of municipal facilities and services. Population projections were obtained from the 2035 Sacramento General plan population forecast. While it is not known if the City will build or acquire new buildings or facilities by 2045, it was conservatively assumed that any newly constructed or acquired building or facility would be at least as energy-intensive as the building or facility it replaced. Therefore, building and facility energy use projected into 2030 and 2045 is the same as energy use in 2016. Waste-in-place emissions are expected to decrease, as the 28th St. Landfill is no longer operating which will decrease overall emissions from off-gassing. All other sectors – water management, streetlights and traffic signals, and vehicle fleet – represent services for the general population and should therefore increase with the population. For simplicity, growth in these service sectors were assumed to increase linearly with population. The exception is electricity usage for stormwater drainage under the water management sector, which will vary from year to year based on total precipitation in each year and was carried forward unchanged from 2016 to 2030 and 2045 for reasons further discussed in Section 3.3.

Overall municipal GHG emissions in the City of Sacramento are forecast to decrease 42 percent by 2045 under existing programs and regulations (Table 10). Due to SB 100 requiring 100 percent GHG-free electricity in 2045, electricity-related emissions from buildings and facilities, streetlights and traffic signals, and water management are expected to reduce to zero by 2045. Emissions from natural gas, waste, and fuel usage from the vehicle fleet are expected to constitute the majority of emissions by 2045.

Table 10 Municipal Forecast Summary

Year	2005	2016	2030	2045
Population	369,365	487,758	600,231	699,903
Projected Population Increase (%)	–	–	23.1 (17% per year)	16.6 00.1% per year
Buildings and Facilities		15,214	10,965	6,149
Water Management	35,773	9,516	6,093	0
Waste-in-Place	14,021	10,512	6,775	3,722
Streetlights and Traffic Signals	6,872	5,186	3,390	0
Vehicle Fleet	21,927	16,035	19,732	23,009
Municipal Emissions (MT CO₂e)	78,584	56,463	46,954	32,880
Municipal Emissions per Capita (MT CO₂e/person)		0.116	0.078	0.047
Reduction from 2016 (%)	–	–	17%	42%

MT CO₂e: metric tons of carbon dioxide equivalent

SB 100 is the only state regulation included in the municipal forecast. Although, it will reduce municipal GHG emissions substantially by 2045 as shown in Table 11. However, a gap remains between the municipal forecast and the City's municipal targets. The reductions to close the gap will come from existing and newly identified municipal measures included in this and future iterations of the Sacramento Climate Action Plan.

Table 11 Estimated GHG Emissions Savings from SB100

Year	2016	2030	2045
Projected Electricity Use (kWh)	40,409,680	40,409,680	40,409,680
BAU Emissions (MT CO ₂ e)	9,065	9,065	9,065
Emissions with SB100 (MT CO ₂ e)	9,065	4,816	0
Savings (MT CO ₂ e)	0	4,249	9,065

3.2 Buildings and Facilities

As described in Section 3.1, it was conservatively assumed that building and facility energy use projected into 2030 and 2045 will be the same as energy use in 2016. That is, the City will use roughly the same amount of electricity, natural gas, gasoline, and diesel each year through 2045. However, while municipal building and facility energy use is expected to remain the same, GHG emissions from electricity in general are expected to decrease each year, due to the Renewable Portfolio Standard (RPS) and SB 100. 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. Further details on the RPS program are contained in Appendix A. After factoring in emissions reductions from the RPS program, overall GHG emissions from municipal buildings and facilities will therefore

decrease through 2045, from 15,214 MT CO₂e in 2016 to 10,965 MT CO₂e in 2030 to 6,149 MT CO₂e in 2045 (Table 12).

Table 12 Activity and Emissions Data for Municipal Buildings and Facilities

	2016	2030	2045
Activity Data			
Purchased Electricity – SMUD (kWh)	40,323,720	40,323,720	40,323,720
Purchased Electricity – PG&E (kWh)	85,960	85,960	85,960
Purchased Electricity – Solar City (kWh)	4,353,000	4,353,000	4,353,000
Natural Gas Use – PG&E (therms)	900,788	900,788	900,788
Gasoline Use (gallons)	44	44	44
Diesel Use (gallons)	1,661	1,661	1,661
Emissions Factors			
SMUD Electricity (MT CO ₂ e/kWh)	0.00022	0.00012	0.0
PG&E Electricity (MT CO ₂ e/kWh)	0.00013	0.00008	0.0
Solar City Electricity (MT CO ₂ e/kWh)	0.00000	0.00000	0.0
PG&E Natural Gas (MT CO ₂ e/therm)	0.00681	0.00681	0.00681
Gasoline (MT CO ₂ e/gallon)	0.00883	0.00883	0.008823
Diesel (MT CO ₂ e/gallon)	0.01147	0.01147	0.01147
Emissions (MT CO₂e)			
Electricity – SMUD	9,053	4,809	0
Electricity – PG&E	12	7	0
Electricity – Solar City	0	0	0
Natural Gas – PG&E	6,130	6,130	6,130
Gasoline	0.4	0.4	0.4
Diesel	19	19	19
Total	15,214	10,965	6,149
MT CO ₂ e: metric ton of carbon dioxide equivalent; kWh: kilowatt hour			

3.3 Water Management

Electricity used for water management attributable to water supply conveyance and wastewater conveyance will increase each year as the population grows, to service more people and meet projected demand. As mentioned above, electricity usage attributable to stormwater drainage varies from year to year based on precipitation levels, independent of population growth. Inventory year 2016 was the ninth wettest year on record in Sacramento, suggesting that electricity usage for stormwater drainage was particularly high in 2016. This forecast made the conservative assumption that 2030 and 2045 may also be particularly wet years, especially considering that climate change is expected to bring more intense rainfall to Northern California. The electricity usage for stormwater drainage from 2016 was therefore carried forward into 2030 and 2045. Emissions totals for electricity usage from water management factored in anticipated changes to emissions factors due to the RPS program (Table 13)

Table 13 Water Management Activity and Emissions Data

	2016	2030	2045
Activity Data			
Water Supply Conveyance (kWh)	35,190,068	43,304,613	50,495,600
Wastewater Conveyance (kWh)	2,551,344	3,139,663	3,661,023
Stormwater Drainage (kWh)	4,645,541	4,645,541	4,645,541
Emissions Factors			
SMUD Electricity (MT CO ₂ e/kWh)	0.00022	0.00012	0.0
Emissions (MT CO₂e)			
Water Supply Conveyance	7,901	5,164	0
Wastewater Conveyance	573	374	0
Stormwater Drainage	1,043	554	0
Total	9,516	6,093	0

MT CO₂e: metric ton of carbon dioxide equivalent; kWh: kilowatt hour

3.4 Waste-in-Place

Waste-in-Place emissions are expected to decrease over time due to no new organic material being added to the 28th Street landfill. As described in Section 2.6, waste-in-place emissions are entirely attributed to flaring of off-gassed CH₄ from the permanently closed 28th Street Landfill. To estimate how emissions may decrease over time the annual percent reduction (4 percent) was calculated for the period between 2013 and 2016. In 2016, the landfill collected and flared 243,718,413 cubic feet of gas with an average methane content of 29.10 percent. Emissions from gas flaring at the landfill were 10,512 MT CO₂e. The estimated gas capture based on historic subsidence and associated emissions based on Equation 9.1 of the LGOP protocol are included below in Table 14.

Table 14 Waste-in-Place Collected Gas and Emissions Estimates

	2016	2030	2045
Data			
Collected Gas	243,718,413	157,070,840	86,282,675
Emissions (MT CO₂e)	10,512	6,775	3,722

3.5 Streetlights and Traffic Signals

Emissions from streetlights and traffic signals are based on electricity usage. Electricity usage associated with streetlights and traffic signals will increase as population increases (Table 15).

Table 15 Streetlights and Traffic Signals Activity and Emissions Data

	2016	2030	2045
Activity Data (kWh)			
Traffic Signals	1,995,276	2,455,371	2,863,099
City-owned streetlights	19,348,584	23,810,211	27,764,037
SMUD-owned streetlights	1,753,473	2,157,810	2,516,127
Emissions Factors			
SMUD Electricity (MT CO ₂ e/kWh)	0.00022	0.00012	0.0
Emissions (MT CO₂e)			
Traffic Signals	448	293	0
City-owned streetlights	4,344	2,839	0
SMUD-owned streetlights	394	257	0
Total	5,186	3,390	0

MT CO₂e: metric ton of carbon dioxide equivalent; kWh: kilowatt hour

3.6 Vehicle Fleet

Emissions from the City's vehicle fleet were calculated based on total fuel usage in the year 2016. To project these numbers forward into 2030 and 2045, all fuel usage was assumed to increase at the same rate of population, as vehicle usage increases to provide services to more people every year (Table 16). Because vehicle fleet emissions are calculated using fuel specific factors (MT CO₂e per gallon of fuel) these emission factors will not change over time as they are tied to the direct properties of the fuel. However, the efficiency of the fleet may increase over time lowering the total fuel combusted. This efficiency increase is difficult to calculate for several reasons. The first is that a large portion of the fuel combusted was in heavy duty vehicles which are not covered under current legislation. Furthermore, the estimates in the EMFAC model tool which is used to calculate future vehicle emissions is based on the countywide fleet. It is not clear that the City fleet (which is already made up of generally newer and more efficient vehicles) would have the same impact due to current legislation like Pavley. Therefore, to be conservative no adjustments were made to the City fleet. Emissions reductions will be calculated as part of the GHG reduction measures.

Table 16 Activity and Emissions Data for Municipal Vehicle Fleet

	2016	2030	2045
Activity Data (gallons)			
Gasoline	1,146,935	1,411,409	1,645,782
Diesel	5,173	6,365	7,422
Biodiesel (99%)	512,081	630,163	734,806
CNG	67,880	83,532	97,403
RNG	18,228	22,432	26,156
Propane	7,538	9,276	10,816
LNG	945,258	1,163,227	1,356,388
Ethanol	53,808	66,216	77,212
Emissions Factors (MT CO₂/gallon)			
Gasoline		0.00886	
Diesel		0.01147	
Biodiesel (99%)		0.00126	
CNG		0.00732	
RNG		0.00097	
Propane		0.00577	
Emissions (MT CO₂e)			
Gasoline	10,125	12,459	14,528
Diesel	59	73	85
Biodiesel (99%)	643	791	922
CNG	495	610	711
RNG	18	22	25
Propane	44	54	62
LNG	4,312	5,306	6,187
Ethanol	340	418	487
Total	16,035	19,732	23,009

4 Municipal Target Setting

Municipal emissions reduction targets can be set the same way as community-wide reduction targets: as either an efficiency target (MT CO₂e per capita or per service population per year) or as a community wide mass emissions target (total MT CO₂e). Target setting is an iterative process which must be informed by the reductions that can realistically be achieved through the development of feasible GHG reduction measures. Furthermore, the General Plan Update may impact the forecast results. As such, the targets identified herein should remain provisional until the General Plan Update values are finalized and the quantification and analysis of potential GHG reduction measures completed.

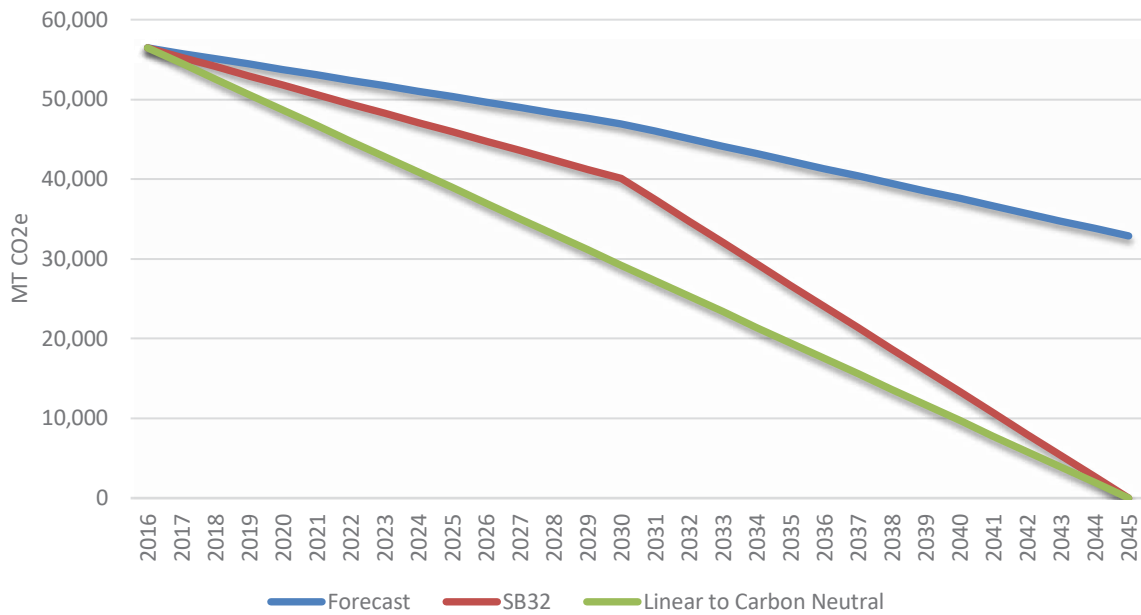
The City of Sacramento has achieved both efficiency and absolute emissions reductions in municipal operations between 2005 and 2016. The purpose of target setting is to develop the trajectory toward achieving the State's 2030 goal and prepare for the deep decarbonization needed by 2045 in a cost-effective manner by setting an incremental path toward achieving the EO B-55-18 goals. There are two primary target pathways available to be consistent with State reduction goals:

- **SB 32 Target Pathway (red)** is the pathway toward achieving the minimum reductions required by State law. This will require minimal reductions until 2030 and then steep reductions from 2030 to 2045.
- **Linear Carbon Neutrality Pathway (green)** is an incremental linear pathway from current per capita emissions levels straight to carbon neutrality in 2045. This pathway is also compliant with the 2030 State goal.

At this time Rincon suggests setting a municipal target that meets or exceeds the targets set for the community. The City has already set a reduction target of 33 percent below 2005 levels by 2020 which is more aggressive than the AB32 requirement of a return to 1990 levels or approximately a 15 percent reduction below 2005 levels by 2020. The two suggested reduction pathways are shown graphically in Figure 2.

Per Capita based municipal emissions targets were not included in this analysis. While a per capita target works well for the community, it is not recommended for the City since municipal emissions are not as directly tied to population growth. Therefore, Rincon suggests setting a mass emissions reduction target of at least 55 percent below 2005 levels by 2030 and carbon neutrality by 2045 and thereafter. This pathway would be consistent with SB32 and Executive Order B-55-18 and is shown in Figure 3 (in red). However, a more aggressive target such as a linear reduction to carbon neutrality in 2045, shown in green in Figure 3, could also be considered. In order to achieve the SB32 compliant pathway (red), the City would need to reduce 48 percent below 2005 levels, 29 percent below 2016 levels, or an estimated 15 percent below 2030 forecast levels by 2030. To reach the linear to carbon neutral target shown in green, the City would need to reduce 60 percent below 2005 levels, 48 percent below 2016 or 38 percent below 2030 forecast levels by 2030. Emission levels for each target pathway, relative to historical actuals and the forecast, are presented in Table 17.

Figure 3 Municipal Target Reduction Pathways



Based on the results of the community target setting and the municipal measure quantification process, the City may choose either of these targets for consistency with state targets.

Table 17 Municipal Target Reduction Pathways

Target Pathway	2005 (MT CO ₂ e)	2016 (MT CO ₂ e)	2030 (MT CO ₂ e)	2045 (MT CO ₂ e)
Historical Actual & Forecast	78,584	56,463	46,954	32,880
SB 32	-	-	40,078	0
Linear to Carbon Neutral	-	-	29,205	0

MT CO₂e: metric tons of carbon dioxide equivalent

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City of Sacramento Climate Action and Adaptation Plan

Appendix F - Municipal Measures GHG Emissions Quantification

prepared by

Rincon Consultants, Inc.
449 15th Street, Suite 300
Oakland, California 94609

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1 Introduction

This technical appendix contains a detailed description of each measure the City will take to reduce its municipal-level greenhouse gas (GHG) emissions, as well as quantification of the reductions expected from the measures wherever possible. This technical appendix is organized around two levels which include:

- **Municipal Measures (MM):** Municipal measures define core strategies that will result in reductions in GHG emissions at the municipal level
 - **Actions:** Each measure is driven by sets of actions that together support and generate the GHG reductions necessary to achieve the City's municipal-level goals

Municipal measures and actions can be either quantitative or supportive and are defined as follows:

- **Quantitative:** These measures and actions have substantial evidence including case studies, calculations, or other substantial evidence that prove that the implementation of said measure/action will have a measurable GHG reduction when implemented. These measures/actions have been quantified based on this substantial evidence and the reductions summed to show how the City will meet its 2030 and 2045 municipal goals and exceed the state target (SB 32) of 40 percent below 1990 GHG levels by 2030.
- **Supportive:** These measures and actions may also be quantifiable and in most cases 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, lack of the necessary data, or simply a high level of difficulty in quantifying accurate GHG reductions, they have not been quantified and do not contribute directly to the expected municipal GHG reduction goal. However, these measures/actions are critical to the overall success of the CAP.

2 Reduction Target

Without additional action, municipal emissions are currently forecast to decrease from 56,463 MT CO₂e in 2016 to 46,954 MT CO₂e in 2030, and to 32,880 in 2045. The City has established a goal of reducing municipal emissions on a linear path to carbon neutrality in 2045. This equates to 29,205 MT CO₂e in 2030 (17,749 MT CO₂e below the 2030 forecast) and net zero in 2045 (32,880 MT CO₂e below the 2045 forecast). Together the quantitative and supportive measures and actions listed in this document will help the City achieve its 2030 and 2045 emission reduction goals. These goals align with the City's community CAP goals as well as the State goals, including the requirements of SB 32 (a 40 percent reduction from 1990 levels in 2030), and the intent of Executive Order B-55-18. A linear reduction to carbon neutrality exceeds the State target by establishing a target of 56 percent below 1990 levels by 2030.

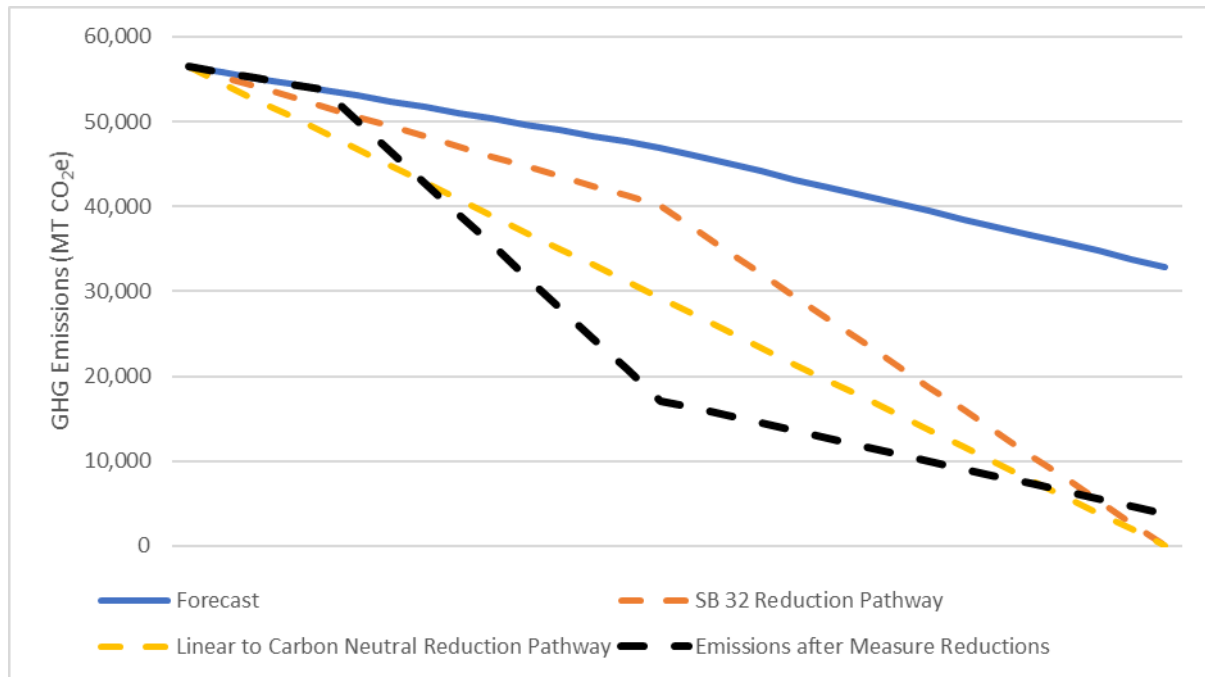
This technical report provides the emission reduction calculations and evidence that the municipal measures adopted in the CAP will allow the City to reach its 2030 goal and will provide substantial foundation for and progress toward achieving the 2045 goal and Executive Order B-55-18.

Achieving carbon neutrality, on both a municipal and community level, will require significant changes to the technology and systems currently in place. These changes include carbon neutral electricity, complete electrification of buildings and the transportation system, a shift to shared and active mobility, and waste reduction and diversion. The measures and actions developed to meet the 2030 goals are the foundations for this long-term transformation. However, the emissions reductions quantified for 2045 in this document are not yet enough to meet the long term 2045 goal. As the current measures and actions are implemented, the City will gain more information, new technologies will emerge, and current pilot projects and programs will scale to the size needed to reach carbon neutrality. Furthermore, the State is expected to continue providing updated regulations and support once the 2030 target is achieved. Future CAP updates will outline new measures needed to reach the 2045 goal of carbon neutrality.

3 GHG Reduction Summary

The City of Sacramento, in coordination with Rincon Consultants has developed a suite of measures and specific actions to reduce municipal GHG emissions over time. Based on these measures, emissions are expected to exceed the 2030 reduction target but fall short of the 2045 target by 3,741 MT CO₂e. This is illustrated below in Figure 1. The 3,741 MT CO₂e remaining in 2045 is entirely attributed to waste-in-place emissions which are caused by the degradation of waste already located in the closed municipal landfill, as well as some remaining gasoline and diesel usage for municipal generators. This waste sector is not usually considered in most GHG inventories, and the City is already capturing methane from this facility, greatly reducing GHG emissions. These remaining sources of GHG emissions will likely need to be mitigated through carbon sequestration taking place at the larger community scale.

Figure 1 Estimated Municipal GHG Reductions and Target Pathway



A summary of the GHG emissions reduction by Measure is included in Table 1. For a complete description of each measure and the contributing actions, please refer to the individual measure descriptions below.

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Table 1 Summary of GHG Emissions Reductions by Measure

Measure #	Measure Description	2030 Reduction (MT CO₂e)	2045 Reduction (MT CO₂e)
MM-1	Reduce natural gas consumption 50% below 2016 levels by 2030 and 100% by 2045.	3,068	6,130
MM-2	Electrify or decarbonize 100% of light-duty fleet vehicles by 2035 and 100% of municipal fleet by 2045.	9,246	23,009
MM-3	Reduce emissions from trips between City facilities occurring during the workday.	Supportive	Supportive
MM-4	Reduce municipal waste sent to landfills.	Supportive	Supportive
MM-5	Reduce emissions from water usage/conveyance and stormwater drainage (in MT of CO ₂ e per MG delivered) 100% by 2030.	6,093	0
MM-6	Improve carbon sequestration potential of municipal parks, greenspace at City properties, and street tree planters in the public right-of-way.	Supportive	Supportive
MM-7	Procure carbon free electricity by 2030, in alignment with SMUD's 2030 Zero Carbon Plan.	8,198	0
MM-8	Reduce City employee commuter VMT.	Supportive	Supportive
MM-9	Encourage an increase in the number of employee-owned EV and plug-in hybrid electric vehicles 28% by 2030 and 100% by 2045	Supportive	Supportive
Reduction Summary			
Estimated Reductions Achieved from Full Implementation of Measures		26,604	29,139
Total Reduction Needed		17,749	32,880
Gap		-8,855	3,741
Notes: MM = municipal measure, numbers may not sum due to rounding.			

4 Municipal Measures Detail

Measure MM-1:

Reduce natural gas consumption 50% below 2016 by 2030 and 100% by 2045.

2030 Target

3,068 MT CO₂e

2045 Target

6,130 MT CO₂e

Performance Metric(s):

- 50% all-electric building stock by 2030
- 100% all-electric building stock by 2045

Action #	Action	Anticipated Reduction
Quantitative Measures		
MM-1.1	Electrification – Implement an “electric first” commitment for building projects and major retrofits.	
MM-1.2	Building Retrofits - Develop a strategy to transition 100% of existing municipally owned and controlled buildings and facilities to electric by 2045 through expansion of the City’s Energy Efficiency Reinvestment Program. This includes auditing remaining City facilities, establishing a retrofit project pipeline of fundable projects prioritized based on opportunities to reduce energy costs and eliminate natural gas, developing a phase-out plan for each piece of natural gas equipment, and creating an internal revolving loan fund for City facility retrofits.	3,065 MT CO ₂ e (2030) 6,130 MT CO ₂ e (2045)
MM-1.3	SolarShares - Maintain participation in SolarShares for off-site solar photovoltaics to offset at least 35% of municipal power in 2030.	3 (2030)
Supportive Measures		
MM-1.4	Streetlights – Retrofit all post-top streetlights to LED and remaining streetlights as feasible by 2030.	Supportive
MM-1.5	Municipal Green Building Policy – Develop a Municipal Green Building Policy to include all-electric retrofits at time of replacement for major retrofits or building replacements, when feasible.	Supportive
MM-1.6	Generator Phase-out – Evaluate the feasibility of phasing out diesel generators by 2033, by replacing them with solar and storage to provide backup power for buildings. Utilize renewable diesel requirements for existing generators in the short-term if needed.	Supportive
MM-1.7	Solar – Expand on-site production of renewable power and develop energy storage technologies for critical operations.	Supportive

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MM-1.8	Battery Storage Pilot Project: Identify a site and construct a battery storage pilot project as well as encourage pairing battery storage systems with all solar PV system installation.	Supportive
MM-1.9	Microgrid Pilot Project - Identify a site and construct a microgrid pilot project preferably for a critical facility like a fire station.	Supportive
MM-1.10	Energy Management – Install and utilize energy management software in existing and new buildings in order to allow for building monitoring, responsive repairs, and assessment of long-term energy trends. Provide trainings on software to facilities management.	Supportive
MM-1.11	Electrification Study – Conduct an electrification study to identify sources of natural gas and diesel which can be eliminated/switched at time of replacement.	Supportive
MM-1.12	Additional Resources – Identify additional resources (money and staffing) to assist with implementation of Municipal Measure 1.	Supportive

MM-1 Quantification

In order for the City to contribute its part in reaching carbon neutrality on a community-wide level, the majority of the City’s building stock will need to be carbon neutral. Electrification allows buildings to use the 100% carbon neutral electricity that will be provided by SMUD by 2030. This measure ensures (1) that new buildings will be built 100% electric so that they won’t need to be retrofitted later, (2) that old buildings will be retrofitted on as fast a timeline as possible, and (3) decreases building emissions to the extent feasible while they are not electric. The municipal forecast also included expected efficiencies through 2045 due to Title 24 and SB 100. Actions 1.1 and 1.2 are quantified together. Supportive Actions 1.4 through 1.12 are not directly quantifiable but will help the City achieve the overall measure.

Evidence for Actions 1.1 and 1.2: These two measures ensure electrification of the municipal building stock. By 2030, electricity will be carbon neutral (i.e., 0 MT CO₂e per kWh) and 100% electrification of the building stock would result in 100% reduction in building emissions from natural gas. In addition to the electrification efforts, retrofits to increase energy efficiency in municipal buildings is well underway, and the City aims to reduce electricity use in buildings 25% by 2030. Between 2016 and 2019, the City has decreased electricity.

Table 2 Quantification Results for MM-1.1 and MM-1.2

Actions 1.1 and 1.2	2030	2045
Natural Gas Saved (therms)	450,394	900,788
MT CO ₂ e/therm	0.00681	0.00681
Emissions reductions (MT CO ₂ e)	3,067	6,130
Emissions from electricity conversion	0	0
Electricity saved from retrofits (kWh)	10,102,420	10,102,420
Net MT CO ₂ e Savings	3,068	6,130

Evidence for Action 1.3: The City of Sacramento participates in the SolarShares program, which has offset 28,979,195 kWh since 2016 (about 35% of electricity usage year-to-year). By continuing to participate in the program, the City expects to continue offsetting approximately 35% of electricity usage each year, resulting in savings through 2030, until electricity is carbon-neutral.

Table 3 Quantification Results for MM-1.3

Action 1.3	2030	2045
Electricity Offset (kWh)	10,607,541	0
Net MT CO ₂ e Savings	3 ¹	0

¹ Emissions reductions are small due to SMUD electricity reaching carbon neutrality by 2030 as part of the SMUD 2030 Plan. The reductions are therefore attributed only to the PG&E electricity which is a small portion of overall City consumption and will also be much lower emissions by 2030.

Measure MM-2: Electrify or decarbonize 100% of light-duty fleet vehicles by 2035 and 100% of municipal fleet by 2045	2030 Target <i>9,246 MT CO₂e</i> 2045 Target <i>23,009 MT CO₂e</i>
Performance Metrics: <ul style="list-style-type: none"> 74% of light-duty fleet vehicles are EVs by 2030 100% of light-duty fleet vehicles are EVs by 2035 100% of municipal fleet is EV by 2045 	

Action #	Action	Anticipated Reduction
Quantitative Actions		
MM-2.1	ZEV First – Continue to implement the City’s adopted “Zero-emission Vehicle First” policy that directs City departments to purchase ZEVs and develop a plan to convert 100% of all light-duty vehicles in the City’s fleet to ZEVs by 2035 while forging partnerships with manufacturers to pilot medium and heavy-duty ZEVs.	9,181 MT CO ₂ e (2030) 23,009 MT CO ₂ e (2045)
MM-2.2	Renewable Diesel and Alternatives – Continue to use renewable diesel in all diesel fleet vehicles.	65 MT CO ₂ e (2030)
Supportive Actions		
MM-2.3	EV Chargers – Install EV charging infrastructure across City-owned facilities for motor pool vehicles and personal vehicle fueling	Supportive
MM-2.4	Hybrid Phase-in – Replace all expiring mid-size vehicles and trucks with hybrid models if no all-electric alternative is available.	Supportive
MM-2.5	Anti-idling Policy – Expand and enforce existing anti-idling policies on all City vehicles	Supportive

MM-2 Quantification

Electrifying the vehicle fleet will reduce the City’s dependence on fossil fuels and enable emissions from vehicles replaced by EVs to go to zero in 2045, due to SB 100 making electricity carbon neutral in 2045. The City of Sacramento will electrify the vehicle fleet in a phased approach that starts with light-duty vehicles and will include medium and heavy-duty vehicles as the technology becomes available. Currently, the City’s fleet of 2,433 units is comprised of 2,179 on-road vehicles and 254 off-road vehicles. A total of 1,632 units (roughly 67% of the fleet) are less than 10 years old, while the remained of the fleet, numbering 801 units (15% of the fleet) is more than 15 years old and

could be replaced with EVs prior to 2025. Actions 2.1 and 2.2 are quantified below. Actions 2.3 through 2.5 are not directly quantifiable but will help the City to achieve the overall measure.

Evidence for Action 2.1: This measure ensures electrification of light-duty vehicles that are expected to use about 1.4 million gallons of gasoline in 2030, the equivalent of 12,459 MT CO₂e. By 2040, the City's vehicle fleet is projected to produce approximately 23,009 MT CO₂e. The conversion of light-duty vehicles to all-electric by 2030 will replace the projected gasoline usage with electricity usage, with a much lower emissions factor than gasoline. By 2045, the emissions factor for electricity will be 0 MT CO₂e/kWh, making all electric vehicles carbon neutral, saving all vehicle fleet emissions otherwise projected.

Table 4 Quantification Results for MM-2.1

Action 2.1	2030	2045
Gallons of gasoline saved	1,411,409	1,645,782
MT CO ₂ e/gallon	0.00883	0.00883
Emissions Reductions (MT CO ₂ e)	12,459	14,528
Emissions from other fuels saved	0	8480
Emissions from electricity conversion	0	0
Net MT CO ₂ e Savings	9,181	23,009

Evidence for Action 2.2: This measure replaces the vehicle fleet's diesel usage in 2030 and 2045 with renewable or biodiesel, reducing associated GHG emissions to zero.

Table 5 Quantification Results for MM-2.2

Action 2.2	2030	2045
Emissions from diesel usage in fleet in 2030 - after Action 2.1 (MT CO ₂ e)	73	0
Diesel usage by fleet in 2030 (gallons)	6,365	0
Renewable diesel emission factor (MT CO ₂ e/gallon)	0.001	0.001
Net MT CO ₂ e Savings	65	0

Measure MM-3

Reduce emissions from work-related trips by City employees

2030 Target

Supportive

2045 Target

Supportive

Performance Metrics:

- Number of actions/programs completed or in place.
- Annual survey of City employees on work-related trips and telecommuting.

Action #	Action	Anticipated Reduction
MM-3.1	Teleconferencing and Telecommuting – Promote video conferencing and telecommuting in place of in person meetings or working in the office when possible	Supportive
MM-3.2	Vehicle Trips – Reduce vehicle trips for City business by encouraging active transportation modes, transit, and carpooling. Award points or have a program to encourage staff to take active and transit modes. Have a prize drawing quarterly to further incentivize adoption.	Supportive
MM-3.3	Bikepools – Expand incorporation of bicycles (including electric bicycles) into City motor pool fleet for employees to use for work-related business.	Supportive

MM-3 Background

One way the City will reduce VMT and overall emissions in the transportation sector, for its employees during the workday will include reducing emissions from trips between City facilities. The City plans to do this by providing alternatives if driving is avoidable (such as telecommuting and teleconferencing) and making an electric car share program available when driving is unavoidable. The mechanism through which the City plans to avoid unnecessary trips is through incentive programs for employees and by institutionalizing work-from-home as a default option for many employees.

Measure MM-4

Reduce municipal waste sent to landfills

2030 Target

Supportive

2045 Target

Supportive

Performance Metrics:

- No waste sent to landfill from municipal buildings in 2045

Action #	Action	Anticipated Reduction
MM-4.1	Develop a set of internal policies for city facilities and departments to increase diversion of solid waste from city operations away from landfills.	Supportive
MM-4.2	Compost and Recycling for Buildings - Ensure organics recycling collection services are available in all owned facilities, as well as ensure its availability in all future occupied facilities, by 2023.	Supportive
MM-4.3	Employee Outreach – Run online and in person outreach and educational events that encourage waste diversion among City employees, including the creation of a training around compost and recycling in City Facilities to be taken by all new hires during their onboarding process.	Supportive
MM-4.4	Centralization - End deskside collection of garbage by custodial, and switch instead to combined organics, recycling and garbage stations.	Supportive
MM-4.5	Update the City's Sustainable Purchasing Policy which mandates procurement of items which have substantial quantities of recycled or reused content and are recyclable, reusable or compostable themselves.	Supportive
MM-4.6	Develop and implement a plan for procuring compost, mulch, and renewable natural gas in alignment with SB 1383 requirements and using these materials for City facilities and operations, community benefit, and/or carbon sequestration.	Supportive

MM-4 Background

While this measure is not directly quantified (and not included in the GHG inventory), the City plans to take multiple steps to drastically reduce its waste output. The City will lead community-wide efforts to reduce and divert organic waste through new programs, and employee education. Action

4.1 directs the city to conduct a waste reduction plan and audit, establishing a baseline for future actions.

The City's control over supplies and services such solid waste collection and janitorial services is largely decentralized. For example, nearly all City facilities contract for their own solid waste services through Waste Management Inc. under an Agreement administered by the Procurement Division. Implementation of MM-4 will require involvement of an array of groups and service providers, from the Facilities Division of Public Works to the Procurement Division of Finance, to align solid waste collection and janitorial services with MM-4 and supporting actions. City will need to develop a set of policies and a strategies to engage and work across multiple departments, divisions, and services providers to divert solid waste from the City's operations away from landfills.

<p>Measure MM-5</p> <p>Reduce emissions from water usage/conveyance and stormwater drainage (in MT of CO₂e per MG delivered) 100% by 2030</p>	<p>2030 Target</p> <p>6,093 MT CO₂e</p> <p>2045 Target</p> <p>0 MT CO₂e</p>
<p>Performance Metrics:</p> <ul style="list-style-type: none"> Water utility emissions associated with electricity decreased 100% by 2030 	

Action #	Action	Anticipated Reduction
Quantitative Actions		
MM-5.1	Purchase 100% carbon-free electricity for water conveyance and stormwater drainage needs.	6,093 MT CO ₂ e (2030) 0 MT CO ₂ e (2045)
Supportive Actions		
MM-5.2	Investigate deployment of on-site solar and storage projects to increase resiliency of critical water and stormwater infrastructure.	Supportive
MM-5.3	Continue to implement and track low water use landscapes (native and drought tolerant plants) for new park development per YPCE Strategic Plan Policy 2.5d and e, and the Model Water Efficiency Landscape Ordinance.	Supportive
MM-5.4	Evaluate the feasibility of converting sports fields to synthetic turf and add new synthetic fields where possible.	Supportive
MM-5.5	Continue to evaluate the existing watering/irrigation schedule and determine what water reduction strategies can be implemented per YPCE Strategic Plan Policy 2.5d and e. Examples include reducing the number of watering days and watering in the evening to reduce evapotranspiration.	Supportive
MM-5.6	Optimize the efficiency of irrigation control systems by training staff how to correctly use them. YPCE will inventory EPA WaterSense certified Smart Irrigation Controllers and host trainings to ensure that the appropriate staff learn how to operate each controller to improve the management, use, reporting, and data analysis of the irrigation control systems.	Supportive

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MM-5.7	Continue to report for the Model Water Efficient Landscape Ordinance each year. YPCE will work with the Community Development Department and the Department of Utilities to submit the Model Water Efficient Landscape Ordinance Implementation Annual Report every January.	Supportive
MM-5.8	Continue investigation of energy efficiency improvements of water utility operations and systems and continue to improve the energy efficiency of utility pumps and water treatment plants.	Supportive
MM-5.9	Water Conservation Inspections for City Facilities: Include landscape irrigation inspections in water conservation inspection and provide educational materials/media for building maintenance staff on how maintain landscape irrigation and track and set leak alerts for buildings.	Supportive

MM-5 Quantification

Emissions from utilities are directly attributable to the electricity, natural gas and diesel used for water and wastewater conveyance and stormwater drainage, with the majority of those emissions from electricity use. By 2045, electricity in California is required to be carbon neutral, with an emissions factor of 0, due to SB 100. However, prior to 2045, there is opportunity for the City to utilize electricity that is carbon neutral or lower carbon than what is offered by the current electricity providers within the City. Because water and wastewater conveyance and stormwater drainage are necessary services that the City will continue to provide through 2045 and beyond, the only way to reduce emissions in this sector is to reduce the emissions factor for the electricity used, by adding more renewable resources—through purchase or direct construction—to the grid mix. In 2017, water management accounted for almost 20% of overall emissions, and is therefore a key emissions sector to address.

Evidence for Action 5.1: The overall measure aims to achieve a 100% carbon free electricity by 2030, and to become carbon neutral by 2045. Emissions from utilities are expected to be approximately 6,000 MT CO₂e in 2030 and, due to electricity being carbon neutral in 2045, 0 MT CO₂e in 2045.

Table 6 Quantification Results for MM-5.1

Action 5.1	2030	2045
Emissions from water utilities	6,093	0
Emission Reduction	100%	100%
Total MT CO ₂ e Savings	6,093	0

<p><i>Measure MM-6</i></p> <p>Improve carbon sequestration potential of municipal parks, greenspace at City properties, and street tree planters in the public right-of-way</p>	<p><i>2030 Target</i></p> <p><i>Supportive</i></p> <p><i>2045 Target</i></p> <p><i>Supportive</i></p>
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Action #	Action	Anticipated Reduction
MM-6.1	Evaluate existing park turf areas for conversion to low water use landscapes using non-irrigated, drought tolerant, or mulched landscaping.	Supportive
MM-6.2	For passive recreation areas, continue to reduce landscape water usage with low-water use plants, compost, and landscape design that emphasizes drought tolerant plants and mulch areas.	Supportive
MM-6.3	Investigate and explore options for carbon sequestration at City facilities such as through carbon sequestration in materials for construction and hardscapes or soil health restoration projects.	Supportive

MM-6 Background

Measure MM-6 focuses on carbon sequestration in municipal greenspaces as a long-term strategy for reducing municipal GHG emissions. Trees, plants, and other green materials have natural carbon sequestration capabilities. The City manages many open and green spaces around Sacramento, including street trees, parks, and other landscaped areas. Managing these spaces for higher carbon sequestration potential includes integrating low-water use landscapes. The City also plans to explore ways to utilize building materials which have been created through a process that stores carbon in the material.

Measure MM-7	2030 Target
Procure carbon-free electricity by 2030	8,198 MT CO₂e
	2045 Target
	0 MT CO₂e

Action #	Action	Anticipated Reduction
MM-7.1	Procure carbon-free electricity for municipal operations by 2030.	8,198 MT CO ₂ e (2030) 0 MT CO ₂ e (2045)

MM-7 Quantification

MM-7 Aligns with SMUDs 2030 Zero Carbon Plan which will provide the City with 100% carbon free electricity by 2030. While there are no specific municipal measures listed, the City will support SMUD in the implementation of the 2030 Zero Carbon Plan as highlighted in the community actions.

Table 7 Quantification Results for MM-7.1

Measure MM-7.1	2030	2045
Emissions from Electricity	8,198	0
Total MT CO ₂ e Savings	8,198	0

Measure MM-8

Reduce City employee commuter VMT

2030 Target

Supportive

2045 Target

Supportive

Performance Metrics:

- Employee VMT reduced 20% by 2030
- Employee VMT reduced 30% by 2045

Action #	Action	Anticipated Reduction
MM-8.1	Establish a Transportation Demand Management program for City employees	Supportive
MM-8.2	Survey City staff to determine baseline commute data. Conduct a new survey every 2 years.	Supportive
MM-8.3	Conduct internal outreach to educate staff on available incentives and solicit feedback on which options work best and how to improve incentives/reduce hurdles to implementation.	Supportive
MM-8.4	Paid Time Off Rewards Program – Implement a sustainable commute rewards program rewarding employees with time off for using alternative modes of transportation.	Supportive
MM-8.5	Pre-Tax Commuter Benefit – Continue providing pre-tax commuter benefits for transit commuters and encourage use of commuter benefits for bicycle commuters as allowed by federal law.	Supportive
MM-8.6	Parking Cash-out – Engage with labor partners to explore alternatives to traditional employee commute provisions such as City-provided parking and parking stipends, and instead incentivize carpooling, public transit, and active transportation.	Supportive
MM-8.7	Dynamic Ridematch – Promote the regional carpool matching platform that allows employees to request carpool with peers on days and times when they are needed.	Supportive
MM-8.8	Remote work – Promote and support working remotely for employees where possible by encouraging it for office employees as appropriate, by providing necessary equipment, training, and encouraging all meetings (when possible) to be set up for web conferencing so that people who aren't physically in the room can attend. Allow for hybrid work-from-home schedules to increase flexibility for employees.	Supportive

MM-8 Background

The actions in Measure MM-8 have not been quantified but are key strategies in reducing VMT at the municipal level within Sacramento, as well as helping to reduce overall VMT within the community. As VMT is a large share of the municipal and community emissions, reducing VMT will result in important emissions reductions. While the City cannot require employees to choose alternate commuting methods, these actions will help provide options and incentives to City employees to choose transportation modes other than single-passenger vehicles to commute to work, thereby creating the opportunity for employees to actively reduce their own VMT.

<p>Measure MM-9</p> <p>Encourage an increase in the number of employee-owned EV and plug-in hybrid electric vehicles 28% by 2030 and 100% by 2045</p> <p>Performance Metrics:</p> <ul style="list-style-type: none"> • 28% of employee-owned vehicles are EV/plug-in hybrid by 2030 • 100% of employee-owned vehicles are EV/plug-in hybrid by 2030 	<p>2030 Target <i>Supportive</i></p> <p>2045 Target <i>Supportive</i></p>
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Action #	Action	Anticipated Reduction
MM-9.1	EV Chargers – Implement the 2017 EV Strategy directive to meet or exceed CALGreen Tier 2 standards for EV chargers, and transition existing facilities to provide EV charging capacity as feasible.	Supportive
MM-9.2	Commuting Surveys – Conduct a survey of City Staff to determine how staff commute to work, what kinds of vehicles they own, and what hurdles they face in purchasing EVs. Conduct a new survey every 2 years.	Supportive
MM-9.3	EV Rebates – Provide information to all City staff about local, State, and federal rebates annually. Include lifecycle and maintenance cost information of EV ownership.	Supportive

MM-9 Background

The actions in Measure MM-9 have not been quantified but are key strategies in decarbonizing the work commutes of Sacramento City employees. While the City does not currently track employee commute distances and methods in order to determine associated GHG emissions, these actions will help the City start to track these metrics, as well as incentivize employees to choose EVs or plug-in vehicles where feasible. The EV adoption goals associated with this measure track with the communitywide EV adoption goals of the CAAP.

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City of
SACRAMENTO

Sacramento City Hall
915 I Street
Sacramento, CA 95814

<https://www.cityofsacramento.org/>

