



LIVERMORE  
CALIFORNIA

City of Livermore

**2022 CLIMATE**

**ACTION**

**PLAN**

Adopted  
November 28, 2022

THERE'S



HERE

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# Acknowledgments

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# Letter From The Climate Change Subcommittee

It has been a pleasure working with City of Livermore staff to create this Climate Action Plan (CAP) for you, residents of Livermore.

Climate change poses an existential threat globally, and is already presenting a number of serious risks to Livermore and the Tri-Valley. It is incumbent on all of us to play our part to reduce our carbon footprint and to adapt to near-term and localized risks such as extreme heat events here in Livermore. We hope you find this CAP informative and useful.

The plan summarizes the current state in Livermore and what we are trying to achieve in the future to make Livermore resilient. It articulates what the City is doing, what you can do as an individual, family or business, and what we can do together.

Please take the time to identify how you can participate at this critical time for our community and planet earth. We can all work together to make a difference.

If you have questions or feedback please do not hesitate to contact either one of us. We look forward to hearing from you.

Vice Mayor

**Gina Bonanno**

Council Member

**Bob Carling**



*Gina Bonanno (left) and Bob Carling (Right)*

# Acronyms and Abbreviations

Term	Definition
AB	Assembly Bill
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CARB	California Air Resources Board
CDC	Centers for Disease Control and Prevention
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH <sub>4</sub>	Methane
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
COVID-19	Coronavirus disease 2019
EO	Executive Order
EV	Electric Vehicle
GHG	Greenhouse Gas
GWP	Global Warming Potential
ICLEI	International Council for Local Environmental Initiatives
IPCC	United Nations Intergovernmental Panel on Climate Change
kW	Kilowatt
kWh	Kilowatt hour
MT	Metric ton
MT CO <sub>2</sub> e	Metric tons of carbon dioxide equivalent
NASA	National Aeronautics and Space Administration
N <sub>2</sub> O	Nitrous oxide
PV	Photovoltaic
RPS	Renewable Portfolio Standard
SB	Senate Bill
U.S. EPA	United States Environmental Protection Agency
VMT	Vehicle Miles Traveled
ZEV	Zero Emission Vehicle

# EXECUTIVE SUMMARY



## CLIMATE ACTION PLAN GOALS

### 1 Prepare the community for climate impacts.

The Climate Action Plan outlines actions to build communitywide resilience to climate impacts in Livermore, including drought, extreme heat, and flooding. Preparing for expected climate impacts is known as adaptation.

### 2 Establish a pathway to carbon neutrality by 2045.

The Climate Action Plan includes updated actions that build off of existing GHG reduction efforts in Livermore. Implementing these actions will set Livermore on a path to carbon neutrality by 2045. Reducing GHG emissions within the community is known as mitigation.

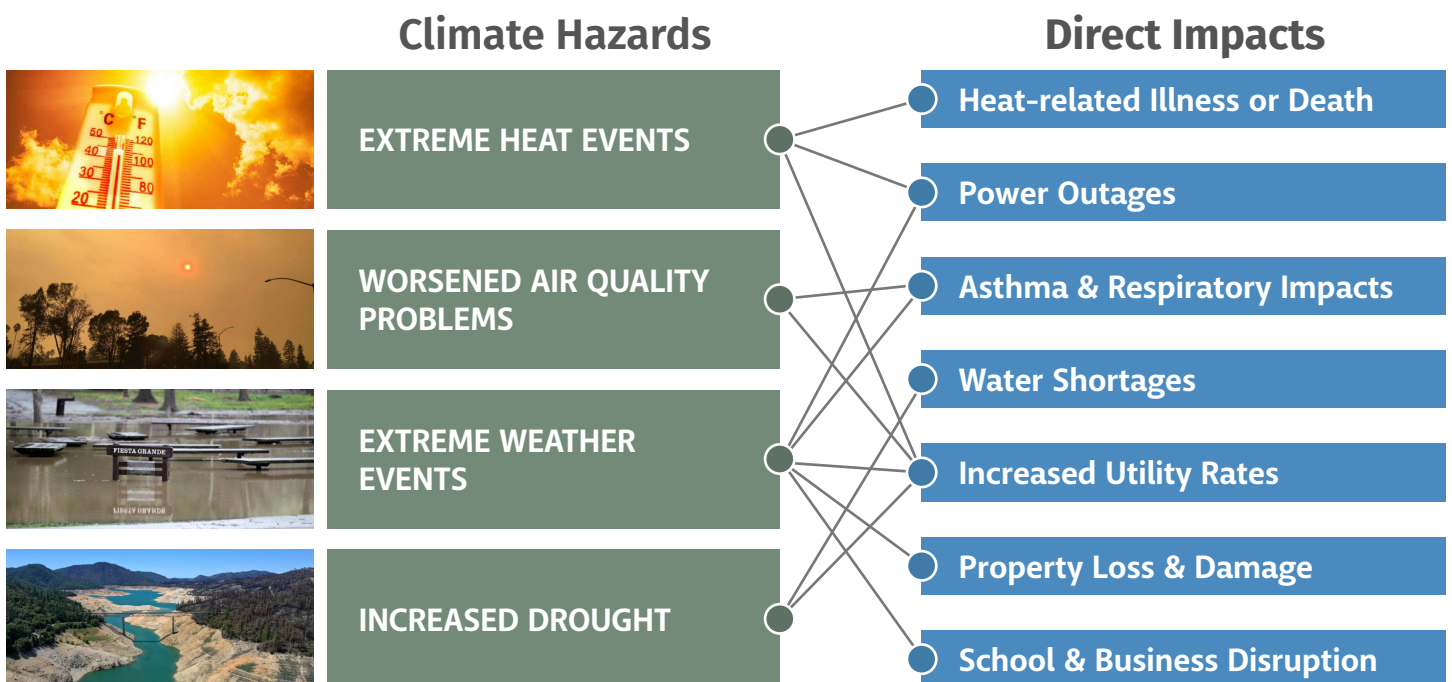
### 3 Establish the City as a climate leader

The Climate Action Plan outlines specific actions the City will take to address climate change in its own operations. The City will set an example for other cities to follow.

## Purpose Statement

The purpose of the 2022 Climate Action Plan (CAP) is to protect public health and the environment, foster a green economy, and improve the quality of life for all Livermore residents. The 2022 CAP is a roadmap to reduce greenhouse gas (GHG) emissions, adapt to extreme weather, deploy reliable and renewable energy, conserve habitat and biodiversity, and ensure equitable access to the benefits of a sustainable city. Livermore will leverage the community's greatest strengths, including cutting edge research facilities, technical and agricultural expertise, and an engaged network of residents, businesses, and institutions, to establish itself as a climate leader and implement the actions outlined in the plan.

## CLIMATE IMPACTS IN LIVERMORE

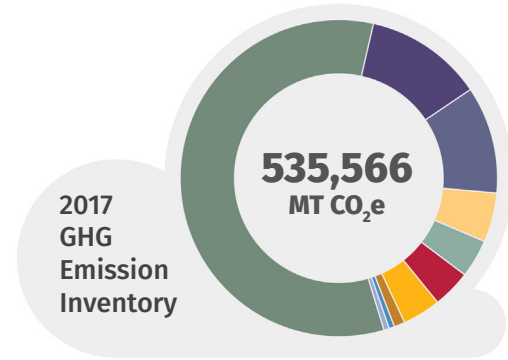




## LIVERMORE'S GHG EMISSIONS

The City completed a community-wide GHG inventory to measure emissions from various sources within Livermore. The GHG inventory helped the City identify strategies to reduce its emissions and will help the City monitor progress reducing GHG emissions and achieving reduction goals.

Livermore's GHG inventory includes emissions from residential and commercial energy use in buildings, on-road passenger and commercial transportation, off-road transportation, landfilled waste, water, and wastewater. The majority of Livermore's emissions come from transportation and building energy.



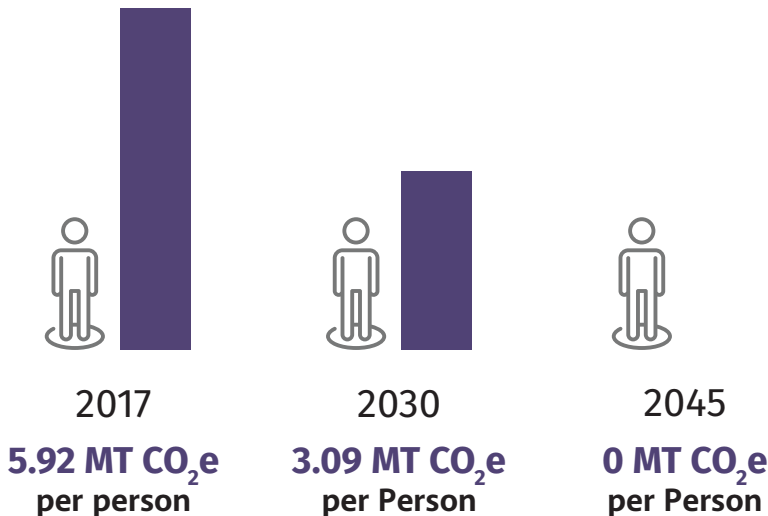
- 59%** On-Road Transportation
- 12%** Residential Gas
- 11%** Nonresidential Gas
- 5%** Nonresidential Electricity
- 4%** Off-Road Transportation\*
- 4%** Waste
- 4%** Residential Electricity
- 1%** Direct Access Electricity\*\*
- <1%** Water
- <1%** Wastewater

\* Offroad includes mobile emissions from construction, recreation, agriculture, lawn and garden, and others.

\*\* Direct Access Electricity - Electricity purchased directly by an organization/facility from the wholesale market.

## GHG REDUCTION TARGETS

The City established a goal to reach carbon neutrality by 2045, consistent with State legislation.



### California Climate Legislation

#### Assembly Bill 32 (2006)

Set a statewide goal to reduce GHG emissions to 1990 levels by 2020.

#### Senate Bill 32 (2006)

Set a statewide goal to reduce GHG emissions 40 percent below 1990 levels by 2030, extending upon the 2020 goal established by AB 32.

#### Executive Order B-55-18 (2018)

Set a statewide goal to achieve carbon neutrality by 2045 and maintain net negative emissions afterwards.

## LIVERMORE'S CAP STRATEGIES AND OBJECTIVES

	STRATEGY	2030 OBJECTIVES
ADAPTATION	<b>Extreme Heat</b>	<ul style="list-style-type: none"> <li>• Increase resilience to extreme heat events</li> <li>• Cool neighborhoods by expanding the urban canopy</li> <li>• Identify vulnerable areas and populations</li> <li>• Develop cooling centers that are energy-resilient</li> </ul>
	<b>Wildfire</b>	<ul style="list-style-type: none"> <li>• Mitigate wildfire risk</li> <li>• Facilitate building retrofits and operate clean air centers</li> <li>• Stockpile personal protective equipment</li> <li>• Reduce fire risk through fire-safe landscaping standards</li> <li>• Improve emergency alert systems</li> </ul>
	<b>Flooding</b>	<ul style="list-style-type: none"> <li>• Improve stormwater management</li> <li>• Harness Livermore's natural landscapes to improve stormwater management</li> <li>• Reduce the expansion of urban hardscapes</li> </ul>
MITIGATION & ADAPTATION	<b>Drought</b>	<ul style="list-style-type: none"> <li>• Improve water conservation</li> <li>• Develop on-site water and water reuse standards</li> <li>• Provide-water efficiency devices</li> <li>• Develop water-efficient demonstration programs</li> </ul>
	<b>Energy Resilience</b>	<ul style="list-style-type: none"> <li>• Enhance community energy resilience</li> <li>• Expand microgrid deployment</li> <li>• Increase local and regional grid reliability</li> <li>• Improve building resiliency</li> </ul>
	<b>Buildings and Energy</b> ↓19,379 MT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Provide 100% renewable electricity by 2024</li> <li>• Require all-electric new construction by 2023</li> <li>• Incentivize electric retrofits in 12% of existing buildings</li> <li>• Develop equitable funding and financing</li> <li>• Incentivize local on-site energy generation</li> </ul>
	<b>Carbon Sequestration</b> ↓1,950 MT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Plant 1,000 trees by 2030</li> <li>• Update City landscaping standards to expand shade trees</li> <li>• Provide free or reduced cost-trees to residents</li> <li>• Preserve open space</li> <li>• Implement carbon farming projects</li> <li>• Explore technology-based carbon capture and storage</li> </ul>
MITIGATION	<b>Transportation and Land Use</b> ↓49,494 MT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Add 1,283 publicly available chargers</li> <li>• Reduce VMT by 2%</li> <li>• Achieve a 10% bike mode share</li> <li>• Support sustainable land use practices</li> </ul>
	<b>Waste and Materials</b> ↓19,379 MT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Reduce the amount of organic waste that is landfilled by 75%</li> <li>• Maintain or exceed 75% waste diversion each year</li> <li>• Improve local re-use and repair programs</li> <li>• Expand the use of low-carbon and recycled building materials</li> </ul>

## EVALUATING THE ACTIONS

The City evaluated the costs, benefits, and readiness of each strategy and action. Additionally, the City assessed the GHG reductions associated with mitigation actions.

### Benefits



#### Resilience + GHG Reduction

Achieving adaptation and mitigation goals concurrently. For example, a building that installs rooftop solar with battery backup can reduce emissions and protect against grid power outages.



#### Community Connectivity

Promoting a strong sense of community by facilitating complete neighborhoods that are accessible by multiple modes of travel, connecting residents to each other and the City, and connecting historically underserved communities to resources.



#### Public Health

Creating a cleaner and healthier community by improving air quality and active transportation and protecting against extreme heat and weather events.



#### Environmental Quality

Improving natural environments within the city to enhance and protect biodiversity and ecosystem services like cleaner air and water.



#### Green Economy

Diversifying local economic opportunities by attracting high-quality jobs in sustainability industries, such as those developing renewable energy and battery storage technologies.

### Readiness



#### Short-Term

Actions that are ready to be implemented today.



#### Mid-Term

Actions that require additional study, funding, or partnerships to be completed before implementation.



#### Long-Term

Actions that require long lead times to fully implement.



#### Ongoing

Efforts that are currently underway and ongoing.

### Costs



#### No-Cost

Actions that are expected to have zero costs to the community or City.



#### Low-Cost

Relatively low upfront costs or City staff time, (e.g., policy ordinances or outreach).



#### Moderate-Cost

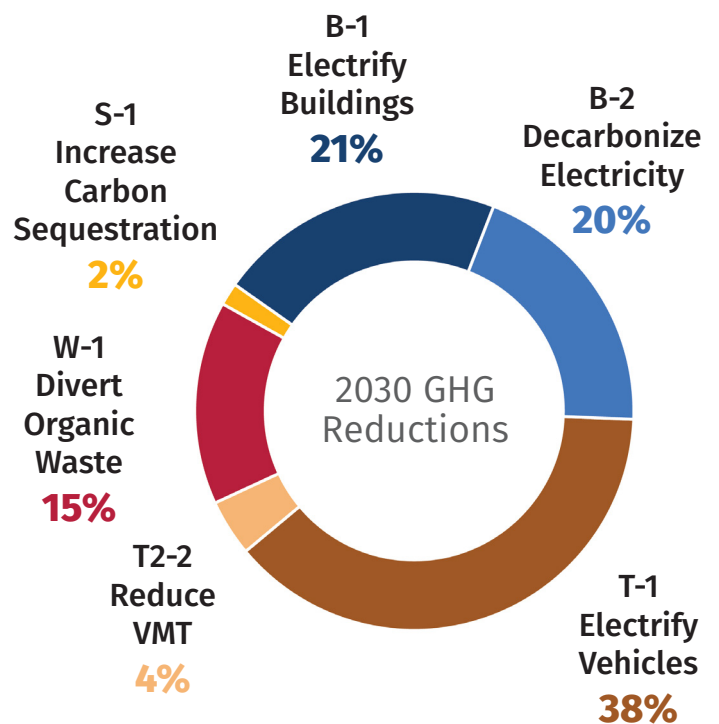
Intermediate level of costs such as consultant work or moderate infrastructure changes, (e.g., feasibility studies, program development, and retrofitting existing infrastructure).



#### High-Cost

Longer term projects requiring substantial investments into major infrastructure or technology over time, (e.g., energy storage, bike lanes, or other infrastructure changes).

### GHG Reductions by Source



## IMPLEMENTING THE PLAN

The CAP includes an implementation plan to ensure that the City stays on track to meet its goals. The City identified the following priority efforts for the first five years of CAP implementation. Additionally, the City will monitor its progress and regularly update the CAP to adjust its strategy as needed.

### 1 Lay the groundwork

Hire a Climate Action Manager, create a brand and identity for the City's climate action program, establish a tracking program for CAP implementation, and create an online resource hub for the community.

### 2 Decarbonize electricity & materials

Enroll community-wide electricity accounts into East Bay Community Energy's Renewable 100 service option, promote low-carbon building materials.

### 3 Electrify buildings & vehicles

Require new buildings in Livermore to be all-electric, incentivize electrification retrofits in existing buildings, expand requirements for EV charging.

### 4 Partner with the national labs

Collaborate with Lawrence Livermore and Sandia National Labs on projects related to microgrids, soil carbon farming, and hydrogen fuel.

### 5 Engage with the community regularly

Engage regularly with the community through a variety of channels and events.

### 6 Support related City efforts

Identify synergies with other City plans and efforts, including the General Plan, Tri-Valley Local Hazard Mitigation Plan, and Active Transportation Plan.

### 7 Utilize assistance programs & funding

Maximize resources to implement the CAP by utilizing funding and technical assistance programs from partners such as East Bay Community Energy and StopWaste.

### 8 Study heat & drought strategies

Conduct additional studies to identify opportunities to mitigate heat, conserve water resources, and expand the urban forest.

### 9 Develop a neighborhood retrofit program.

Develop a holistic retrofit program for healthy and resilient building upgrades. Upgrades could include weatherization, air filtration, solar and battery backup systems, and drought tolerant landscaping.

## It Takes a Village!

Addressing climate change will require more than just action from the City of Livermore itself. Individuals, businesses, and community groups all have a critical role to play in achieving the City's climate action goals. The quality of life in Livermore for future generations depends on the actions we take today. The City of Livermore looks forward to building a healthier and more resilient Livermore together.

## Staying on Track

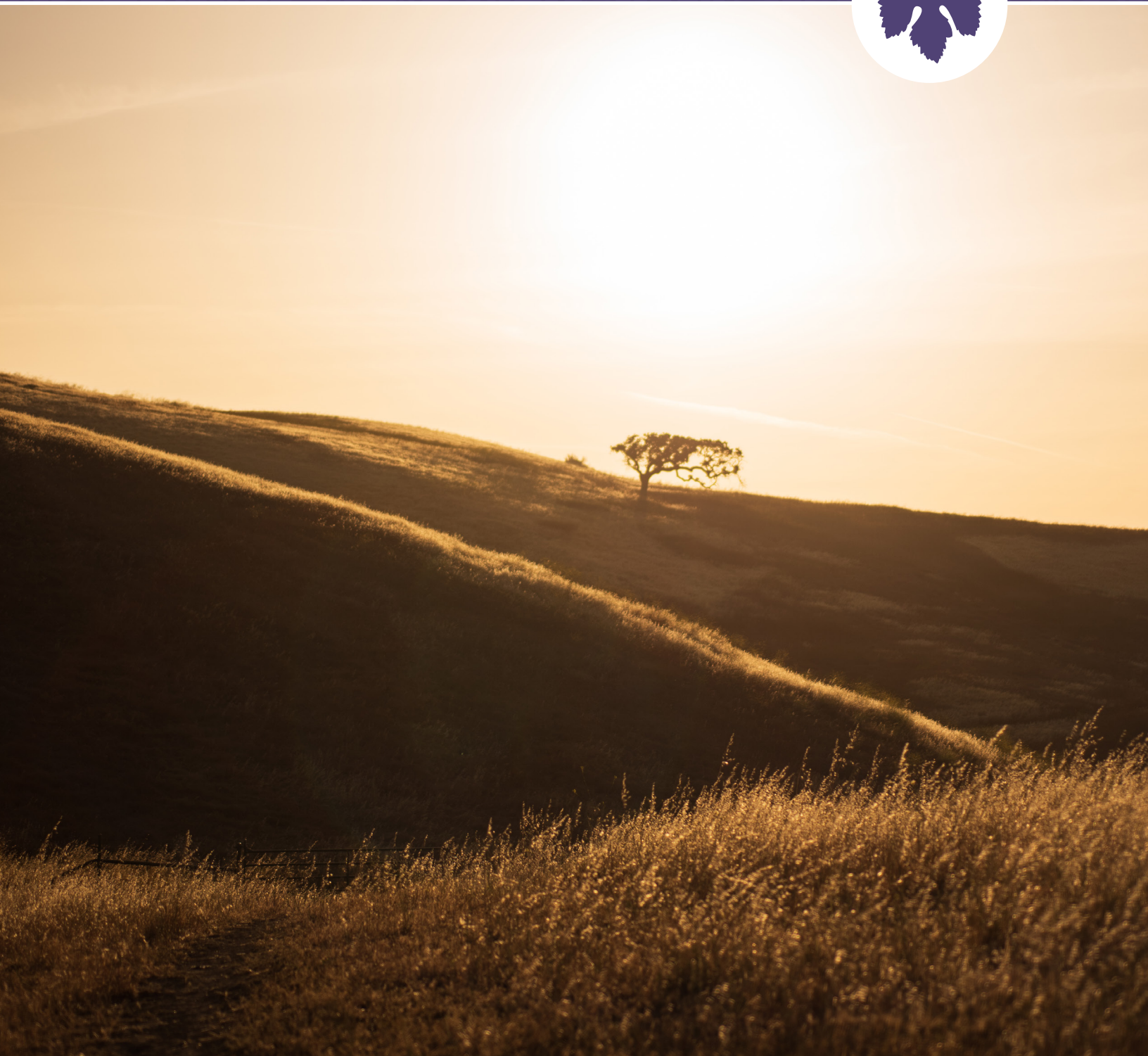
- Implementation Tracking Tool
- Annual Progress Reports to City Council
- 5-year Plan Updates

**You can help create a  
healthy and resilient Livermore!**

VISIT:

***LivermoreResilientHub.com***

# CHAPTER 1. Introduction



# 1-1. Climate Action Plan Overview



The City of Livermore (City) adopted its first Climate Action Plan (CAP) in 2012, which established a greenhouse gas (GHG) emissions reduction goal of reducing emissions by 15% by 2020. The City exceeded the 2020 GHG reduction goal identified in the 2012 CAP by achieving a 17 percent reduction three years early in 2017. The reductions achieved through implementation of the CAP reflect local actions, behavior change, and state initiatives.

This updated CAP establishes new GHG reduction goals consistent with new State legislation. Reducing GHG emissions is known as **climate mitigation**. In addition, the CAP includes strategies and actions to prepare Livermore for the impacts of climate change, which have become increasingly apparent. Preparing for climate impacts is known as **climate adaptation** and is a primary focus of Livermore's overall climate strategy.

## 2022 CLIMATE ACTION PLAN PURPOSE STATEMENT

The purpose of the 2022 Climate Action Plan (CAP) is to protect public health and the environment, foster a green economy, and improve quality of life for all Livermore residents. The 2022 CAP is a roadmap to reduce greenhouse gas (GHG) emissions, adapt to extreme weather, deploy reliable and renewable energy, conserve habitat and biodiversity, and ensure equitable access to the benefits of a sustainable city. Livermore will leverage the community's greatest strengths, including cutting edge research facilities, technical and agricultural expertise, and an engaged network of residents, businesses, and institutions, to establish itself as a climate leader and implement the actions outlined in the plan.

# 1-2. Climate Change

The mechanisms that drive climate change have been well understood since the middle of the nineteenth century.<sup>1</sup> The greenhouse effect is the natural process by which gases in the atmosphere trap heat, acting as a blanket and making the temperature habitable for life on earth, shown below in Figure 1-1.

However, since the beginning of the industrial revolution in the eighteenth century, human activities like burning fossil fuels and deforestation have caused large amounts of additional GHGs to be released into the atmosphere.

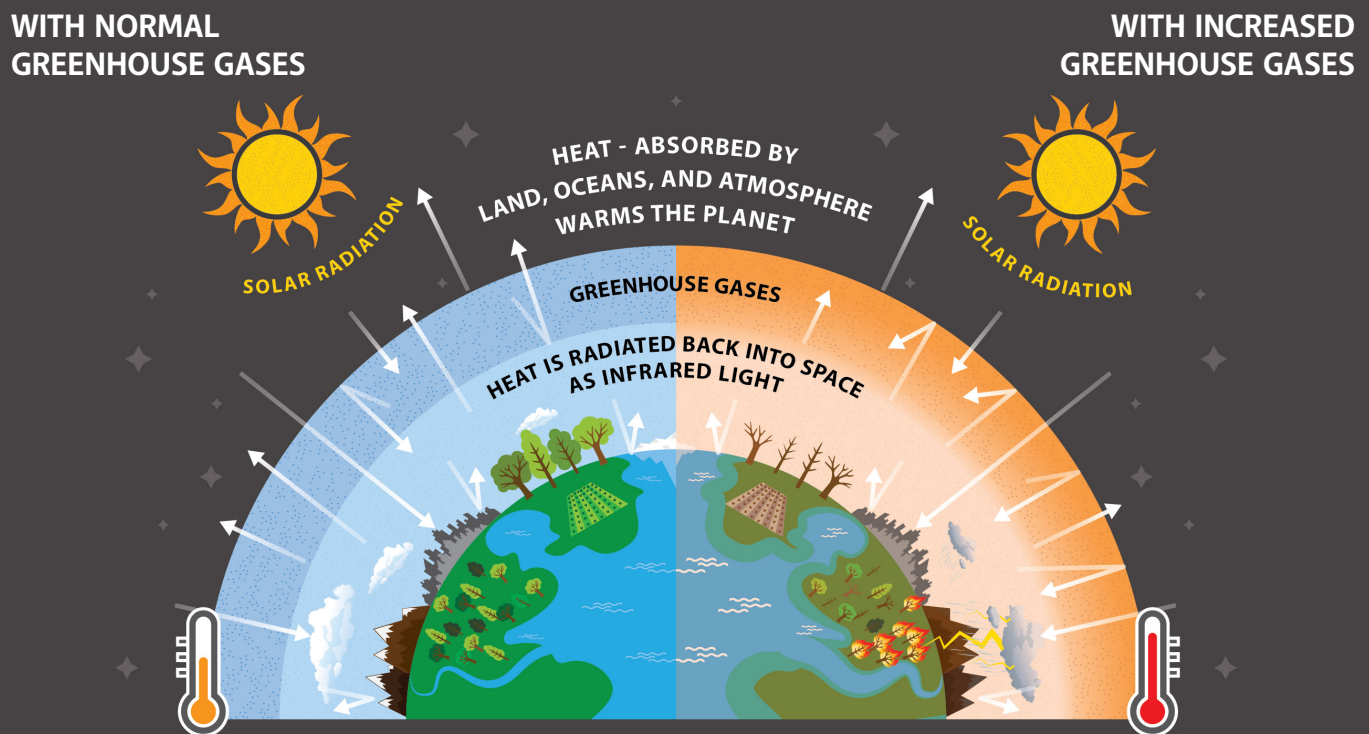
Specifically, atmospheric carbon has increased from a historical range of 200–280 parts per million to over 400 parts per million during the past century. This represents an atmospheric carbon content which is higher than at any point over the past 800,000 years.<sup>2</sup> These additional GHGs cause more heat to be trapped in the atmosphere, and as a result, global temperatures have been rising. Anthropogenic (human-caused) climate change has been the scientific consensus for several decades, with over 97 percent of climate scientists agreeing that the planet is warming due to human activities.<sup>3</sup>

1. <https://climate.nasa.gov/evidence/>  
 2. Lindsey, Rebecca. September 19, 2019. Climate Change: Atmospheric Carbon Dioxide. <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>  
 3. <https://www.ipcc.ch/report/ar2/wg1/>

**Figure 1-1. Greenhouse Gas 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.**



## SOURCES OF GHGs

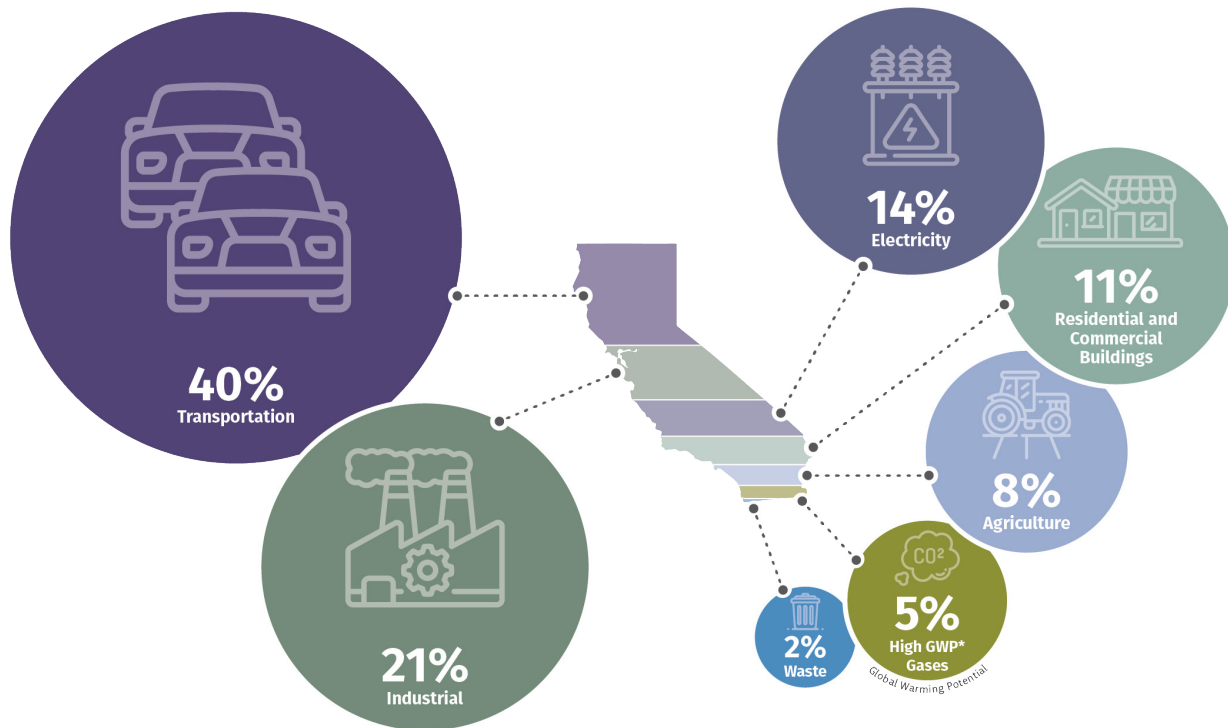
GHGs listed by the United Nations Intergovernmental Panel on Climate Change (IPCC) include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), as well as chloro-fluorocarbons, hydrochlorofluorocarbons, hydro-fluorocarbons, perfluorocarbons, and sulfur hexa-fluoride, which are collectively called fluorinated gases. Fluorinated gases are man-made gases that can stay in the atmosphere for centuries and contribute to the GHG effect. Ninety-seven percent of the annual GHG emissions generated in the United States consists of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O, while fluorinated gases result in the remaining three percent of emissions.

Each GHG has a differing ability to trap terrestrial radiation, called its global warming potential (GWP).<sup>4</sup> Because of its dominance in terms of

total emissions, CO<sub>2</sub> is used as the reference GWP and given a value of 1. CH<sub>4</sub> causes 28 times more warming per unit mass than CO<sub>2</sub>, so it has a GWP of 28. N<sub>2</sub>O has a GWP of 265. Fluorinated gases also serve as GHGs and have even larger GWPs, but their occurrence is so small that their impact is negligible. Due to its large rate of emissions, CO<sub>2</sub> is the most important GHG despite its relatively weak GWP.

Anthropogenic GHG emissions stem primarily from the burning of fossil fuels (including gasoline, natural gas, and coal), decomposition of organic waste in landfills, methane emissions from agriculture, and deforestation. California’s GHG emission by source are summarized in Figure 1-2.

**Figure 1-2. GHG Emission Sources in California**



4. <https://www.ipcc.ch/assessment-report/ar5/>



## EFFECTS OF CLIMATE CHANGE

Climate change is a global phenomenon that is already linked to a number of changes that will have a dramatic impact on humans, wildlife, and ecosystems. Scientists have measured shrinking ice sheets, warming oceans, increasing global temperatures, less snow cover, higher precipitation variability, sea level rise, and species extinction.<sup>5</sup> As the planet continues to warm, effects like flooding in low-lying areas, drinking water shortages, severe weather, wildfires, and adverse impacts to public health and ecosystems will become more severe.

Globally, a warming trend is exceedingly clear, with all the top seven hottest years on record happening since 2014. The 10 hottest years on record have all occurred since 1998.<sup>6</sup> According to the IPCC, the total increase in global temperature should be limited to below 1.5° Celsius (C) in order to prevent “rapid, far-reaching and unprecedented changes in all aspects of society.”<sup>7</sup> If current global trends persist and GHG emissions are not significantly reduced, the World Resources Institute (WRI) projects that the most likely warming scenario is an increase in global temperature by 3.7 °C. This level of warming would produce significant changes by the 2080s.<sup>8</sup>

**Reduced water availability for about 32 percent more of the projected global population compared to the 1980s**



**Approximately seven times more people expected to be exposed annually to a 100-year flood event compared to the 1980s**



**More than a 50 percent decrease in the ranges of the many plant and animal species around the world**



**Large-scale negative impacts to agricultural production and global food security**



5. [https://www.ipcc.ch/site/assets/uploads/2018/02/SYR\\_AR5\\_FINAL\\_full.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf)

6. <https://www.scientificamerican.com/article/2020-will-rival-2016-for-hottest-year-on-record/>

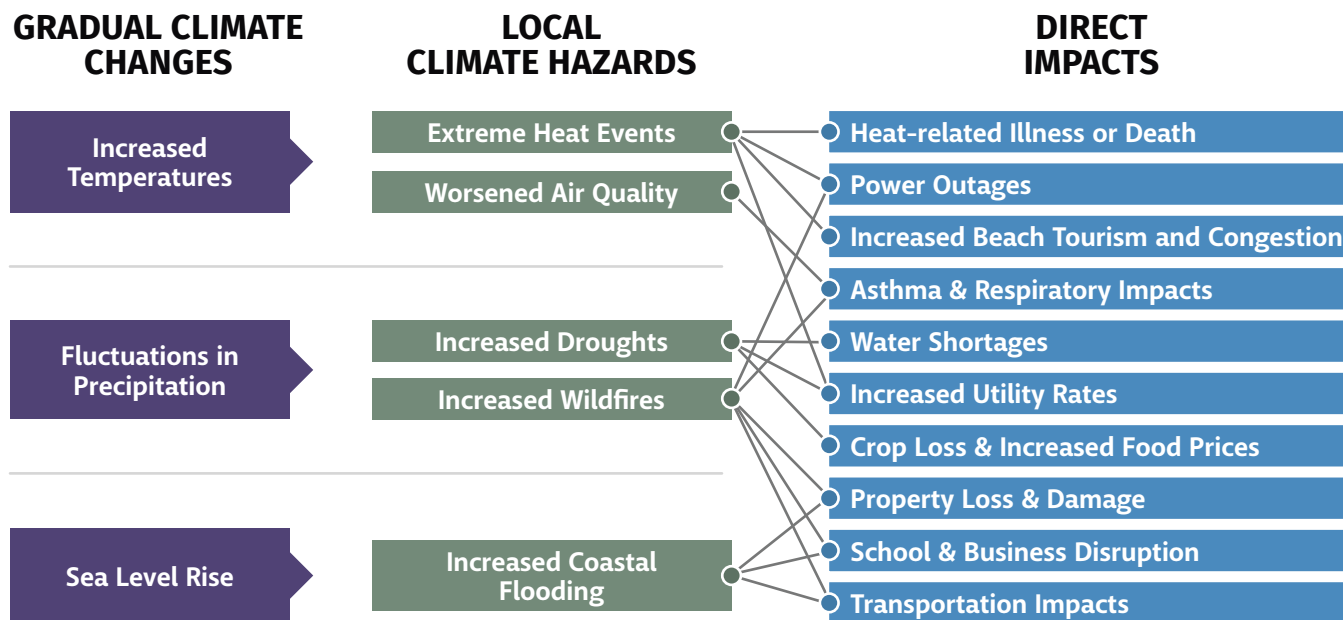
7. <https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-specialreport-on-global-warming-of-1-5c-approved-by-governments/>

8. <https://www.wri.org/ipcc-infographics-emissions>

In California, the impacts of climate change are already being felt and will continue to become more severe throughout the twenty-first century. Higher temperatures, more extreme heat events and wildfires, and rising sea levels are all effects of climate change experienced in California. The California Office of Environmental Health Hazard Assessment reported in 2018 that despite annual variations in weather patterns, California has seen a trend of increased average temperatures, more extreme heat days, higher acidity in the Pacific Ocean, earlier snowmelt, and less rainwater runoff.<sup>9</sup> From 1895 to 2011, average temperatures have increased by about 1 °C statewide, and a smaller proportion of annual precipitation is falling as snow instead of rain. During 1972-2018, California experienced a

fivefold increase in the annual area burned, very likely due to increased atmospheric temperatures caused by climate change.<sup>10</sup> Over the last century sea levels have risen by more than 5.9 inches along Central and Southern California coast, which has accelerated coastal erosion, disrupted wetlands and natural habitats, and threatened levee systems and other coastal infrastructure.<sup>11</sup> Many of these hazards caused by climate change could have direct effects on Livermore and other communities throughout California, including water shortages, power outages, and property damage. An overview of climate hazards and their impacts is shown below in Figure 1-3 and a detailed vulnerability assessment for the City of Livermore is summarized in Chapter 2 and included in detail in Appendix B.

**Figure 1-3. Climate Hazards and Impacts in California**



9. <https://oehha.ca.gov/media/downloads/climate-change/report/2018indicatorssummary.pdf>  
 10. <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019EF001210>  
 11. [https://www.energy.ca.gov/sites/default/files/2019-11/Statewide\\_Reports-SUM-CCCA4-2018-013\\_Statewide\\_Summary\\_Report\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf)

## 1-3. Legislative Context

### CLIMATE LEGISLATION IN CALIFORNIA

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California is recognized globally as a leader on climate change, having established a variety of ambitious GHG-reduction targets and associated strategies. The primary legislation that has driven statewide GHG-emissions reductions are Assembly Bill (AB) 32, Senate Bill (SB) 32, and most recently, Executive Order (EO) B-55-18. Aligning with State targets is one of the requirements of the California Environmental Quality Act (CEQA) Guidelines for streamlining. Livermore's CAP meets the requirements of a CEQA Qualified CAP and can be used to streamline new development which is consistent with the CAP's measures and actions. More information on the CEQA requirements can be found in Appendix D.

#### AB 32 – Global Warming Solutions Act (2006)

AB 32 set a statewide goal for reducing GHG emissions to 1990 levels by 2020 and required the California Air Resources Board (CARB) to prepare a Scoping Plan to outline the main strategies California would take to achieve this goal. The first Scoping Plan was adopted in 2008.<sup>12</sup>

#### SB 32 (2016)

SB 32 set a new statewide goal for reducing GHG emissions 40 percent below 1990 levels by 2030, extending upon the 2020 goal already established by the Global Warming Solutions Act. In 2017, CARB adopted an update to the Scoping Plan which provided a framework for achieving the 2030 target.

**A qualified CAP allows Livermore to streamline new developments that meet our climate goals, decreasing costs and effectively incentivizing climate smart development.**

#### EO B-55-18 (2018)

Governor Jerry Brown's Executive Order (EO) B-55-18 (2018) set a new statewide GHG-emission reduction goal to achieve carbon neutrality by 2045 and maintain net negative emissions afterwards. While not yet codified into law, it is generally seen as superseding the previous statewide goal of reducing GHG emissions 80 percent from 1990 levels by 2050.

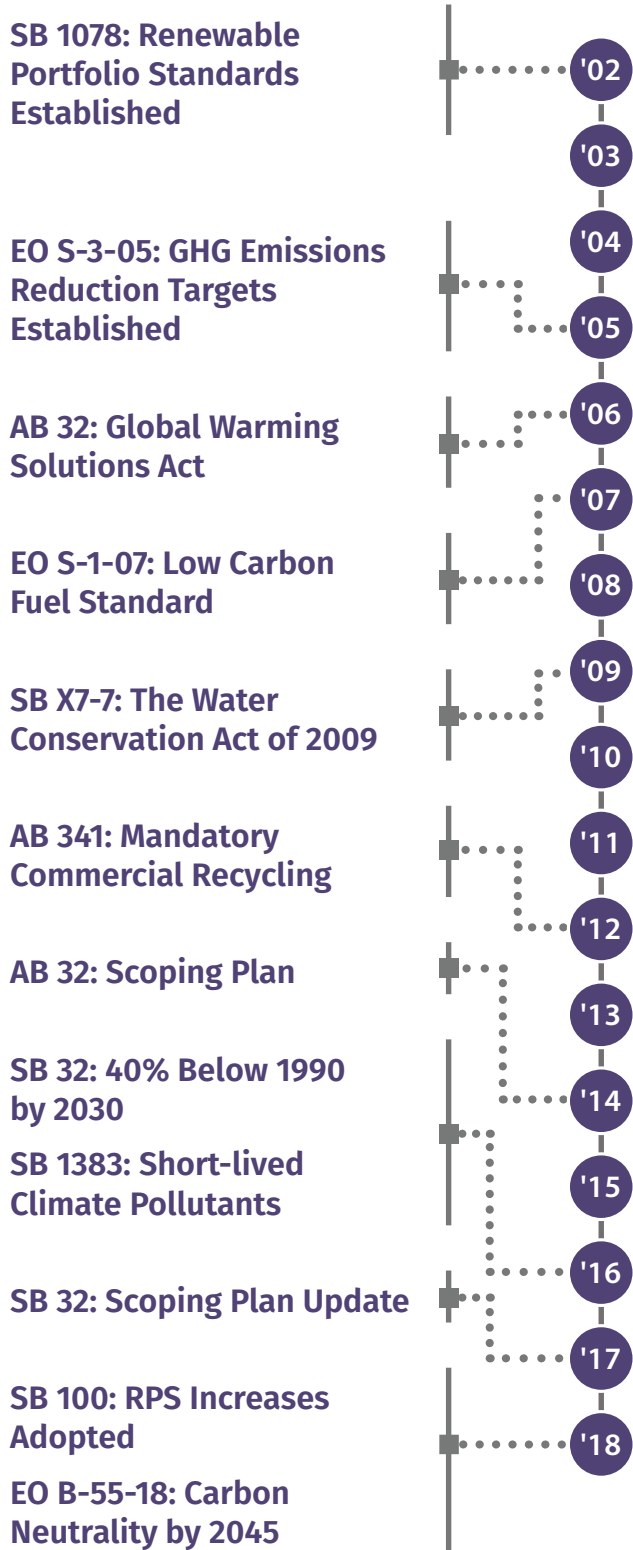
#### Other Key Legislation

California's GHG-emissions-reduction strategies that will help achieve these reduction targets are developed through its Scoping Plan and various Sustainable Communities Strategies passed by local Metropolitan Planning Organizations. Other important climate legislation that will help California achieve its GHG-reduction targets include the state's green building code (Title 24), SB 1383, which set targets for reducing organic waste to landfills, and SB 100, which mandated 100 percent carbon-free electricity by 2045. A timeline of major California climate legislation is shown in Figure 1-4. For a complete list of California's climate change regulations please see Appendix E.

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12. Both the State of California and the City of Livermore exceeded this goal as of 2017.

**Figure 1-4. California Climate  
Legislation Timeline**



## 1-4. Livermore's Past Climate Action Success



The City of Livermore (City) is no stranger to taking bold, progressive action on climate change. The City adopted a Climate Change Element into its General Plan in 2009 that established policies for addressing climate change in Livermore. The Climate Change Element called for the City to adopt a CAP to set forth strategies to reduce GHG emissions. The City adopted its first CAP in 2012, which established a target to reduce emissions 15 percent below 2008 levels by 2020. This target was in accordance Assembly Bill (AB) 32. The City conducted a 2017 GHG emissions inventory that revealed Livermore had surpassed the 2020 target by 2017, three years ahead of schedule. More details about the 2017 inventory and the City's emissions reductions are included in Chapter 2.

Since adopting the CAP, the City has adopted additional plans that help implement key components of its overarching sustainability strategy, including an Active Transportation Plan, Green Infrastructure Plan, and Tri-Valley Local Hazard Mitigation Plan. The most relevant plans referenced in the CAP Update are highlighted below in more detail.

Livermore was a founding member of East Bay Community Energy, a Community Choice Energy service which has provided the city with clean electricity options for both residents and businesses since 2018.<sup>13</sup> In 2017, Livermore was awarded the Gold Level Spotlight Award for Sustainability Best Practices by the Institute of Local Governments, as a part of the Beacon Program.<sup>14</sup> Livermore has also been recognized by the Arbor Day Association, which awarded Livermore the Sterling City USA designation in 2018 for achievements in urban forestry education, partnerships, tree planting, and maintenance.

There are currently 96 electric vehicle chargers available to the public in Livermore, and the City has over a dozen electric and hybrid vehicles as a part of its public fleet.<sup>15</sup> Livermore also holds annual electronic waste recycling events, reuses damaged asphalt, and purchases recycled materials for City operations.<sup>16</sup> In 2011, Livermore banned the use of Styrofoam to-go containers for food service businesses, reducing

13. <https://ebce.org/about/>

14. <https://www.ca-ilg.org/award/city-livermore-sustainability-best-practice-activities-0>

15. <https://www.plugshare.com/directory/us/california/livermore>

16. <https://www.livermoreca.gov/departments/community-development/planning/climate-action-plan>

litter and water pollution.<sup>17</sup> The City also utilizes a recycled water system for irrigation, fire protection, and other uses to conserve water.

Since adopting the first CAP, Livermore, like many communities in California, has increasingly felt the impacts of climate change. In recent years wildfires have become more severe, degrading air quality and impacting residents with smoke that can last weeks, such as during the SCU Lightning Complex Fire in 2020. The extended drought of the 2010s was one of the most intense in California's history,

straining water supplies and putting the local agriculture and wine industry at risk. Extreme heat events have become more common, worsening public health risks for vulnerable communities and those with existing health conditions. These climate impacts have only reinforced the City of Livermore's commitment to taking meaningful climate action, in order to ensure a prosperous and livable climate for future generations. The City's past efforts provide the foundation for Livermore's CAP Update and will be key to its successful implementation.

Click on the plan name or image below to view the document.



**FACT: Livermore reached their 2020 GHG reduction goal in 2017, exceeding the goals set by the 2012 Climate Action Plan.**



17. <https://www.livermoreca.gov/departments/public-works/environmental-services>.

## 1-5. CAP Goals and Development Process



The Climate Action Plan creates a roadmap to prepare the community for climate impacts and establish a pathway to carbon neutrality by 2045. Implementation and funding strategies are a key consideration of the plan to ensure that strategies are actionable and lead to meaningful improvements in resilience and reductions in GHG emissions. Additionally, implementation of the CAP will be based upon inclusivity, focusing on equity, youth involvement, and open dialogue with local leaders in vulnerable communities.

The CAP update leveraged several unique characteristics of the city including its active and engaged community, the technological prowess of Livermore's two National Laboratories, and its strong agricultural heritage. Additionally, Livermore's neighboring communities of Dublin and Pleasanton have both recently updated their own CAPs, setting GHG reduction and climate adaptation goals that are in-line with those of Livermore. This presents an opportunity to work together on regional implementation efforts, whether through the passage of unified

codes, joint funding of regional infrastructure projects, or cooperative resilience planning. The risks posed by climate change do not occur in a vacuum and neither should climate mitigation or adaptation planning. Together, Livermore and other Tri-Valley communities can help create a better more sustainable East Bay. The Livermore CAP development process is shown in Figure 1-5.

**Figure 1-5. Livermore CAP Update Development Process**

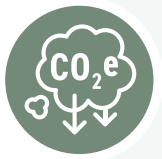
- 1. Complete a Climate Change Vulnerability Analysis.** The first step of the CAP Update was to identify the climate change impacts that are expected in Livermore and analyze how those changes would affect the community.



- 2. Complete a GHG Inventory and Forecast and Establish Reduction Targets.** At the same time, the City quantified existing GHG emissions to create a baseline, used growth factors to estimate future emissions, and established targets for reducing GHG emissions that align with established state goals.



- 3. Conduct Community and Stakeholder Engagement.** The City engaged with the community and stakeholders and incorporated feedback and input into the CAP. This engagement included a Climate Action Plan Advisory Committee made up of Livermore residents.



- 4. Establish a GHG Reduction and Adaptation Strategy.** The CAP includes community-specific strategies and actions that will achieve Livermore's GHG emissions reduction targets, build community resilience to climate impacts, and protect vulnerable communities.



- 5. Complete CAP Document and California Environmental Quality Act (CEQA) Environmental Review.** The City combined the data and strategies into an accessible, implementable document and completed CEQA review.



- 6. Implement the Strategies in the Plan.** Following City Council adoption, the City will take action and implement the CAP strategies in the community.



- 7. Monitor and Track Progress.** The City will monitor implementation progress to ensure that it is on-track to meet its goals, and make adjustments to the CAP as needed.



## BENEFITS OF CLIMATE ACTION

The City is committed to creating a more sustainable, equitable, and healthy community that balances the needs of a growing population and economy. Through implementing the CAP Livermore expects to see several important benefits. Together, the CAP’s measures and actions will contribute to the creation of a stronger community based upon:



**Public Health** – Creating a healthier community by improving air quality and active transportation.



**Community Connectivity** – Promoting a strong sense of community by creating complete, accessible neighborhoods, opportunities to engage, and resources for underserved communities.



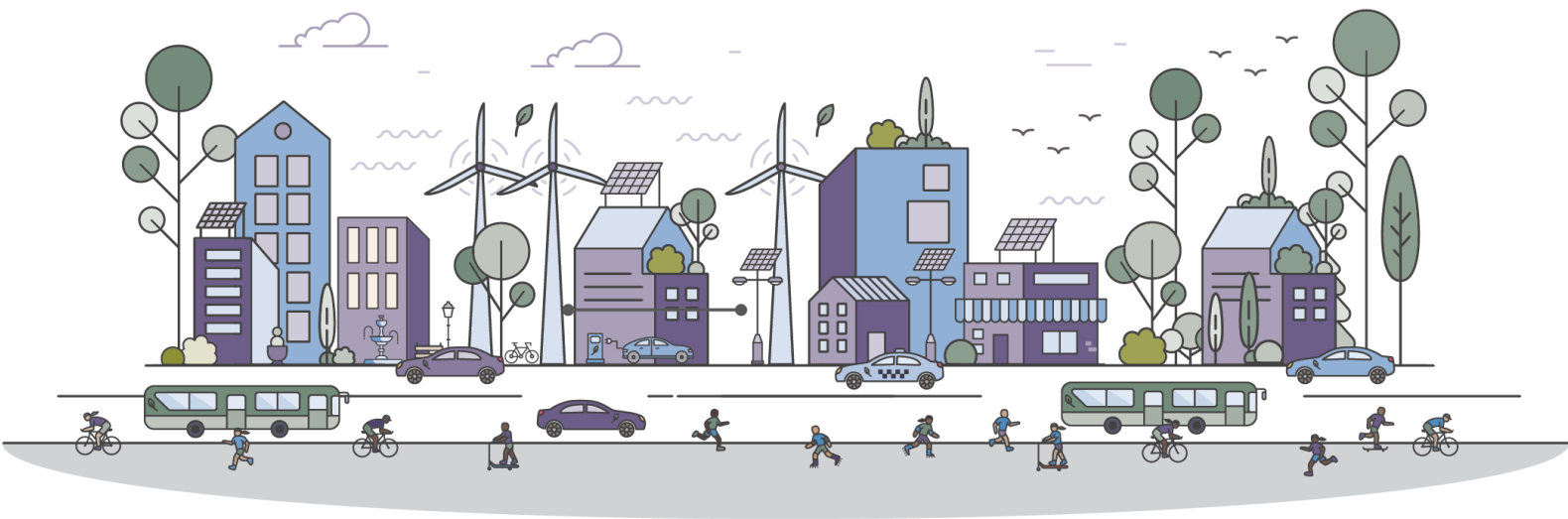
**Resilience + GHG Reduction** – Some GHG reduction strategies can have resilience benefits as well, and vice versa. For example, increasing local energy storage and power generation can increase energy resilience while decarbonizing the grid.



**Environmental Quality** – Improving natural environments within the city to protect biodiversity and ecosystem services like cleaner air and water.



**Green Economy** – Diversifying local economic opportunities by attracting high-quality jobs in sustainability industries such as those focused on developing zero emission vehicles or battery storage technologies.



# CHAPTER 2.

## Climate Change in Livermore



## 2-1. Climate Change Impacts in Livermore

As a part of Livermore's CAP Update, a Vulnerability Analysis was conducted to evaluate the potential impacts of climate change on community assets and populations. This analysis provides a deeper understanding of Livermore's vulnerabilities to the impacts of climate change that served as a foundation for the climate adaptation strategies and actions included in the CAP to increase resilience. The main findings of Livermore's Vulnerability Analysis are summarized here with additional information provided in Appendix B.

### A SUMMARY OF CLIMATE CHANGE IN LIVERMORE

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**Extreme Heat:** Maximum and minimum temperatures are expected to increase by the mid-to-late twenty-first century. The extent of these increases and the associated impacts have a high degree of uncertainty in the near-term.



**Wildfires and Air Quality:** Wildfire risk will decrease within the city limits, but smoke from increased wildfires statewide will continue to have adverse effects on public health and quality of life in Livermore.



**Precipitation Variability:** Precipitation variability is expected to increase throughout the twenty-first century with larger flashier storms and less consistent precipitation in between. This is expected to result in both flooding and drought conditions.



**Vulnerable Populations and Infrastructure:** Vulnerable populations, vital community infrastructure, and the city's transportation system are most sensitive and at-risk to climate impacts. Livermore currently has a low-to-medium adaptive capacity rating due to the high number of existing measures but low overall implementation rates.

## INCREASED TEMPERATURES AND EXTREME HEAT EVENTS

By the end of the twenty-first century, average annual temperatures in the Bay Area are projected to increase anywhere from 4.2 °F to 7.2 °F depending on the emissions scenario, when compared to the historic baseline period of 1950 to 2005.<sup>1</sup> Inland areas like Livermore are expected to experience the most significant changes. The Vulnerability Analysis found that temperature projections for Livermore show a consistent increasing trend through the end of the century, with average annual maximum temperatures projected to increase between 4.5 °F to 8.7 °F when compared with 1990. Average annual minimum temperatures are also projected to increase between 3.2 °F and 8 °F by the end of the century, which indicates less cooling off at night.<sup>2</sup> In a medium-to-high emissions scenario, rising temperatures could

also cause 75 percent to 85 percent more days with weather conducive to ozone formation when compared to today.<sup>3</sup> Ozone is a compound that when inhaled can cause both short-term and long-term adverse health effects.<sup>4</sup>

The frequency and duration of extreme heat events are also projected to increase in Livermore by the end of the century. Under a high emissions scenario, Livermore is expected to experience 25 extreme heat days annually (defined as days with temperatures over 102.7 °F) by the end of the century, compared to four in 1990. The annual number of heat waves (defined as four or more extreme heat days in a row) is expected to be from 0 to 3 under the same scenario, with the longest duration of consecutive extreme heat days increasing from 2.2 days in 1990 to just over 7 days.<sup>5</sup>

1. <https://barc.ca.gov/sites/default/files/documents/2020-12/20190116-sanfranciscobayarea.pdf>
2. <https://cal-adapt.org/>
3. <https://www.ucsusa.org/resources/california-global-warming-impacts>
4. <https://www.epa.gov/ozone-pollution-and-your-patients-health/health-effects-ozone-general-population>
5. <https://cal-adapt.org/>

Average  
Annual Minimum  
Temperature  
Projected to Increase  
**3.2°F-8°F**  
By the End  
of the Century

## INCREASED HUMAN HEALTH IMPACTS FROM LARGE WILDFIRES

Wildfire risk is determined by multiple factors, including climate variability, local topography, land cover, and human activity. Increasing acreage burned by wildfire is being driven by increasing air temperatures and periods of drought.<sup>6</sup> Statewide, the mean area burned is projected to increase by 77 percent by the end of the century under a high-emissions scenario when compared to 1961-1990.<sup>7</sup> Livermore's Vulnerability Analysis, however, found that the annual average of acres burned in Livermore is projected to decrease through the end of the century. This is likely due to wildfires throughout the century reducing the amount of vegetation available to burn, changes in plant communities due to the local warming climate, and the low number of CAL FIRE Very High Fire Hazard Severity Zones within the city. There is a strong connection between human activity and wildfires, with fire activity peaking

in wildland-urban interface areas due to increased ignitions. Future land use patterns and development will thus heavily impact wildfire risk throughout the twenty-first century.<sup>8</sup>

While wildfires may not pose a direct threat to life and property within Livermore, smoke from wildfires throughout the state continues to have detrimental effects on quality of life and public health in Livermore. Wildfires have the potential to cause smoky days thousands of miles beyond the areas that they burn, worsening air quality and putting vulnerable populations at risk. The particulates that make up wildfire smoke are pollutants that present a substantial public health risk. This could result in increases in eye and respiratory tract irritation, reduced lung function, pulmonary inflammation, bronchitis, asthma and other lung diseases, cardiovascular disease, and premature death by the end of the century.<sup>9</sup>

6. [https://www.energy.ca.gov/sites/default/files/2019-11/20180827\\_Summary\\_Brochure\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/20180827_Summary_Brochure_ADA.pdf)
7. [https://www.energy.ca.gov/sites/default/files/2019-11/Statewide\\_Reports-SUM-CCCA4-2018-013\\_Statewide\\_Summary\\_Report\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf)
8. <https://barc.ca.gov/sites/default/files/documents/2020-12/20190116-sanfranciscobayarea.pdf>
9. <https://www.cdc.gov/disasters/wildfires/smoke.html>

**77%**  
Increase in  
Mean Area Burned  
Statewide  
Compared to  
1961-1990

Photo credit: Glen Florey

## CHANGES IN PRECIPITATION PATTERNS

Average annual precipitation in Livermore will increase slightly by the end of the century.<sup>10</sup> Precipitation will likely be more variable and unpredictable overall, resulting in more whiplash events where extremely dry periods are followed by extremely wet periods.<sup>11</sup> This could pose difficulties for local drinking water supplies and the agricultural industry, both of which rely on the predictability of annual precipitation patterns.

The frequency and intensity of extreme precipitation events (successive days where the total two-day rainfall is above 1 inch) is expected to increase in the Bay Area region through the end of the twenty-first century.

**Increase of  
3-7  
Extreme Precipitation  
Events Annually**  
From 1990 to  
Mid-century

However, this trend is not as clear in Livermore.<sup>12</sup> Projections show the number of extreme precipitation events increasing from three in 1990 to five to seven by mid-century, depending on the emissions scenario. If extreme precipitation events increase, Livermore can expect more flooding in low-lying areas.



▲ 2017 storm damage along the Arroyo Mocho in Livermore.

## REDUCTION IN THE SIERRA NEVADA SNOWPACK

The state's average snow water is anticipated to decline to less than two-thirds of its historical average by 2050,<sup>13</sup> likely to lead to water supply challenges statewide. The snowpack in the Sierra Nevada Mountains is responsible for about 30 percent of the state's annual water supply<sup>14</sup> and provides roughly 75 percent of statewide agricultural water.<sup>15</sup> Wineries and other agricultural businesses in Livermore are highly sensitive to

changes in water availability, which could lead to decreased agricultural output from the Tri-Valley region. Reduced water runoff from snowpack may also reduce the amount of electricity that can be produced from hydropower.

**Sierra Nevada  
Mountain  
Snowpack Provides  
~30%**  
State's Annual  
Water Supply

10. <https://cal-adapt.org/>

11. <https://barc.ca.gov/sites/default/files/documents/2020-12/20190116-sanfranciscobayarea.pdf>

12. [https://www.energy.ca.gov/sites/default/files/2019-11/20180827\\_Summary\\_Brochure\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/20180827_Summary_Brochure_ADA.pdf)

13. [https://www.energy.ca.gov/sites/default/files/2019-11/Statewide\\_Reports-SUM-CCCA4-2018-013\\_Statewide\\_Summary\\_Report\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf)

14. <https://www.sacbee.com/news/california/water-and-drought/article240394281.html>

15. <https://www.climate.gov/news-features/featured-images/warming-winters-and-dwindling-sierra-nevada-snowpack-will-squeeze#:~:text=Snowmelt%20from%20the%20Sierra%20Nevada,of%20Southern%20California's%20water%20resources.&text=Based%20on%20the%20new%20study,in%20average%20winter%20air%20temperature.>

## SENSITIVE STRUCTURES, FUNCTIONS, AND POPULATIONS

Sensitivity describes aspects of Livermore that will be most affected by the identified stressors and hazards that the community will be exposed to as a result of climate change. These can generally be broken down between community structures and functions, and populations. Community structures and functions that were identified include:

- Essential facilities are needed for the health and welfare of the population of Livermore and are especially important following climate-influenced hazard events. Essential Facilities include City of Livermore municipal buildings, healthcare facilities, schools, and senior living facilities
- Sensitive facilities are those places where damage would have large environmental, economic, or public safety consequences, are also considered particularly vulnerable to climate change. These include water collection, storage, and distribution infrastructure, the Livermore Water Reclamation Plant, and Lawrence Livermore and Sandia National Laboratories
- Community functions include the energy delivery system, emergency services such as police and fire, recreation spaces, and agricultural businesses and facilities

- Transportation systems include roads and freeways, bike and trail network, and public transit systems, such as the Altamont Corridor Express and Wheels Bus (also known as the Livermore Amador Valley Transit Authority)

Sensitive populations in Livermore include its senior citizens, chronically ill individuals (e.g., heart and lung disease, diabetes), socially or economically disadvantaged populations, and outdoor workers, such as those in the agriculture industry. Sensitive community structures, functions, and populations may be the most affected by climate impacts, particularly in areas where multiple or compounding vulnerabilities exist.

Adaptive capacity describes Livermore's ability to cope with extreme events and make changes in the community to moderate potential damage. The City has a variety of both reactive and proactive adaptation measures included in its General Plan Climate Change Element, Emergency Operations Plan, Tri-Valley Local Hazard Mitigation Plan, and others. An analysis conducted for the CAP found that while Livermore has over 200 sustainability and adaptation measures, there is a relatively low level of implementation of these measures, resulting in an overall low-to-medium adaptive capacity rating for the community.

The  
ability of  
a community  
to withstand an  
extreme climate  
event is called  
**Adaptive  
Capacity**



Livermore Water Reclamation Plant

## 2-2. Livermore's GHG Emissions



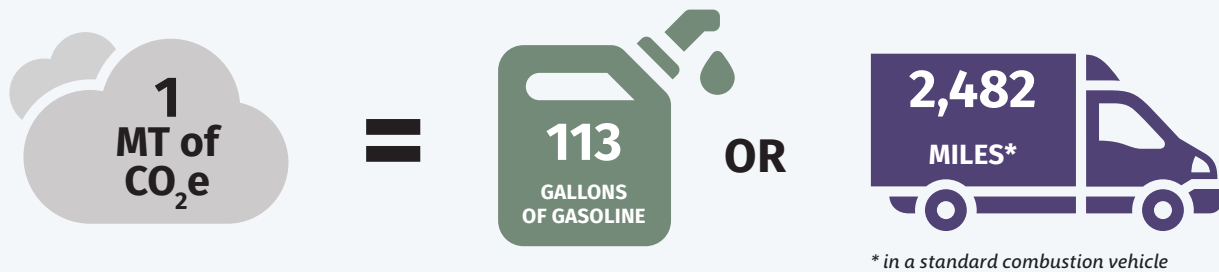
An important part of the climate action planning process is the development of a GHG inventory. GHG inventories measure emissions from various sources or sectors within a jurisdiction and allow for monitoring progress, reducing GHG emissions, and achieving established GHG-reduction targets.

Livermore's CAP includes community-wide GHG emissions inventories for 2010, 2015, and 2017, as well as an updated 2005 baseline GHG inventory (originally conducted for the 2012 CAP). Emissions from municipal operations are included as part of the community emissions. They

were not calculated separately from community-wide emissions due to their relatively small contribution to Livermore's overall emissions.

Due to CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O comprising the large majority of GHG emissions in Livermore, this CAP focuses on these three gases for its GHG emissions inventory, forecast, and reduction strategy, consistent with the ICLEI – Local Governments for Sustainability's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. All emissions are converted to the equivalent of one metric ton of carbon dioxide, or MT CO<sub>2</sub>e.

**One MT CO<sub>2</sub>e is the equivalent of using 113 gallons of gasoline or driving 2,492 miles in a standard combustion vehicle.<sup>16</sup>**



16. <https://developer.epa.gov/greenhouse-gas-equivalencies-calculator-widget/>



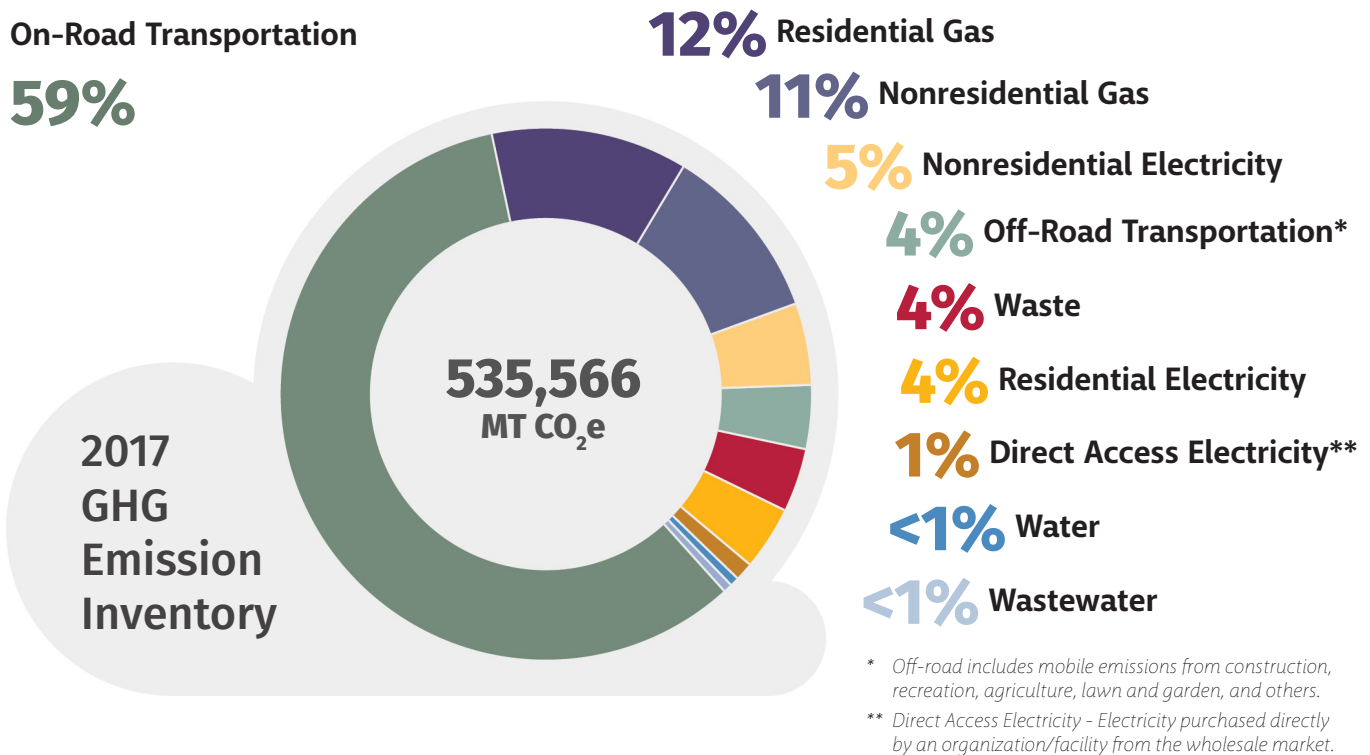
## 2017 GHG INVENTORY

The 2017 GHG inventory was utilized to track progress reducing GHG emissions and to develop updated forecasts and GHG emissions reduction targets for the CAP through 2045. Emissions from residential and commercial energy usage, on-road passenger and commercial transportation, off-road transportation, landfilled waste, water, and wastewater are all included in the inventory. Livermore's total GHG emissions for 2017 were estimated to be 535,566 MT CO<sub>2</sub>e, as depicted below in Figure 2-1. More information on the data and methodologies used can be found in Appendix A.

According to the results of the 2017 GHG inventory, the largest source of GHG emissions in Livermore was from on-road passenger and

commercial transportation, which accounted for 59 percent of total emissions. This is primarily related to single-passenger automobiles, as well as commercial trucks and delivery vehicles within the city.<sup>17</sup> The second largest amount of GHG emissions was from natural gas usage in both residential and nonresidential buildings, which combined accounted for 23 percent of Livermore's total GHG emissions. Natural gas is used to heat water, homes, and businesses, as well to run natural gas-powered appliances. Electricity usage accounted for the third largest source of emissions, with residential and nonresidential sectors combining for nine percent of total emissions in Livermore.

**Figure 2-1. GHG Emissions Summary for Livermore, 2017**



17. On-road vehicle emissions were calculated using vehicle miles travelled (VMT) that was adjusted using recommended methods from the Senate Bill 375 Regional Targets Advisory Committee (RTAC) and converted to GHGs using emissions factors from CARB's Emissions Factor (EMFAC) model.

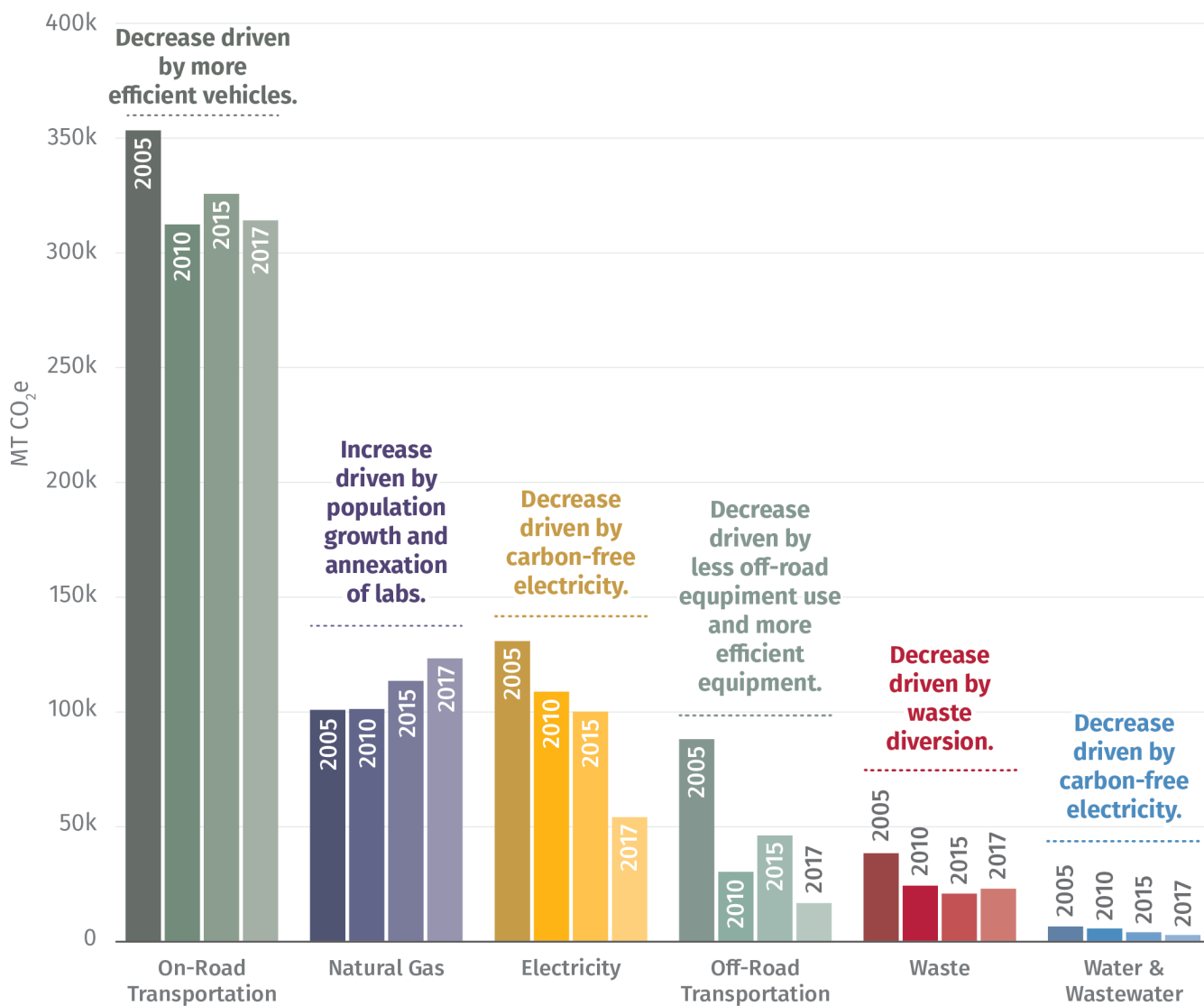
## LIVERMORE'S GHG EMISSIONS OVER TIME

Between 2005 and 2017 Livermore's total GHG emissions have decreased by 17 percent, achieving the 2020 reduction target adopted by the City's previously adopted 2012 CAP. GHG emissions decreased across all sectors from 2005 to 2017, except for nonresidential gas and off-road transportation, which likely increased due to the addition of the Lawrence Livermore National Laboratory and Sandia National Laboratory to the City's boundary in 2012 as

well as growth of the commercial sector within the city and offroad vehicles. Additional details including emission factors and activity data for all inventory years can be found in Appendix A.

During the time period that these GHG emission reductions took place, Livermore experienced a population increase of 16 percent. Despite this population growth, Livermore still achieved an overall reduction in GHG emissions (Figure 2-2).

**Figure 2-2. Historic Emissions in Livermore, 2005–2017**



## GHG EMISSIONS FORECAST

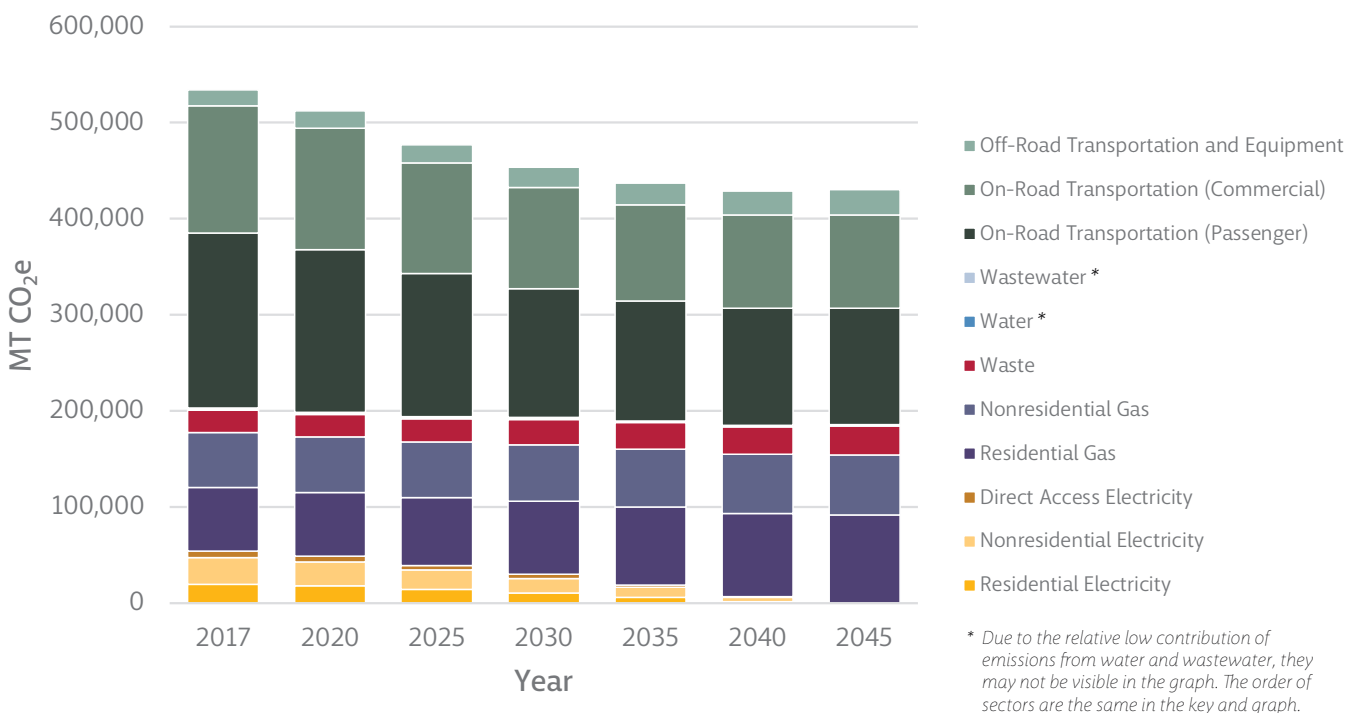
While GHG inventories provide data on Livermore's current emissions, GHG emissions forecasts estimate the city's projected GHG emissions into the future. Forecasts are developed from the most recent GHG inventory and provide an estimate of how Livermore's emissions might change over time based on demographic projections including population, employment, housing, and transportation activity. Forecasts also include future State legislation that will help lower Livermore's emissions over time.

A GHG emissions forecast was developed to quantify future GHG emissions within the city through 2045. It was developed based off future demographic forecasts from the Association of Bay Area Government's Plan Bay Area 2040 and Livermore's 2003-2025 General Plan. The forecast provides a projection of how GHG emissions are likely to change over time due

to the implementation of State regulations described in Chapter 1. The forecast includes several regulations including SB 100 and Advanced Clean Fleets. More information on these regulations and how they were accounted for in the forecast can be found in Appendix A.

Livermore's forecast projects that the City's GHG emissions will decrease through 2030, and continue to decrease, but at a slower rate, through 2045. The slower reduction in GHG emissions after 2030 is due to current State legislation, including Title 24 and California's GHG vehicle emission standards, being fully phased in and then being offset by population and job growth. Potential new State legislation could be adopted in the future to continue driving down emissions statewide. A summary of Livermore's forecast through 2045 is shown below in Figure 2-3.

**Figure 2-3. GHG Emissions Forecast for Livermore, 2017–2045**



## LIVERMORE'S GHG EMISSION REDUCTION TARGETS FOR 2030 AND 2045

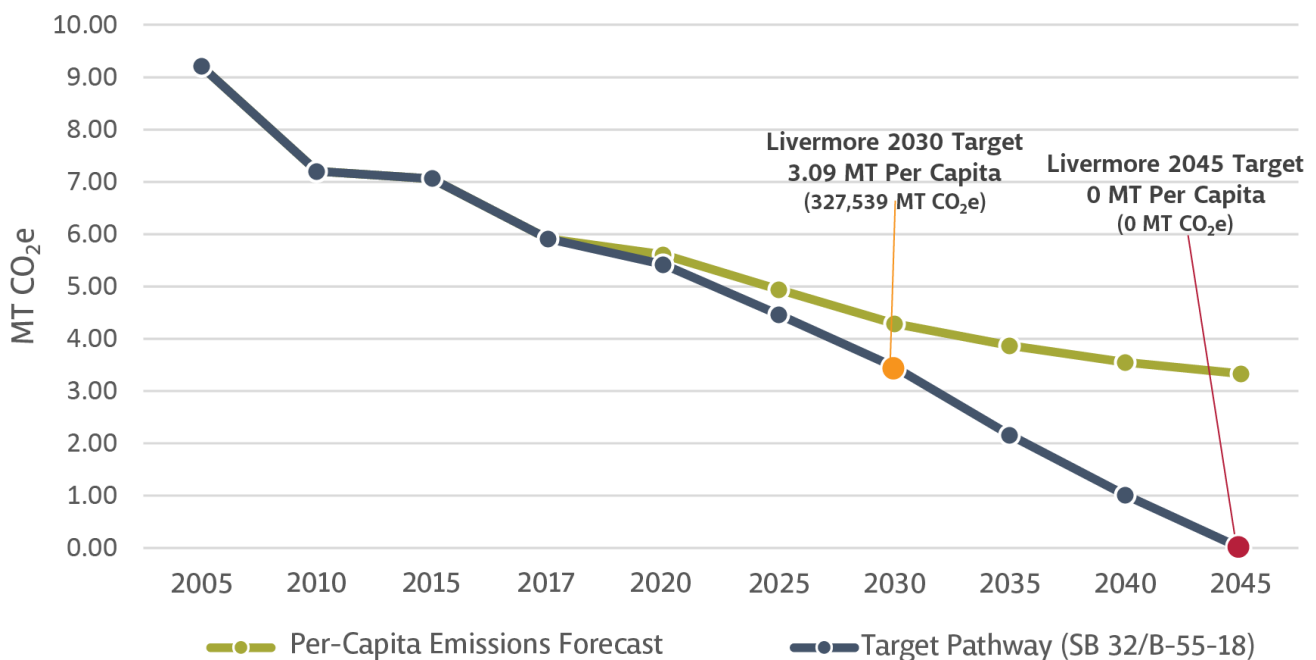
By defining specific reduction targets, Livermore can track its progress towards meeting its goals and measure the success of its CAP. Livermore's CAP includes GHG reduction targets for 2030 and 2045, calculated based on the GHG emissions forecast and State requirements set forth by SB 32 and EO B-55-18. These GHG reduction targets were established to be consistent with the State's climate goals, which would result in Livermore's "fair share" of emissions reductions in support of California's overall statewide reductions.<sup>18</sup> Additionally, the City established per-capita targets for 2030 and 2045 instead

of mass emissions targets, as recommended by CARB in the 2017 Scoping Plan, due to per-capita target's flexibility in the event of greater than expected population growth or decline. The pathway to achieve Livermore targets is shown below in Figure 2-4. The emissions gap between the forecast and the target pathway represents the amount of GHG emissions that Livermore will need to reduce through locally adopted GHG reduction strategies and actions. For 2030, this translates to mass emission reductions of 128,238 MT CO<sub>2</sub>e in 2030, and 430,965 MT CO<sub>2</sub>e in 2045 based on current population projections.

**Livermore will reduce GHG Emissions by 40% below 1990 by 2030 and achieve carbon neutrality by 2045.**



**Figure 2-4. Per-Capita GHG Emission Reduction Targets Summary for Livermore**



18. Association of Environmental Professionals, Final White Paper, Beyond 2020 and Newhall, October 18, 2016. [https://califaep.org/docs/AEP-2016\\_Final\\_White\\_Paper.pdf](https://califaep.org/docs/AEP-2016_Final_White_Paper.pdf)

## 2-3. Community Perspectives on Climate Action



In addition to the Vulnerability Analysis and the GHG inventory and forecast, the City's climate action strategy was informed by extensive community engagement. The City provided an open and inclusive community engagement process with ample opportunities to welcome residents, businesses, and other partners into the CAP process and inspire them to be a part of Livermore's climate-resilient future. The engagement process brought community members into the project early and often, keeping a pulse on their level of support and being responsive to their concerns. The engagement process was driven by three primary goals.

### GOAL A

Cultivate a shared understanding of the purpose, motivation, and value of the CAP to the City and individuals and the process of developing the CAP.

### GOAL B

Gather community perspectives and feedback on the CAP that are representative of the makeup of the community to inform CAP development.

### GOAL C

Build community- wide support for advancing CAP priorities and implementing mitigation and adaptation actions.

## ENGAGEMENT ACTIVITIES

Due to the project’s timing and the impacts of COVID-19, the initial outreach and engagement scope shifted away from traditional in-person events to more virtually based approaches. The City held a variety of virtual events that provided wide-reaching public engagement.

### Climate Action Plan Advisory Committee Meetings (8/20–11/22)

The Climate Action Plan Advisory Committee (CAPAC) was made up of nine Livermore residents selected by the City Council to provide input and feedback to City staff throughout the development of the CAP. Each meeting offered opportunities for members of the public to submit comments in writing.

### Online Survey (4–8/20)

The City released a bilingual (English-Spanish) online survey that included questions regarding community perspectives about climate action, priorities for climate action focus areas, and levels of concern about climate impacts.

### Online Open House (1/21)

The City developed interactive pages on the project website to mimic an in-person open house. The pages contained information in both English and Spanish about the GHG inventory, vulnerability analysis, and broad strategies the City could take to address climate change in Livermore. They also contained survey questions and comment boxes for members of the public to write their ideas and reactions to the content on each page. The City concluded the online open house engagement with a live Zoom event that gave community members an opportunity to discuss the content directly with representatives from the City and the Climate Action Plan consultant team.

### Online Workshop (3/21)

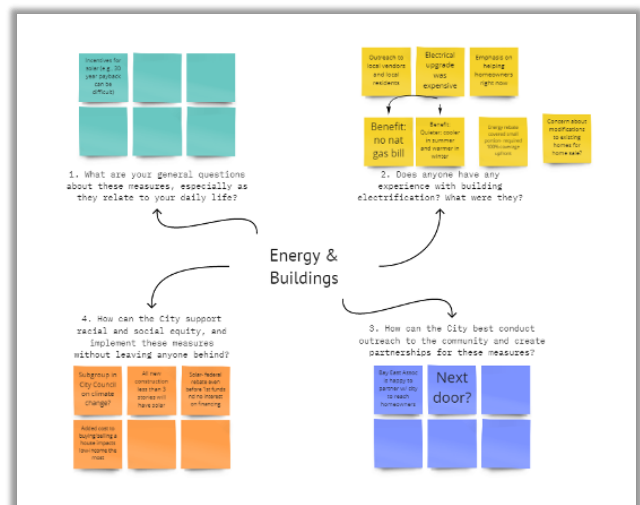
The City hosted an interactive workshop to gather community feedback on the preliminary list of CAP strategies and actions.

### Targeted Focus Groups and Presentations (4–8/21)

The City hosted focus groups and presentations to targeted groups that were underrepresented in the engagement activities above. The City met with members of the local business community, stakeholders in the winegrowers and open space community, students from Livermore High School and Junction Avenue School, and service providers such as La Familia and Partners for Change.

### Farmers Market (4/21)

As COVID-19 restrictions eased towards the end of the outreach process, City staff were able to host a table at the Livermore Farmers Market.

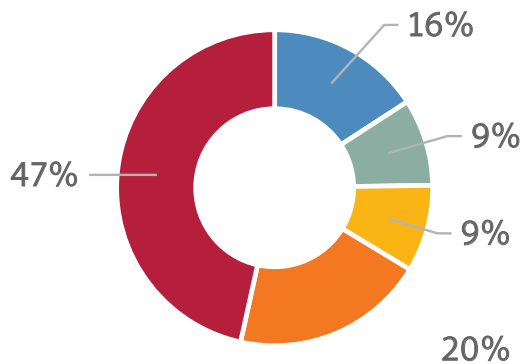


▲ Interactive Mural Board from the Online Workshop

## OVERARCHING FEEDBACK FROM ENGAGEMENT

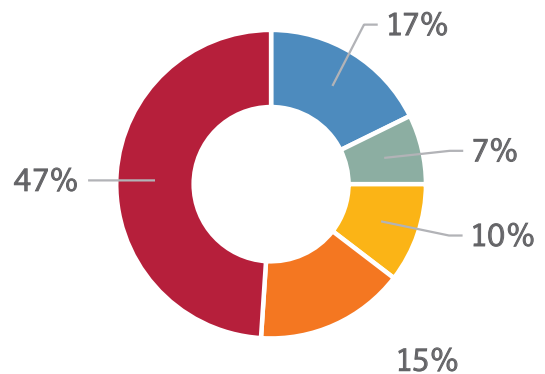
The overall response to Livermore's climate goals and strategies was positive. Over 75 percent of the community has at least some concern over the impacts of climate change. In addition, a strong majority of Livermore's community ranked taking action on climate change as important. The quotes below were received from Livermore community members during outreach events or submitted through surveys.

How worried are you about climate change?



- Not at all Worried (54)
- Slightly Worried (29)
- Very Worried (159)
- Not Very Worried (31)
- Quite Worried (68)

How important is it to you that the City of Livermore community take action on climate change?



- Not Important (57)
- Slightly Important (35)
- Very Important (171)
- Not Very Important (25)
- Quite Important (52)

“ I believe that the health and safety of all Livermore residents will be impacted.”

▼ Livermore resident responses to online survey.

“ I'm concerned about long periods of drought and blackouts during hot weather months.”

“ I'm very concerned that climate change will have the worst impact on the most vulnerable people.”

“ We will reap the benefits from important actions taken in 2021 to ensure nobody's livelihood is threatened by climate change.”

Throughout the outreach process several key themes developed. Many residents expressed concern over climate change impacts such as water availability, extreme heat, and poor air quality. Residents supported efforts related to expanding renewable energy sources, water conservation, alternative transportation modes, and improving resiliency in public infrastructure. Overall, most residents wanted the City to act on climate, but with cost effective and equitable strategies that preserve Livermore’s status as a place where people can live, work, and raise families. These themes and how they were included in the CAP development are summarized in Table 2-5.

**Table 2-5. Summarized Community Feedback by Theme**

Theme	Community Feedback	Where to Find it in the CAP
<b>Affordability</b>	Participants encouraged the City to provide incentives and financial assistance to property owners and expressed concern that appliance replacements and ongoing electricity costs will be expensive.	Economics and cost effectiveness were made a top priority through the inclusion of the economics guiding principle (Chapter 3). Many actions are no or low cost for the community.
<b>Community Connectivity</b>	Participants value the feeling of community in Livermore and want it to continue to be a place where people want to live, work, raise families, and visit. The ability to move around the City easily through active transportation was also identified.	Community connectivity was made a key benefit in action development. This benefit is reflected throughout Chapter 3.
<b>Outreach and Partnerships</b>	Participants were interested in continued outreach and education to residents and had ideas for partnerships with the local laboratories, homeowners associations, local businesses, transit agencies, and schools.	Partnerships were included as a guiding principle of the CAP and many actions including Priority Area 4 and Strategy I-3 are dedicated to partnerships and outreach.
<b>Awareness and Action</b>	Many participants feel that the City is not acting urgently enough and urge Livermore to be a leader in climate action.	The CAP provides a clear implementation section, funding and financing strategies, and a dedicated implementation action section to spur progress (Chapter 4).
<b>Quality of Life Decline</b>	Participants expressed concern about the decline in quality of life that will be caused by climate change impacts like extreme heat, drought, and wildfire smoke. The impacts on lower income communities was of particular concern.	The CAP focuses heavily on adaptation strategies and actions related to Livermore’s most pressing climate issues. A summary of Livermore’s adaptation strategy is found on page 33.
<b>Housing and Jobs Balance</b>	Participants are concerned about the availability of housing and jobs in Livermore and want to ensure that there is enough affordable housing to support everyone who works in Livermore.	Through the CAP transportation and land use section (Chapter 3) and the General Plan update, the City is working to increase housing in the city and manage the jobs/housing balance.
<b>Equity</b>	Participants noted that people who are low-income, experiencing homelessness, or have recently secured housing don’t have the resources to consider their carbon footprints or the ability to adapt to climate change.	Equity was made a guiding principle and benefit of the CAP. Actions with specific equity benefits are noted throughout Chapter 3.



# CHAPTER 3. Livermore's Climate Action Strategy



# 3-1. Strategy Overview

Livermore's climate action strategy outlines a plan for how the City can prepare for climate change impacts while reducing GHG emissions to meet its 2030 and 2045 targets. This CAP builds upon Livermore's previous efforts with actions that are equitable, achievable, and implementable. The strategies and actions in the CAP were developed through a collaborative process between City staff, the Climate Action Plan Advisory Committee, Planning Commission, City Council, key stakeholders, and the community (as described in Chapter 2).

## HOW TO READ THIS SECTION

The strategies are organized by adaptation and mitigation topic (e.g., Wildfire, Flooding, Buildings and Energy, Transportation and Land Use). Each topic identifies primary objectives the City will use to measure success. The City will aim to complete these objectives before 2030.

Each strategy includes a summary that details why the strategy was chosen and major considerations for implementation. The mitigation topics include a breakdown of the total GHG emissions reductions expected from each strategy. The strategies identify specific actions the City will take to achieve its objectives. Each action includes a table with the following additional detail:

### B-2 ACTIONS

#### ACTION NUMBER AND ACTION DESCRIPTION

Identifies and defines what the City will do.

#### B-2.1 Opt-up community EBCE accounts to 100 percent renewable electricity

Opt-up community EBCE accounts in Livermore to 100 percent renewable electricity by 2024. Achieve an opt-out rate lower than 4 percent from 100 percent renewable. Conduct public outreach and education to highlight the benefits of 100 percent renewable energy. Partner with community-based organizations to ensure low/moderate income households are aware of EBCE's CARE program to receive decreased electricity rates.

#### GHG REDUCTIONS

The expected GHG reductions from completing this action in 2030 and 2045. Adaptation actions do not have this data.

GHG Reduction	Benefits	City Cost	Timeline
<b>2030:</b> 25,505 MT CO <sub>2</sub> e <b>2045:</b> 0 MT CO <sub>2</sub> e	 Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Env. Quality	 \$	 Short-term

#### BENEFITS

Beyond GHG reductions or increasing resilience, many actions provide additional community benefits. If an icon is highlighted, the action provides that benefit. A definition of each benefit is included under Strategy Benefits.

#### CITY COST

Identifies the city cost as high, moderate, low, or no cost.

#### TIMELINE

Identifies the implementation timeline as short-term, mid-term, long-term, or ongoing.

# LIVERMORE CAP STRATEGY OVERVIEW

**Table 3-1. Working Towards Climate Resilience and Carbon Neutrality**

	STRATEGY	2030 OBJECTIVES
ADAPTATION	<b>Extreme Heat</b>	<ul style="list-style-type: none"> <li>• Increase resilience to extreme heat events</li> <li>• Cool neighborhoods by expanding the urban canopy</li> <li>• Identify vulnerable areas and populations</li> <li>• Develop cooling centers that are energy-resilient</li> </ul>
	<b>Wildfire</b>	<ul style="list-style-type: none"> <li>• Mitigate wildfire risk</li> <li>• Facilitate building retrofits and operate clean air centers</li> <li>• Stockpile personal protective equipment</li> <li>• Reduce fire risk through fire-safe landscaping standards</li> <li>• Improve emergency alert systems</li> </ul>
	<b>Flooding</b>	<ul style="list-style-type: none"> <li>• Improve stormwater management</li> <li>• Harness Livermore’s natural landscapes to improve stormwater management</li> <li>• Reduce the expansion of urban hardscapes</li> </ul>
MITIGATION & ADAPTATION	<b>Drought</b>	<ul style="list-style-type: none"> <li>• Improve water conservation</li> <li>• Develop on-site water and water reuse standards</li> <li>• Provide water efficiency devices</li> <li>• Develop water-efficient demonstration programs</li> </ul>
	<b>Energy Resilience</b>	<ul style="list-style-type: none"> <li>• Enhance community energy resilience</li> <li>• Expand microgrid deployment</li> <li>• Increase local and regional grid reliability</li> <li>• Improve building resiliency</li> </ul>
	<b>Buildings and Energy</b> ↓19,379 MT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Provide 100% renewable electricity by 2024</li> <li>• Require all-electric new construction by 2023</li> <li>• Incentivize electric retrofits in 12% of existing buildings</li> <li>• Develop equitable funding and financing</li> <li>• Incentivize local on-site energy generation</li> </ul>
	<b>Carbon Sequestration</b> ↓1,950 MT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Plant 1,000 trees by 2030</li> <li>• Update City landscaping standards to expand shade trees</li> <li>• Provide free or reduced cost-trees to residents</li> <li>• Preserve open space</li> <li>• Implement carbon farming projects</li> <li>• Explore technology-based carbon capture and storage</li> </ul>
MITIGATION	<b>Transportation and Land Use</b> ↓49,494 MT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Add 1,283 publicly available chargers</li> <li>• Reduce VMT by 2%</li> <li>• Achieve a 10% bike mode share</li> <li>• Support sustainable land use practices</li> </ul>
	<b>Waste and Materials</b> ↓19,379 MT CO <sub>2</sub> e	<ul style="list-style-type: none"> <li>• Reduce the amount of organics that is landfilled by 75%</li> <li>• Maintain or exceed 75% waste diversion each year</li> <li>• Improve local re-use and repair programs</li> <li>• Expand the use of low-carbon and recycled building materials</li> </ul>

## ADAPTATION STRATEGY SUMMARY

Even if all GHG emissions sources stopped emitting today, the current concentration of GHGs in the atmosphere would continue to change California’s climate and directly impact Livermore.<sup>1</sup> Specifically, as described earlier in Chapter 2, Livermore is likely to experience impacts from extreme heat and weather events, drought, and statewide wildfires. These impacts will have cascading effects on Livermore’s residents, businesses, infrastructure, environment, and economy. The City developed a suite of adaptation strategies to increase Livermore’s resilience to climate change impacts, prioritizing vulnerable communities and vital public facilities.

- **ENERGY RESILIENCE** – Adding distributed energy resources like solar and batteries and working with partners to improve electrical grid reliability and capacity will be key to the City’s energy resilience strategy.
- **DROUGHT** – The City’s drought strategy uses a range of policy and planning strategies to support water efficiency and on-site water reuse.
- **FLOODING** – The City will implement a suite of natural (green) and engineered (grey) stormwater solutions to capture and infiltrate water while protecting infrastructure.
- **EXTREME HEAT** – Cooling urban areas via expanded shade structures and the urban tree canopy, ensuring energy resilience at cooling centers, and building partnerships with trusted community-facing facilities, as well as incorporating emergency heat response into emergency operations.
- **WILDFIRES** – The City’s wildfire adaptation strategy includes updated planning initiatives in the wildland/urban interface to protect infrastructure from potential fires as well as retrofitting existing buildings to protect occupants against poor air quality.

**Table 3-2. Adaptation Strategies**

Strategy #	Strategy
<b>Energy Resilience</b>	
E-1	Enhance community energy resilience
<b>Drought</b>	
D-1	Improve water conservation and reuse
<b>Flooding</b>	
F-1	Improve stormwater management
<b>Extreme Heat</b>	
H-1	Increase resilience to extreme heat events
<b>Wildfire</b>	
WF-1	Mitigate wildfire risk and improve preparedness

<sup>1</sup> <https://earthobservatory.nasa.gov/features/HeatBucket/heatbucket4.php>

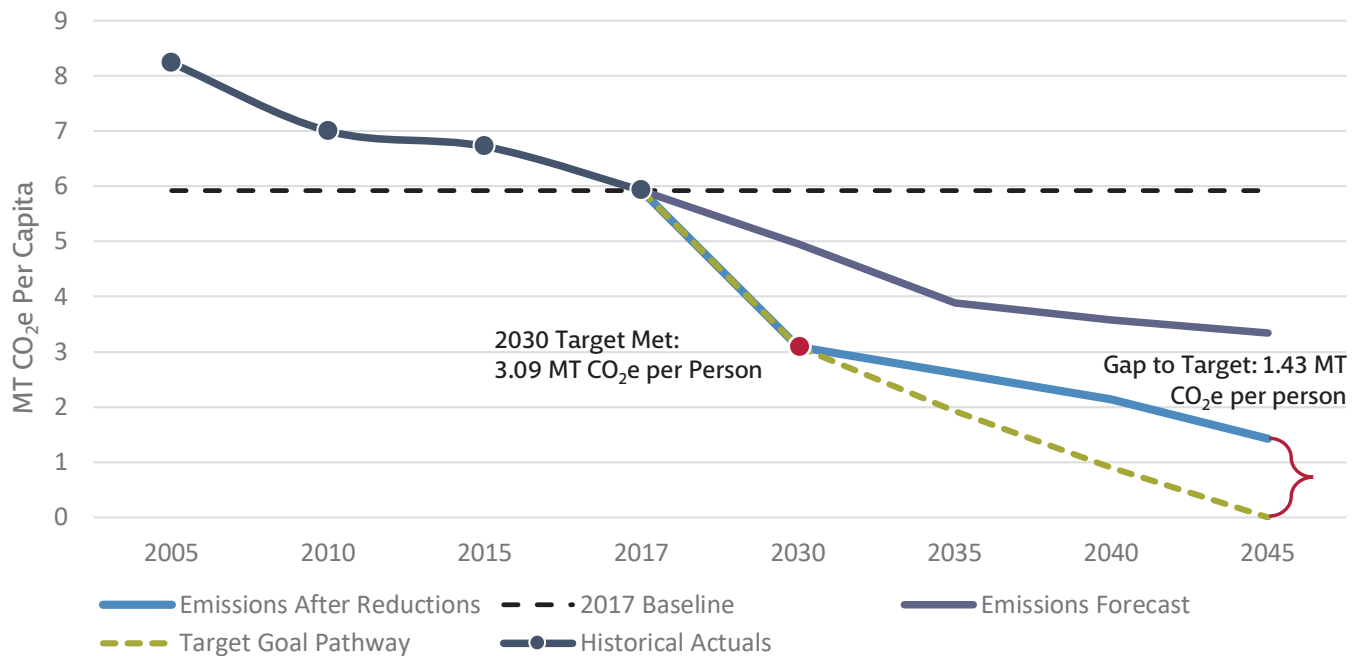
## MITIGATION STRATEGY SUMMARY

As the City works to protect the community from climate impacts, it will continue its efforts to reduce community-wide emissions. With full implementation of the CAP, Livermore expects to exceed the 2030 reduction target by 692 MT CO<sub>2</sub>e and provide substantial progress towards carbon neutrality by 2045 (see Appendix D for more information regarding the calculated emission reductions anticipated from each strategy and action, including substantial evidence). The following four sectors form the core of Livermore’s GHG reduction strategy to achieve the 2030 target and establish a pathway to carbon neutrality by 2045:

- **BUILDINGS AND ENERGY** – Building electrification will shift energy use from natural gas to electricity, maximizing GHG reductions from increasingly clean electricity, while also being cost-effective and improving indoor air quality for residents and businesses.
- **TRANSPORTATION AND LAND USE** – Emissions reductions will come from increased adoption of electric vehicles (EVs), as well as increasing alternative transportation usage, such as transit, biking, and walking
- **WASTE AND MATERIALS** – These strategies focus on implementing the requirements of SB 1383, which will decrease the amount of organic waste that is landfilled and in turn reduce methane in landfills.
- **CARBON SEQUESTRATION** – New management practices on natural lands and protecting existing open spaces will help reduce net emissions.

Figure 3-2 details the GHG-reduction trajectory established by the 2022 CAP. Table 3-3 includes a summary of the strategies and their estimated GHG emissions reduction potential.

**Figure 3-2. Livermore’s GHG Reduction Pathway**



**Table 3-3. GHG Mitigation Strategies**

Strategy #	Strategy	2030 Emissions Reduction (MT CO <sub>2</sub> e)	2045 Emissions Reduction (MT CO <sub>2</sub> e)
<b>Buildings and Energy</b>			
B-1	Require new buildings to be all-electric and incentivize electrification retrofits of existing buildings	27,383	121,493
B-2	Decarbonize electricity from the grid and increase local renewable energy generation	25,505	0
<b>Transportation and Land Use - 42% of Total Reductions</b>			
T-1	Facilitate a transition to electric vehicles	49,494	93,458
T-2	Facilitate a transition to transit and shared mobility services	3,033	4,656
T-3	Improve and expand active transportation infrastructure	2,127	2,111
T-4	Support sustainable land use practices	Not Quantified	Not Quantified
<b>Waste and Materials</b>			
W-1	Reduce the amount of waste that is landfilled	19,379	22,646
W-2	Expand use of low-carbon and recycled building materials	Not Quantified	Not Quantified
<b>Carbon Sequestration</b>			
S-1	Maximize local carbon sequestration	2,008	2,434
<b>OVERALL REDUCTIONS</b>			
<b>Emissions Reduction Needed to Achieve State Targets</b>		128,238	430,965
<b>Estimated Reduction Achieved by Full Implementation of Strategies</b>		128,929	246,798
<b>Absolute Emissions Reduction from 1990 (%)<sup>1,2</sup></b>		-40%	-66%
<b>Per Capita Emissions Reduction from 1990 (%)</b>		-68%	-85%
<b>Gap to SB 32 Target</b>		(692) <sup>3</sup>	184,167

MT CO<sub>2</sub>e = metric ton of carbon dioxide equivalent

1 Emissions reductions go to zero by 2045 due to Senate Bill 100 and the Renewable Portfolio Standard.

2 Absolute emissions reduction values are estimated based on current population projections and are for reference.

Actual progress toward the 2030 target will be determined by comparison to the per capita GHG emissions target of 3.08 MT of CO<sub>2</sub>e per person pursuant to guidance in the 2017 Scoping Plan.

3 Parentheses denote a negative number or an exceedance of the target.

Note: Quantitative GHG emissions reduction values were rounded to the nearest tenth to reflect the level of estimation involved in calculations.

# MUNICIPAL OPERATIONS AND PLAN IMPLEMENTATION STRATEGY SUMMARY

The CAP includes important actions the City will take to lead the community by example to address climate change. The City will reduce emissions and improve resilience in its own operations, dedicate resources to implement the CAP, and develop equitable outreach programs to educate the community on ongoing climate initiatives. Additionally, the City will track and assess CAP implementation progress on a regular basis and adjust its strategies every 5 years (as outlined in Chapter 4) to account for future changes to technology and State law. By taking action, the City can build a meaningful momentum in the community and achieve its goals.

**Table 3-4. Municipal Operations and Plan Implementation Strategies**

Strategy #	Strategy
<b>Municipal</b>	
M-1	Enhance resilience at public facilities
M-2	Electrify municipal facilities and operations
M-3	Electrify the City’s vehicle fleet and encourage employees to utilize alternative transportation and teleworking opportunities
M-4	Conserve water in municipal landscaping and improve on-site stormwater management
M-5	Purchase more sustainable products to reduce waste from City operations
M-6	Utilize public lands to increase local carbon sequestration and reduce urban heat island effect
<b>Implementation</b>	
I-1	Make climate impacts and resilience a standard consideration during planning and development processes
I-2	Dedicate City resource to CAP implementation and consistently monitor progress
I-3	Create a public outreach campaign to educate the community about CAP initiatives
I-4	Foster green innovation in Livermore

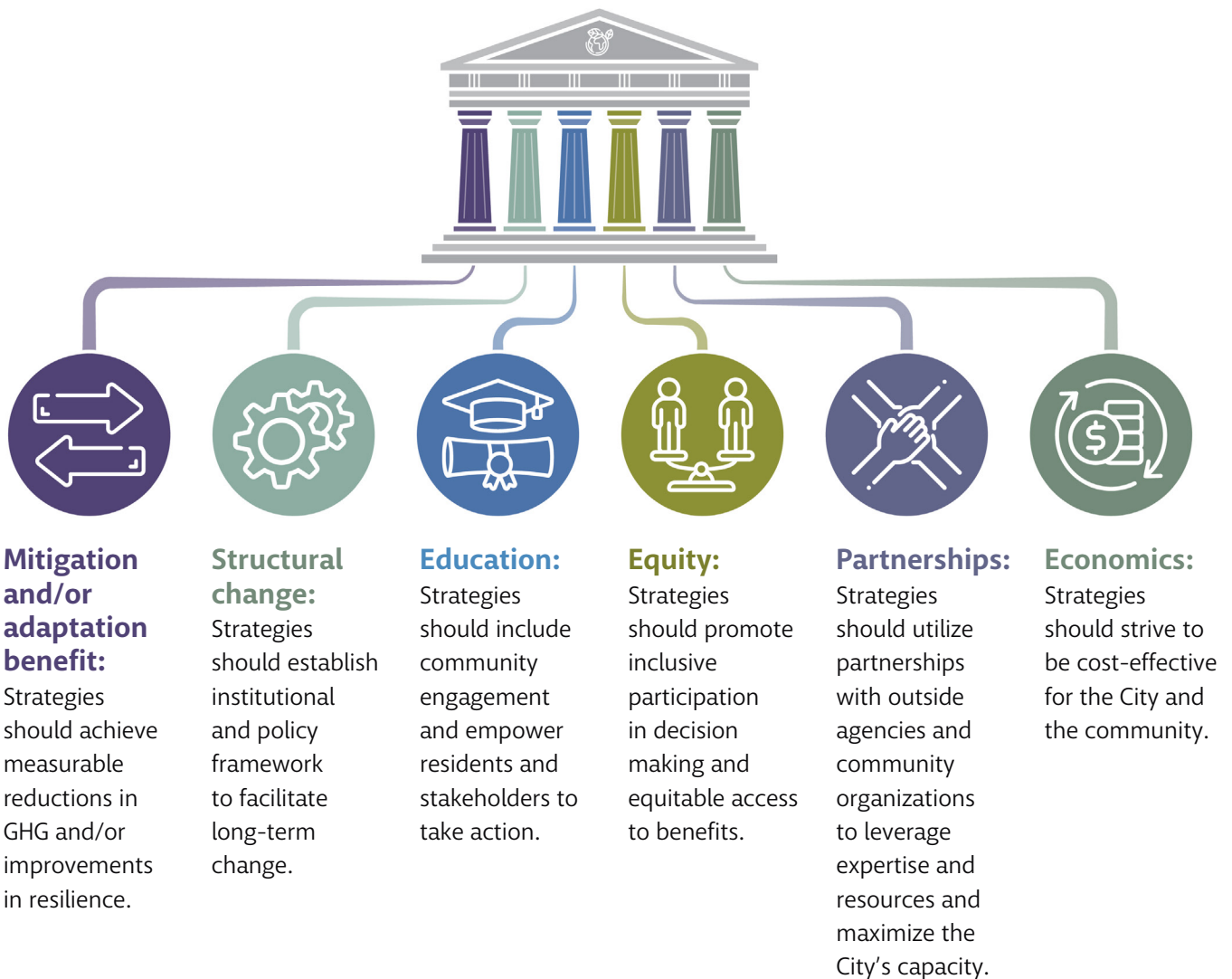
# STRATEGY DEVELOPMENT CONSIDERATIONS

To develop the strategies and action in the CAP, the City utilized guiding principles and considered factors such as costs, benefits, and readiness. Each of these elements is described in more detail below.

## Guiding Principles

The CAP lays out a comprehensive approach to meeting the City’s climate goals through a range of strategies and actions. Each strategy was developed by carefully considering a set of guiding principles. The guiding principles are highlighted below in Figure 3-2. Additional information on how the guiding principles shaped the strategy and action development can be found in Appendix D.

**Figure 3-2. Guiding Principles**





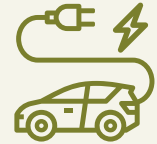
## Strategy Costs

Each CAP strategy was categorized as either no-cost, low-cost, moderate-cost, or high-cost based on its costs to both the City and the community. The descriptions for these categories are included in Table 3-5. Implementing CAP strategies and actions can be extremely variable in cost, as strategies range from outreach and education (low-cost) to major investments in new infrastructure such as microgrids and bike lanes (high-cost). While it is tempting to consider just the upfront costs of new policies or actions, there are many other cost considerations that should be part of the decision-making process. For a complete description of the cost considerations for CAP strategies please see Appendix D.

### DID YOU KNOW?







**1.** A new electric vehicle may cost more upfront than its gas-powered counterpart. However, an electric vehicle can cost less over the lifetime of the vehicle once the costs for gas, oil changes, and other maintenance requirements for gas-powered vehicles are taken into account.



**2.** Investing in climate action pays off. The World Resources Institute found that every dollar invested in resilience and adaptation will result in \$2 to \$10 dollars’ worth of benefit in the future.







**Table 3-5. Cost Framework Summary**

Cost Segment	Description
 <b>No-Cost</b>	Actions that have zero costs to the community or City. This includes actions that will save money both upfront and over time.
 <b>Low-Cost</b>	Actions with relatively low upfront costs or city staff time, (e.g., policy ordinances or outreach). For community members, this represents costs between \$1 and \$100 per year.
 <b>Moderate-Cost</b>	Actions involving consultants or moderate infrastructure changes, (e.g., feasibility studies, program development, and retrofitting existing infrastructure). For community members, this represents costs between \$100 per year and \$500 per year.
 <b>High-Cost</b>	Longer term projects requiring substantial investments into major infrastructure or technology over time, (e.g., energy storage, bike lanes, or other infrastructure changes). For community members, this represents costs between \$500 per year and \$1,000 per year.

## Strategy Readiness

It is important to understand the overall readiness or speed at which a strategy can be deployed. Some policies and actions are ready to be implemented today with existing resources and community support, while others will need additional feasibility studies, community engagement, or funding before implementation can occur. Each CAP strategy was categorized as short-term, mid-term, long-term, or ongoing. The description of each readiness category is included in Table 3-6.

**Table 3-6. Readiness Framework Summary**

Readiness Timeframe	Description
 Short-term	Actions that are ready to be implemented today such as certain ordinances and community outreach efforts. This can also include studies and pilot projects that will set up implementation of longer term actions.
 Mid-term	Actions that require additional study, funding, or partnerships to be completed before implementation.
 Long-term	Actions that require longer lead times to fully implement.
 Ongoing	Actions that are underway and ongoing.

*To see a full breakdown of the methods to assess cost, benefit, and readiness, please refer to Appendix D.*

## STRATEGY BENEFITS

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### Public Health



**Creating a healthier community by improving air quality and active transportation.** Reducing fossil fuel use in Livermore will improve public health in the community. Natural gas-powered appliances like gas stoves are a major source of indoor air pollution which worsen health conditions like asthma.<sup>2</sup> Fossil-fuel powered vehicles emit carcinogens and air pollutants that negatively impact public health. All-electric buildings, electric vehicles, and a well-connected active transportation network, residents will provide residents with cleaner air and more opportunities for physical activity.<sup>3</sup>

### Community Connectivity



**Promoting a strong sense of community by creating complete, accessible neighborhoods, opportunities to engage, and resources for historically underserved communities.** Facilitating a city where community members can participate in public life and build deep ties to their neighbors is foundational to building a sustainable Livermore. Research indicates that this type of community cohesion is also important for community mental and physical health outcomes.<sup>4</sup>

### Resilience and GHG Reduction



**Some GHG reduction strategies can have resilience benefits as well, and vice versa.** For example, increasing local energy storage and power generation can increase energy resilience while decarbonizing the grid. Urban greening harnesses the carbon sequestration potential of natural land, while providing shade and urban cooling during extreme heat events.

### Environmental Quality



**Improving natural environments within the city to protect biodiversity and ecosystem services, like cleaner air and water.** Healthy ecosystems can reduce pollutants in the air and local waterways, provide species habitat, and offer natural areas for community recreation. Healthy ecosystems can help alleviate extreme weather impacts as well, passively absorbing rainwater and relieving the burden on Livermore's built infrastructure. Finally, increasing green and natural space within Livermore contributes to increased quality of life for the community.

### Green Economy



**Diversifying local economic opportunities by attracting high-quality jobs in sustainability industries, such as those focused on developing zero emission vehicles or battery storage technologies.** As Livermore decarbonizes, nearly every sector from energy to waste management will experience a green jobs transition, and many will experience green job growth. A recent study by the UCLA Luskin Center for Innovation found that 100,000 full-time equivalent jobs would be created across various sectors of the economy as the result of electrifying all of California's new and existing buildings by 2045. In the waste and materials sector, the process of re-using materials was found to create 200 times as many jobs as sending those materials to landfills and incinerators while recycling increased jobs by a factor of 60.<sup>5</sup>

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2 <https://www.nationalasthma.org.au/living-with-asthma/resources/patients-carers/factsheets/gas-stoves-and-asthma-in-children>

3 Potential of active transport to improve health, reduce healthcare costs, and reduce greenhouse gas emissions: a modeling study, 2019, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6636726/#:~:text=Increasing%20active%20transport%20by%20switching,also%20reduce%20greenhouse%20gas%20emissions.>

4 <https://www.vtpi.org/cohesion.pdf>

5 <https://ilsr.org/new-report-from-global-anti-incineration-alliance-zero-waste-creates-200-times-more-jobs-than-landfills-and-incinerators/>

## 3-2. Adaptation Strategies and Actions

# Energy Resilience

## 2030 Objectives

- Enhance community energy resilience
- Increase local and regional grid reliability
- Expand microgrid deployment
- Improve residential and non-residential building resiliency



Windmill at the Scott Haggerty Wind Energy Center just outside Livermore.

## Strategy E-1: Enhance community energy resilience

As natural gas-powered appliances are replaced with electric appliances as part of climate change mitigation, and heating and cooling become increasingly important to adapt to extreme heat and high-smoke days, it is more important than ever to have uninterrupted carbon-free energy generation. Strengthening community energy resilience in Livermore also contributes to Livermore's carbon neutrality goals through increased generation of local renewable energy in addition to implementing a microgrid pilot project. Energy resilience also is foundational for achieving heat and wildfire smoke adaptation actions, which involve cooling and filtering indoor air to increase the health and wellbeing of Livermore residents during these events. Energy resilience also means developing and implementing strategies to reduce the impacts from Public Safety Power Shutoffs which have become more common due to climate change.

Building grid resiliency will rely on a multifaceted approach of assessing existing grid vulnerabilities, building-out local energy generation and storage, and implementing energy efficiency strategies. Improving building resiliency will also emphasize incentives and resources for rental property owners and low-income residents so that energy resilience

at the individual-building level is implemented for all. Benefits from this strategy could include the generation of local green jobs as the City promotes on-site power generation and green retrofits. As residential and nonresidential buildings continue to pursue weatherization, both residents and businesses will see long-term savings on energy bills because of more efficient heating and cooling.

Implementing actions for energy resiliency will require strong partnerships and leveraging new sources of funding. Actions that require partnership with other cities, and stakeholders like East Bay Community Energy (EBCE) and Lawrence Livermore National Laboratory will be relatively low-cost to the City, as most costs will stem from staff time spent on partnership development and coordination. Other actions will require new infrastructure investments. Microgrids, which allow a grid to function autonomously even during power outages, have relatively large upfront costs. The best strategy of the cost of microgrids is the cost per unit capacity (\$/megawatt [MW]). In California, the average cost per MW of storage added is \$3.5 Million.<sup>6</sup> However, these costs can be financed or even completed through public private partnerships and can significantly increase resilience in the City.

6. Asmus, Peter, Adarm Forni, and Laura Vogel. Navigant Consulting, Inc. 2017. Microgrid Analysis and Case Study Report. California Energy Commission. Online at <https://www2.energy.ca.gov/2018publications/CEC-500-2018-022/CEC-500-2018-022.pdf>. Accessed June 1, 2021.

## E-1 ACTIONS




### E-1.1 Increase local and regional grid reliability

Work with EBCE, PG&E, other Tri-Valley cities, and the Lawrence Livermore National Laboratory to create a regional grid reliability strategy, with the goal of assessing vulnerabilities to maximize local resilience.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Long-term








### E-1.2 Expand microgrid deployment

Based on the results of the municipal pilot (M-1.2) expand microgrid deployment to provide resilience at critical facilities (fire, police, city hall) and in vulnerable communities. Partner with the Lawrence Livermore National Laboratory on microgrid projects and identify and pursue opportunities to obtain state and federal funding.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$\$	Mid-term








### E-1.3 Improve resilience of residential buildings

Implement a Neighborhood Retrofit Program to improve resilience in residential buildings (i.e., on-site power generation and storage, weatherization, air conditioning, etc.), with an emphasis on connecting incentives and resources with rental property owners and low-income residents. Partner with community organizations to leverage existing resources.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term

### E-1.4 Improve resilience of non-residential buildings

Develop an equitable incentive program to improve resilience in nonresidential buildings to prevent disruptions in the local economy during power outages.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term

# Drought

## 2030 Objectives

- Improve water conservation and reuse
- Study and establish standards for on-site water reuse
- Develop a water-efficient demonstration program
- Continue to provide water-efficiency devices and encourage residential water capture and reuse



Winners of the City of Livermore's Beautification Committee Award.

## Strategy D-1: Improve water conservation and reuse

Drinking water in Livermore is a combination of local groundwater and imported water from the State Water Project. Water availability in Livermore is variable and is dependent on rainfall and snowpack in the Sierra Mountains, both of which are expected to be negatively impacted by climate change.<sup>7</sup> As the City's water supplies fluctuate and shrink, it is critical to build-up resilience and reserves of water that can be used during droughts that are sourced independently of the State Water Project and leverage on-site water reuse and recycling.

Livermore's water resilience strategy levies multiple actions for on-site water reuse and water conservation. Actions to bolster drought resiliency will transform the way Livermore currently uses water, from implementing water efficient landscaping to updating wastewater treatment methods to increase recycled water availability. A keystone part of Livermore's drought resilience

strategy will be to develop on-site water reuse standards. Implementing drought resiliency actions will also depend on showing businesses and residents ways to reduce water demand in landscaping through a water-efficient demonstration program, and the continued provision of free or subsidized water conservation devices to residents in collaboration with Zone 7 and Cal Water.








Costs associated with strategy D-1 include staff and consultant time to develop and implement new plans and standards for water reuse as well as costs for subsidized water-use reduction devices. Community costs include upfront costs for developing on-site water reuse systems for new development and retrofit costs for drought tolerant landscaping and water capture devices. However, these upfront costs will be offset by long-term water savings and the priceless value of a reliable water supply.

7. [www.livermoreca.gov/water](http://www.livermoreca.gov/water)

## D-1 ACTIONS



### D-1.1 Study on-site water reuse

Partner with Zone 7, Cal Water, large water users, and other stakeholders to study a broad range of strategies for on-site stormwater capture, wastewater treatment, and reuse in commercial and residential settings.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term







### D-1.2 Establish standards for on-site water reuse

Establish standards to expand on-site water reuse, such as requiring new developments and major renovations to meet certain plumbing and irrigation demands with greywater or stormwater

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term

### D-1.3 Continue implementing the Water Efficient Landscape Ordinance

Continue implementing the Water Efficient Landscape Ordinance during plan check and inspections of new and renovated landscaping.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Short-term








### D-1.4 Develop a water-efficient demonstration program

Collaborate with residents, businesses, and agency partners to promote native, drought-tolerant landscaping through demonstration projects. Identify and promote incentives and financing opportunities.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Short-term

### D-1.5 Continue to provide water-conservation devices and encourage residential water capture and reuse

Continue working with Zone 7 and Cal Water to provide free or subsidized water-conservation devices to residents with a focus on low-income communities. Encourage the installation of cisterns and other water-storage devices for single-family homes to capture rainwater for irrigation uses.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Ongoing

# Flooding

## 2030 Objectives

- Improve stormwater management
- Harness Livermore's natural landscapes to improve stormwater management through wetland restoration and tree planting
- Update standards to expand permeable hardscapes and passive rain capture



## Strategy F-1: Improve stormwater management

Floods are among the deadliest and most common type of natural disaster in the United States.<sup>8</sup> They are caused by an overflow of inland waters (like rivers or streams) or accumulation of water from heavy rains. As an inland city, Livermore is most vulnerable to urban flooding, where heavy rainfall overwhelms the local stormwater drainage capacity due to runoff from roads, parking lots, and other impervious surfaces.<sup>9</sup> As storm events increase in duration and intensity, Livermore will need to increase local capacity to absorb and channel stormwater while not having it overwhelm the local management system.

Actions to reduce flood risk harness existing ecosystems in Livermore to passively absorb rainwater in the urban environment through green spaces like vegetative swales and tree planting. Policies and incentives will also be levered to improve stormwater management through expanded standards for passive rainwater capture in new infrastructure and development projects and new incentives for passive rain capture features in existing landscapes developed in partnership with water and

wastewater providers. Hardscapes like impervious parking lots and buildings will be reduced in future developments, ensuring that flood-vulnerable hardscapes do not expand as a result of local economic development. Implementing these actions for resiliency will require staff time and cost and maintenance of permeable surfaces.

On the community side, businesses will need to consider the cost of incorporating pervious materials. However, benefits may also be seen from savings associated with decreased flood damage. Wetland restoration and tree planting as part of this adaptation strategy will deliver benefits in increased environmental quality as the urban canopy expands and urban creeks and floodplains are revitalized with native plant species. The expansion of green spaces, particularly the urban canopy, will also bring down the temperature and help Livermore adjust to rising temperatures. Finally, flood reduction actions can also help to capture rainwater for future reuse, increasing drought resiliency.

8. <https://www.fbiic.gov/public/2010/mar/FloodingHistoryandCausesFS.PDF>








9. <https://www.nrdc.org/stories/flooding-and-climate-change-everything-you-need-know>



## F-1 ACTIONS







### F-1.1 Prioritize wetland restoration

Implement projects in the Stream Maintenance Plan that will revitalize urban creeks and floodplains, encourage groundwater recharge, and use native plant species to reduce flood risk and restore riparian habitats. Support and promote local programs such as Living Arroyos.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Long-term








### F-1.2 Prioritize flood-resiliency projects

Implement stormwater management projects identified in Livermore's Storm Drain Master Plan, Green Infrastructure Plan, and Capital Improvement Program that improve flood resilience from future storms. Ensure new infrastructure and retrofits are adequately sized to handle future flows exacerbated by climate change.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$\$	Long-term

### F-1.3 Expand passive rain capture standards

Expand the requirements for passive rain capture features, such as vegetative swales and planting trees, in new infrastructure and development projects, particularly in areas of the city that are vulnerable to flooding.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term








### F-1.4 Provide incentives to increase passive rain capture

Work with water and wastewater providers to create and promote incentives for existing landscapes to incorporate passive rain capture features.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term








**F-1.5 Require new hardscape to be permeable**

Update standards for new development hardscape to be consistent with CALGreen Tier 1 and/or increase the current fee for installation of new impervious surfaces.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term

**F-1.6 Combine tree planting and stormwater management**

Include stormwater management strategies like bioswales when implementing tree planting and other urban greening programs, with a focus on low-income communities.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Long-term

# Extreme Heat

## 2030 Objectives

- Increase resilience to extreme heat events
- Cool neighborhoods by expanding the urban canopy and sources of shade
- Identify heat vulnerable areas and populations and enhance equity-focused heat response in emergency planning
- Develop cooling centers that are energy-resilient



## Strategy H-1: Increase resilience to extreme heat events

Adapting to rising temperatures, extreme heat events, and longer, more frequent heat waves will become a fixture of life in Livermore. Without resiliency strategies, extreme heat can be fatal, and disproportionately affects community members who are elderly, children, have pre-existing physical or mental health conditions, and do not have access to indoor air conditioning. Ensuring that Livermore's vulnerable populations have access and awareness of indoor cooling options and reducing the heat in Livermore's urban areas through expanded shade and urban greening will be critical to ensuring that Livermore's community can stay comfortable and healthy during a hotter future.

Actions to address heat events will rely partially on planning efforts. Specifically, the development of a heat vulnerability index to identify Livermore's most heat-vulnerable areas and populations and developing a heat mitigation plan to reduce urban heat and prepare for higher temperatures. Syncing with actions for carbon sequestration, heat planning also connects with the implementation of an Urban Forest Management Plan, which will expand tree canopy shade, reducing the urban heat island effect. These urban greening efforts






will contribute to environmental quality and biodiversity in Livermore, while providing key cooling benefits. The cost to the City of implementing these actions will be moderate, entailing staff time, tree planting costs, shade structure implementation, and retrofit program implementation. The community is not expected to incur any mandatory costs but will certainly experience the benefits of cooler neighborhoods and robust heat emergency strategies. Residents who participate in heat resilience strategy implementation in their homes may see some costs if they decide to participate.

The City will also improve energy resilience in cooling centers, ensuring that they are not vulnerable to power outages and are also using carbon-free electricity to provide indoor cool air to the populations that need them most. Finally, actions to help the Livermore community withstand higher temperatures include integrating heat into Livermore's Emergency Operations Plan and providing well-being checks to vulnerable populations including low-income families, older adults, speakers of non-English languages, and Livermore's unsheltered population. These outreach efforts are both low-cost and have high levels of positive public health impact.

## H-1 ACTIONS



### H-1.1 Study heat vulnerability

Building off efforts in the 2023 Tri-Valley Local Hazard Mitigation Plan, create a Heat Vulnerability Index to identify and map heat-vulnerable areas and populations in the city. Explore actions to reduce urban heat and prepare for higher temperatures and more frequent extreme heat events.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term








### H-1.2 Expand tree canopy cover in the city

Utilize the City's new street tree inventory and other available tools to identify areas of the city with low tree canopy cover. Focus tree planting in areas with underserved and vulnerable populations.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term

### H-1.3 Create a neighborhood cooling program

As part of a Neighborhood Retrofit Program (E-1.3), implement cooling strategies consistent with the Heat Mitigation Plan. Strategies could include planting trees, using heat-resistant materials, and installing heat pump HVAC units. Partner with local nonprofits and organizations to provide resources to low-income residents for retrofits. Partner with manufacturers or installers to make bulk purchases and installations in the community.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term








### H-1.4 Establish shade standards

Establish and implement shade standards to encourage continuous shade for human movement in areas with high public transit use to protect public transit riders from extreme heat and precipitation events. Standards may encourage shade-providing building features, such as galleries, arcades, and awnings, bus and train shelters, and tree planting.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term








### H-1.5 Install additional shade structures

Build shade structures at public destinations that lack adequate tree cover, major transit stops, and along non-motorized transportation corridors, such as those identified in the City's Active Transportation Plan. Prioritize communities with high-heat vulnerability.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$\$	Long-term








### H-1.6 Increase resilience at cooling centers

Ensure cooling centers have backup power systems in place to operate during power shutoffs. Explore the use of public libraries and other trusted community-serving facilities as additional cooling centers.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Short-term

### H-1.7 Enhance heat response in emergency planning

Integrate an emergency heat plan into the City of Livermore's Emergency Operations Plan that provides an emergency notification and well-being checks to protect the most vulnerable populations, such as Livermore's unsheltered population, low-income families, speakers of non-English languages, and older adults.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term

# Wildfire

## 2030 Objectives

- Mitigate wildfire risk and improve preparedness
- Facilitate building retrofits, operate clean air centers, and stockpile personal protective equipment to protect the community during wildfire smoke events
- Reduce fire risk through fire-safe landscaping standards and fire fuel-load reduction programs
- Improve emergency alert systems through updated hazard planning and outreach



*The City and LARPD use goats for weed abatement to prevent wildfires.*

## Strategy WF-1: Mitigate wildfire risk and improve preparedness

Although wildfire events are not expected to increase within Livermore's city limits, vulnerable populations will still be affected by wildfire smoke, and experience negative health outcomes due to decreased air quality during smoke events. Livermore is also surrounded by natural and working lands that are vulnerable to wildfire. Livermore's wildfire resilience strategy combines updated hazard planning, fire prevention, and increased supports and infrastructure for maintaining public health and indoor air quality during smoke events.

A major part of the CAP strategy for wildfire resilience is reducing the potential for wildfires to occur. The City will continue to implement the community fire and fuel-load reduction programs while conducting outreach for fire-safe landscape management in multiple languages.




These planning and outreach strategies are relatively low-cost but contribute significantly to Livermore community preparedness, safety, and fire reduction.

Planning for the changing risk profile for wildfire will be updated in the General Plan Safety Element and Tri-Valley Local Hazard Mitigation Plan. This updated planning will be combined with encouraged use of the Alameda County (AC) Alert system to let business owners and residents know about wildfire and smoke events via multilingual and culturally appropriate outreach. Finally, the City will strengthen resiliency for indoor air quality during smoke events by stockpiling personal protective equipment and operating energy-resilient clean air centers. Implementing these strategies across the community may entail a small increase in development cost as new fire standards are adopted. However, the City will bear most of the cost of implementation to adapt to wildfires.

## WF-1 ACTIONS







### WF-1.1 Update hazard planning for wildfires

Update the General Plan Safety Element and Tri-Valley Local Hazard Mitigation Plan to reflect the changing risk profile for wildfire including emergency response capabilities and evacuation plans.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Short-term







### WF-1.2 Create fire-safe landscaping standards

Adopt fire-safe landscaping standards for new construction and major renovations that are based on the risk profile.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term







### WF-1.3 Facilitate building retrofits that maintain indoor air quality

As part of the Neighborhood Retrofit Program, incentivize building retrofits that help maintain indoor air quality during wildfires, including ventilation, filtration, and cooling, with an emphasis on connecting incentives and resources with low-income residents.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Short-term








### WF-1.4 Continue to implement community fire fuel-load reduction programs

Continue to update and implement the annual Vegetation Management Program and Weed Abatement Program to remove and thin vegetation.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Ongoing








**WF-1.5 Continue to conduct outreach on fire prevention measures**

Continue to conduct multilingual public education programs to raise awareness of the new standards and best practices for fire-safe buildings and landscape management. This should include information about maintaining defensible space and implementing low-cost fire prevention measures, such as vegetation management and screening attic vents.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Ongoing








**WF-1.6 Operate clean air centers**

Ensure cooling centers can also function as clean air centers. Maintain temperature/air quality thresholds that dictate when these facilities become available. Gather input from users to determine how these facilities can continue to be improved and support daily life, such as by offering indoor exercise and recreation activities/spaces.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Short-term

**WF-1.7 Stockpile personal protective equipment**

Stockpile masks and other personal protective safety equipment for community use during wildfire and/or smoke events and prioritize distribution to vulnerable communities.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Short-term

**WF-1.8 Encourage use of the AC Alert system**

Promote the AC Alert system to residents and business owners through multilingual, proactive, and culturally relevant outreach methods, with a focus on boosting enrollment in vulnerable communities.

Benefits					City Cost	Timeline
						
Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Short-term



## 3-3. Mitigation Strategies & Actions

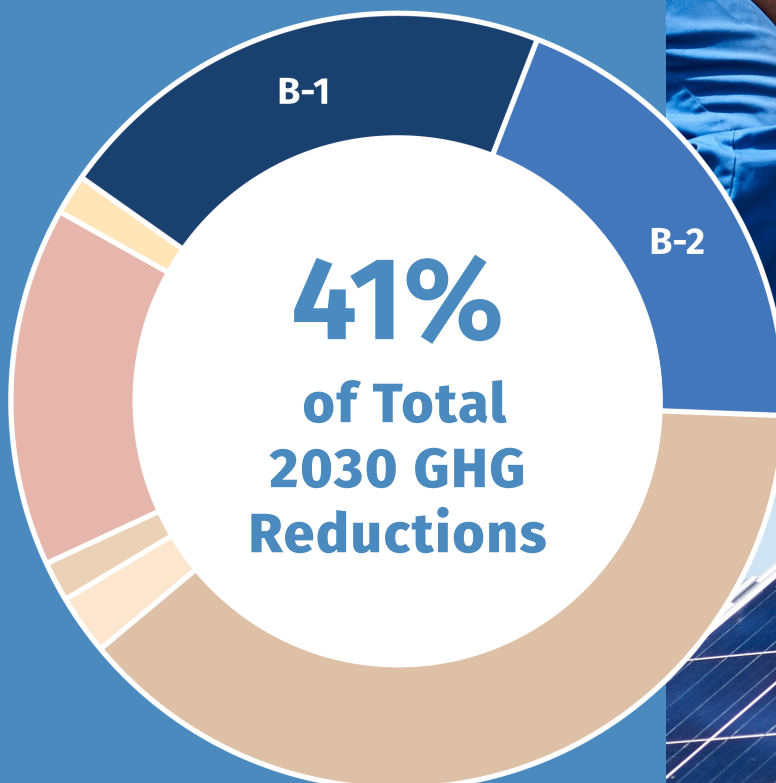
### Buildings and Energy

#### 2030 Objectives

- Provide 100 percent renewable electricity by 2024
- Require all-electric new construction by 2023
- Incentivize electric retrofits in 12% of existing buildings by 2030
- Develop equitable funding and financing for building electrification
- Incentivize local on-site energy generation and storage

#### GHG Reductions

- Strategy B-1 = 27,383 MT CO<sub>2</sub>e
- Strategy B-2 = 25,505 MT CO<sub>2</sub>e



## Strategy B-1: Require new buildings to be all-electric and incentivize electrification retrofits of existing buildings.

### **Electrification is the most feasible and reliable way that Livermore can meaningfully reduce its GHG emissions to meet its 2030 target.**

With the adoption of SB 100 (which requires 100 percent carbon free electricity), all-electric buildings will be carbon neutral by 2045, while buildings with natural gas systems will continue to produce GHG emissions. Buildings generated 33 percent of Livermore's total GHG emissions in 2017. As the grid decarbonizes, electricity used in buildings will become carbon-free, leaving natural gas used for cooking, water, and space heating as the remaining significant sources of emissions. Reducing future natural gas use by preventing it in new construction and making strides towards electric retrofits of natural gas-powered appliances will be essential in achieving Livermore's carbon-neutrality goals.

Building new all-electric buildings in Livermore is more cost-effective than building traditional mixed-fuel buildings, mostly due to cost savings resulting from not needing to install natural gas infrastructure. All-electric homes are also more efficient than those that use natural gas in Livermore's climate zone, reducing lower utility bills for low-income families. Electrification will further relieve the expected future energy burden on low-income families, as natural gas prices are projected to increase significantly due to decreased gas consumption and aging infrastructure.<sup>10</sup> Switching to electric appliances also has the benefit of improving public health, as burning natural gas in poorly ventilated buildings can significantly increase harmful indoor air pollutants that are linked with a higher risk of respiratory illnesses, particularly in vulnerable populations. Peer reviewed studies have documented that residences with gas stoves have a 50 to 400 percent higher average

nitrogen dioxide concentrations than homes with electric stoves.<sup>11</sup> Living in a home with a gas stove may increase children's risk of asthma by 42 percent.<sup>12</sup> Given that Californians spend 70 percent of a given day indoors,<sup>13</sup> and potentially more given the context of the COVID pandemic, indoor air quality is an important health consideration for many. Gas usage that occurs within our buildings also causes outdoor air pollution and generates six times more nitrogen oxides emissions than all in-state power plants combined.<sup>14</sup> Outdoor air pollution from buildings has been linked to pre-mature deaths in California.<sup>15</sup>

This strategy, and its resulting actions will be predominantly implemented through City ordinance and partnerships, which tend to be cost-effective to implement while providing long-term climate benefits. Passing an electrification ordinance will include staff time spent by existing personnel, in addition to consultant time. Livermore residents will experience cost savings as well: cost-effectiveness studies show that new building electrification costs less to build than mixed-fuel buildings, particularly when built with heat pumps instead of resistance heating. Though electrifying existing buildings to reduce natural gas consumption can have higher upfront costs, retrofitting existing buildings also provides significant long-term climate benefits. Community costs include retrofitting existing infrastructure, which varies depending on the appliance. Providing financing and incentives from the City could significantly reduce the cost burden on communities to replace non-electric appliances. More information on costs related to building electrification can be found in the Cost Technical Appendix.

10. <https://gridworks.org/initiatives/cagas-system-transition/>

11. U.S. EPA. Integrated Science Assessment (ISA) for Oxides of Nitrogen – Health Criteria (Final Report, Jul 2008). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/071, 2008. <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=194645>.

12. Weiwei, L., Brunekreef, B., & Gehring, U. (2013). Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children. *International Journal of Epidemiology*, 42(6), 1724–1737. <https://doi.org/10.1093/ije/dyt150>.

13. Klepeis, N. E., Nelson, W. C., Ott, W. R., Robinson, J. P., Tsang, A. M., Switzer, P., ... & Engelmann, W. H. (2001). The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants. *Journal of Exposure Science & Environmental Epidemiology*, 11(3), 231–252.







14. California Air Resources Board. 2016 SIP Emission Projection Data: 2012 Estimated Annual Average Emissions. <https://www.arb.ca.gov/ei/emissiondata.htm>

15. Dedoussi, I. C., Eastham, S. D., Monier, E., & Barrett, S. R. (2020). Premature mortality related to United States cross-state air pollution. *Nature*, 578(7794), 261–265.

## B-1 ACTIONS








### B-1.1 Require new construction to be all-electric

Adopt an electrification ordinance which requires all new construction to be all-electric. Conduct a cost-effectiveness study to develop an ordinance that facilitates both construction and on-bill cost savings. Minimize the number of exemptions associated with the ordinance to limit the number of stranded natural gas lines in the city. Allow case by case allowances for certain site development standards when an applicant can demonstrate infeasibility. Leverage partnerships with the Building Decarbonization Coalition, EBCE, StopWaste, and others, to engage with local building industry stakeholders in development of the ordinance.

GHG Reduction	Benefits					City Cost	Timeline
<b>2030:</b> 10,891 MT CO <sub>2</sub> e <b>2045:</b> 28,056 MT CO <sub>2</sub> e							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Short-term







### B-1.2 Incentivize electric retrofits in existing buildings

Incentivize voluntary electrification of existing buildings through incentives, rebates, permit streamlining, and education. Develop a suite of equity strategies to limit displacement and promote equitable distribution of electrification benefits like resilience, improved health and safety, and reduced energy cost burden. Partner with stakeholders such as EBCE and PG&E to establish funding pathways to ease community costs for electrification upgrades.

GHG Reduction	Benefits					City Cost	Timeline
<b>2030:</b> 16,492 MT CO <sub>2</sub> e <b>2045:</b> 93,437 MT CO <sub>2</sub> e							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term

### B-1.3 Conduct a cost analysis and feasibility study for existing building electrification requirements

Conduct an existing building electrification feasibility and cost study to understand the potential for, and associated costs of, electrification retrofitting requirements. This would include an analysis for implementing requirements for newly permitted heating and cooling systems, hot water heaters, and other electric appliances.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term

**B-1.4 Partner with stakeholders to conduct electrification outreach, promotion, and education**

Leverage partnerships with stakeholders to conduct multilingual outreach, promotion, and education around building electrification, including:

- Creating a list of water heater, space heating, and appliance (electric stove/dryers) replacement programs and incentives.
- Hosting an induction/electric stove cooking competition to demonstrate the benefits of electric stoves.
- Organizing events to educate the public on the potential health and cost benefits of replacing gas stoves with electric.
- Offering workforce development trainings for installers and building owners/operators to discuss benefits and technical requirements of electrification.
- Conducting internal trainings with planners and building officials on state decarbonization goals and incentives available for electric homes.
- Conducting targeted outreach to rental property owners to facilitate upgrades that benefit renters.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified	 Public Health	 Resilience and GHG Reduction	 Community Connectivity	 Green Economy	 Environmental Quality	 \$	 Mid-term

## Strategy B-2: Decarbonize electricity from the grid and increase local renewable energy generation.

In order for Livermore to reach its 2030 reduction target and 2045 carbon-neutrality target, the majority of energy utilized in the City will need to be carbon-free. Renewable electricity procurement is essential for decarbonizing the communities emissions from electricity and will create the foundation for a carbon-free future. The focus of Livermore’s energy strategy is procuring 100 percent carbon-free electricity for both residents and businesses as soon as possible. Decarbonizing electricity works hand-in-hand with building electrification and EVs to achieve carbon neutrality in both the building and transportation sectors in Livermore.

One of the primary actions in the energy decarbonization strategy is opting all community accounts into a 100 percent carbon-free or renewable electricity tier through EBCE. As this is a one-time action by City Council, the major costs are staff time (preparing staff reports and conducting community outreach). The community may experience a marginal increase in electricity costs as a result of this action. However, increased electricity cost is dependent on the rate plans used by the household or business: certain plans will experience no increase,

and others may experience a marginal on-bill cost. Other actions under B-2 include conducting outreach to low/moderate income households to increase awareness about EBCE’s CARE Program, which provides a discounted rate for electricity to qualifying low-income households.

Other actions within Strategy B-2 provide important benefits including increased energy-system resilience through storage and continued analysis of other energy opportunities like hydrogen. Geographic diversification of energy generation reduces the impact of a single event, like a storm or technology failure, on central location. Increasing generation and storage of local renewable energy is considered to be high-cost, as specific financing and funding opportunities have not yet been identified. However, these actions yield long-term substantial climate impacts and can provide long-term savings.

Stakeholder collaboration between the City, PG&E, EBCE, and other community partners will be key to increasing local energy generation and storage incentives. Promoting energy storage at the same time as increased local renewable energy, like community solar, will be an essential strategy for success.

### B-2 ACTIONS

#### B-2.1 Opt-up community EBCE accounts to 100 percent renewable electricity

Opt-up community EBCE accounts in Livermore to 100 percent renewable electricity by 2024. Achieve an opt-out rate lower than 4 percent from 100 percent renewable. Conduct public outreach and education to highlight the benefits of 100 percent renewable energy. Partner with community-based organizations to ensure low/moderate income households are aware of EBCE’s CARE program to receive decreased electricity rates.

GHG Reduction	Benefits					City Cost	Timeline
<p><b>2030:</b> 25,505 MT CO<sub>2</sub>e</p> <p><b>2045:</b> 0 MT CO<sub>2</sub>e</p>	 Public Health	 Resilience and GHG Reduction	 Community Connectivity	 Green Economy	 Environmental Quality	 \$	 Short-term

**B-2.2 Coordinate with stakeholders to provide local energy generation and storage incentives**

Partner with PG&E, EBCE, and/or other community partners to support and incentivize local on-site energy generation and storage. This could include:

- Connecting home and business owners, particularly those in vulnerable communities, to incentives for renewable energy and storage projects.
- Promoting installation of storage technology in concert with renewable energy infrastructure through multilingual education programs, outreach, and information provided via City platforms.
- Installing a co-located community solar and storage facility to demonstrate the benefits.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Mid-term






**B-2.3 Establish renewable energy facility standards and permitting requirements**

Establish renewable energy facility standards and permit requirements, including solar arrays and battery storage systems, to allow for easier implementation of these technologies in the city.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Mid-term

**B-2.4 Explore hydrogen and renewable fuel opportunities**

Seek assistance from Sandia National Laboratory to identify opportunities to expand hydrogen and renewable fuel projects, particularly in the transportation and industrial sectors.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Short-term

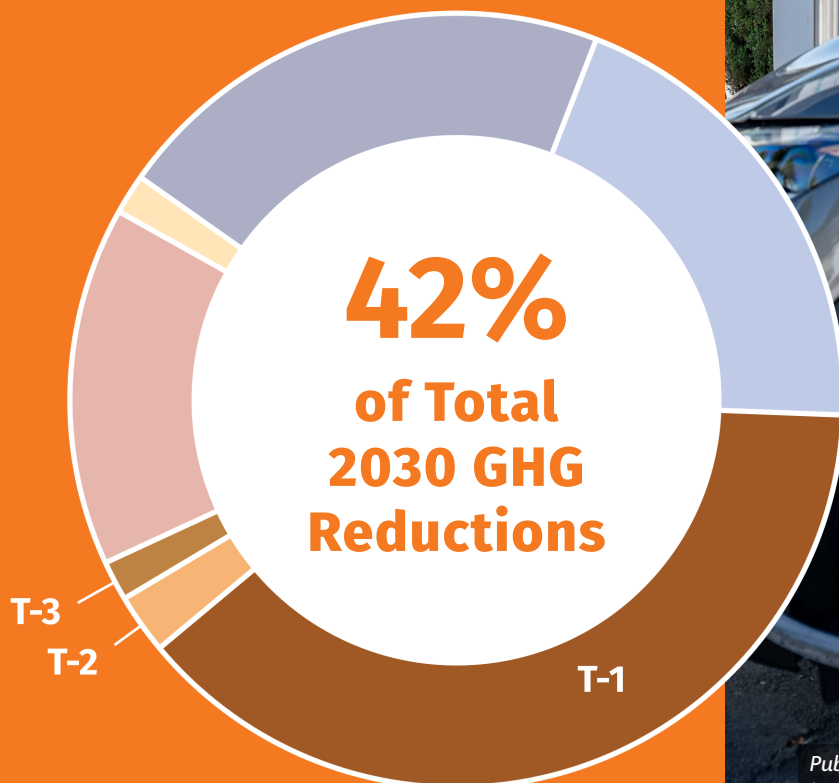
# Transportation and Land Use

## 2030 Objectives

- Add 1,283 publicly accessible electric vehicle chargers
- Reduce Vehicle Miles Traveled (VMT) by 2%
- Achieve 10% bike mode share
- Support sustainable land use practices

## GHG Reductions

- Strategy T-1 = 49,494 MT CO<sub>2</sub>e
- Strategy T-2 = 3,033 MT CO<sub>2</sub>e
- Strategy T-3 = 2,127 MT CO<sub>2</sub>e



Public electric vehicle chargers at the San Francisco Premium Outlets in Livermore

## Strategy T-1: Facilitate a transition to electric vehicles

Reducing transportation GHG emissions will require reducing the number of miles driven by on-road fossil fuel-powered vehicles, from both passenger and commercial vehicles. On-road transportation accounts for almost 59 percent of total GHG emissions in Livermore, with 58 percent of those emissions coming from passenger vehicles, and 42 percent coming from commercial vehicles (see Appendix A). It is important to electrify the transportation sector so it can benefit from increasingly clean electricity as a result of SB 100. Additionally, reducing tailpipe air pollution through EV adoption provides public health benefits as it reduces a major source of outdoor air pollution.

Actions under Strategy T-1 expand the adoption of EVs across the residential and commercial sectors, primarily through electrification infrastructure installation and ordinances for new construction which will require lifecycle cost saving steps like installation of conduit and panel capacity.








Costs to the City in implementing actions to promote EV adoption include the development of an EV Readiness Plan. A key part of this plan will be identifying funding sources for installing chargers. Implementing these actions rides heavily on effective outreach and education, as well as partnership development with major employers like the Lawrence Livermore National Lab to expand employer adoption of EV use and charging infrastructure. On the community side, developers may see increased costs of conduit and panel capacity for EV capable charging spaces in new development as well as the costs of charger installation. The long-term cost savings of owning an EV could offset the purchase of an internal combustion vehicle.

### T-1 ACTIONS

#### T-1.1 Expand EV infrastructure to support EV adoption

Expand EV infrastructure to support EV adoption in the community by doing the following:








- Establishing standards for EV chargers in new development that expand requirements for EV-Capable, EV-Ready, and/or EV-Installed spaces; Introduce preferential parking for EVs near building entrances at popular destinations; Require all new gas stations and major remodels to install an EV charger; Establish universal, accessible, and multilingual EV signage and marking requirements for EV parking spaces;
- Partnering with stakeholders, like EBCE, BayREN, and affordable housing providers, to coordinate incentives and/or rebates for at-home electric circuits, panel upgrades, and Level 2 chargers, with a focus on supporting EV upgrades for low-income households. Provide multilingual education and outreach to the community on available programs.
- Working with the Livermore Valley Chamber of Commerce, Livermore Downtown Inc, and major employers (e.g., Lawrence Livermore National Lab, Kaiser Permanente, GILLIG, Topcon, LARPD, and LVJUSD) to encourage EV adoption and improvements to EV infrastructure.
- Promoting the availability of public chargers on social media and the City website.

GHG Reduction	Benefits				City Cost	Timeline	
<p><b>2030:</b> 49,494 MT CO<sub>2</sub>e</p> <p><b>2045:</b> 93,458 MT CO<sub>2</sub>e</p>	 Public Health	 Resilience and GHG Reduction	 Community Connectivity	 Green Economy	 Environmental Quality	 \$\$	 Short-term










**T-1.2 Identify barriers to electric vehicle adoption**

Assess EV infrastructure needs and challenges, strategies to increase EV infrastructure and EV adoption, particularly in underserved communities, and identify funding for charging infrastructure.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$\$	 Short-term








**T-1.3 Electrify retail delivery vehicles**

Establish licensing fees for vehicles making deliveries, such as online retail deliveries, to provide funding for new active transportation and EV charging infrastructure, and/or provide discount licensing fees for delivery companies which utilize electric vehicles.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Mid-term








**T-1.4 Reduce sources of idling emissions**

Adopt an ordinance limiting new drive thru businesses and other sources of idling emissions.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Mid-term

**T-1.5 Develop an EV car-share pilot program**

Work with stakeholders to develop an EV car-share pilot program to provide access to a low-cost and emission-free mobility option in low-income communities.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$\$	 Mid-term

## Strategy T-2: Facilitate a transition to transit and shared mobility services

Providing expanded access to mobility programs and transit service will be a vital part of reducing transportation emissions for Livermore, as well as improving transportation equity in the region.

Livermore will support regional transit providers, including the Altamont Corridor Express (ACE), Bay Area Rapid Transit (BART), and the Livermore Amador Valley Transit Authority (LAVTA)<sup>16</sup>, 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. Improving shared mobility and transit programs and infrastructure will also help to shift mode share to public transit. Working with the recently created Tri-Valley – San Joaquin Valley Regional Rail Authority will also be key to achieving greater use of public transportation, specifically on the proposed Valley

Link project which would connect the existing BART station in Dublin/Pleasanton to the approved ACE North Lathrop Station in San Joaquin County.<sup>17</sup>








Most City costs associated with implementation of this action involve developing partnerships to expand and improve transit systems, as well as outreach and education. If the City chooses to pursue a pilot program for e-bikes or scooters, installation and implementation would entail additional city costs. Members of the Livermore community would experience minimal costs and expanded wallet-friendly options to get between destinations in the city. Improving transportation equity is also a critical part of this strategy and involves identifying and removing barriers for Livermore’s vulnerable communities to take public transit, walk, bike, or use rideshare/carshare.

### T-2 ACTIONS

#### T-2.1 Improve transit and shared mobility services.

Improve transit and shared mobility services to reduce single-occupancy vehicle travel by doing the following:

- Supporting efforts by transit providers to offer more frequent and reliable transit service; improve service/communication through multilingual interactive service maps, mobile payments, and real-time arrival info; improve active transportation access to transit stops; and provide enhanced, comfortable stops and stations.
- Consider a pilot program downtown, ideally with e-bikes or scooters.
- Conducting a shared mobility services (e.g., car-share, bike-share, scooter-share) feasibility study, possibly in coordination with neighboring communities Pleasanton and Dublin.
- Based on the feasibility study, establish standards for shared mobility services to operate in Livermore.
- Identify local equity issues and remove barriers for people of color, low-income, people experiencing homelessness, and senior populations to take transit, walk, bike, use rideshare, or carshare.



GHG Reduction	Benefits					City Cost	Timeline
<b>2030:</b> 3,033 MT CO <sub>2</sub> e <b>2045:</b> 4,656 MT CO <sub>2</sub> e	 Public Health	 Resilience and GHG Reduction	 Community Connectivity	 Green Economy	 Environmental Quality	 \$\$	 Mid-term

16 <https://www.wheelsbus.com/wp-content/uploads/2015/08/FINAL-SRTP.pdf>

17. <https://www.valleynlinkrail.com/valleynlink-project>

### T-2.2 Conduct a local transportation survey

Include multilingual National Citizens Survey questions related to transportation to better understand the community's needs and motivation for travelling by car versus other alternatives such as by bike or bus. Use the survey results to inform transportation projects.

GHG Reduction	Benefits	City Cost	Timeline
Not Quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Short-term

### T-2.3 Establish ride-share loading/unloading zone requirements

Establish requirements for ride-share parking and loading/unloading zones in new nonresidential development.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Mid-term

## Strategy T-3: Improve active transportation infrastructure

Tailpipe emissions are a major source of Livermore's GHG emissions. Reducing the number of miles driven by fossil fuel-powered vehicles, particularly when replaced with public-health boosting active modes of transportation, provides a critical way to reduce GHG reductions while connecting communities and keeping Livermore residents healthy. As part of the CAP strategy, Livermore will prioritize active transportation by expanding access to safe, low-stress, and convenient biking and pedestrian infrastructure. Expanding active transportation infrastructure will increase quality of life and public health through increased exercise and increased community connectivity.

A key part of this strategy, and the largest quantified contribution to GHG reduction comes from Implementing the Livermore Bicycle, Pedestrian, and Trails Active






Transportation Plan (ATP). This is projected to add around 77 miles to the active transportation network in Livermore by 2030. An ATP fee study will explore potential funding mechanisms for implementing the ATP.

City costs associated with the expansion of active transportation include staff time devoted towards the implementation of the City's ATP. Developing bike lanes and boulevards will require costs to install (estimated \$10,000 per mile), while separated bike lane cost between \$1.5 and \$3 million per mile. Community costs will be minimal, though may include potential funding mechanisms including sales taxes, or revenues generated through an ATP fee for new development. For more information on City and community cost, please refer to Appendix D.

## T-3 ACTIONS








### T-3.1 Accelerate implementation of the Livermore ATP

Implement 50 percent of the Livermore Bicycle, Pedestrian, and Trails ATP by 2030 in accordance with its goals, objectives, and policies so that the City adds approximately 77 miles to the active transportation network. Continually improve methods for engaging the community, gathering input, and utilizing it to prioritize projects that implement the ATP. Work with local active transportation organizations like Bike East Bay to identify projects and funding to accelerate implementation of the ATP. Review all ATP projects to ensure ATP projects are deployed equitably across all Livermore neighborhoods with an emphasis on connecting low-income communities to downtown and public transportation.

GHG Reduction	Benefits					City Cost	Timeline
<b>2030:</b> 2,127 MT CO <sub>2</sub> e <b>2045:</b> 2,111 MT CO <sub>2</sub> e							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$\$	Long-term

### T-3.2 Conduct an ATP fee study

Conduct a fee study and adopt an ordinance requiring development projects to pay fees that will be dedicated to implementing active transportation routes and infrastructure citywide.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term

### T-3.3 Promote active transportation through car-free events

Identify areas of town to periodically close streets to cars, potentially coupled with the Farmer's Market or other large and regular events.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term

## Strategy T-4: Support sustainable land use practices

Livermore's climate strategy includes supporting land use practices that promote sustainable development. Auto-oriented, low-density development increases vehicle miles traveled, destroys natural lands, and increases impervious surfaces that cause polluted stormwater runoff, affecting local waterways. Sustainable land use practices increase density, promote a jobs-housing match, encourage development of vacant and underutilized

urban sites, and facilitate walkable and transit-oriented neighborhoods. These strategies will preserve the carbon-sequestration potential of Livermore's surrounding natural lands and reduce total driving and energy consumption. Though these actions do not have quantified GHG reductions, they lay the foundation for sustainable development in Livermore by creating a denser, better-connected, less car-dependent city.

### T-4 ACTIONS

#### T-4.1 Promote a jobs-housing match

Update the General Plan to identify and plan for a housing supply that meets the needs of Livermore's workforce.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$\$	 Mid-term

#### T-4.2 Maximize infill development

Update the Development Code and Specific Plans to maximize opportunities for infill development.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Mid-term








#### T-4.3 Revise parking standards for developments

Adjust parking minimums and establish parking maximums where appropriate, such as near transit.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Mid-term

#### T-4.4 Facilitate complete and walkable neighborhoods

Update zoning in neighborhoods lacking amenities like grocery stores and parks. Work with community partners to focus these efforts in low-income communities.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$\$	 Long-term

# Waste and Materials

## 2030 Objectives

- Reduce the amount of organic waste that is landfilled 75% from 2014 levels by 2025
- Maintain or exceed 75% solid waste diversion each year
- Improve local reuse and repair programs
- Expand the use of low-carbon and recycled building materials

## GHG Reductions

□ Strategy W-1 = 19,379 MT CO<sub>2</sub>e

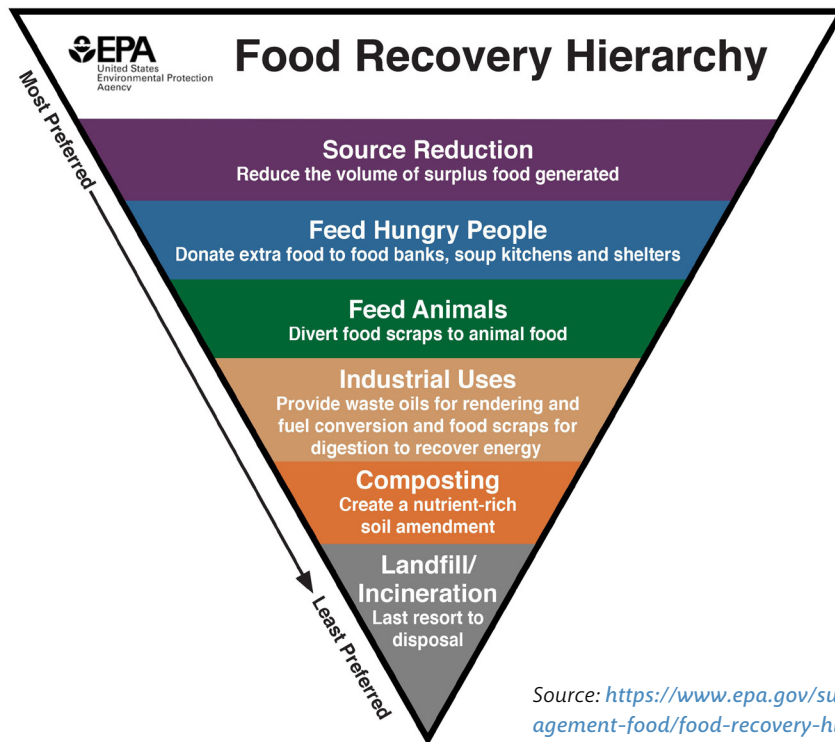


COMPOST

## Strategy W-1: Reduce the amount of waste that is landfilled

Emission reductions in the waste sector will be driven through compliance with SB 1383, which requires all jurisdictions in California to reduce organic waste disposal by 75 percent and increase edible food recovery by 20 percent relative to 2014 levels by 2025. SB 1383 also requires Livermore to procure 7,297 tons of compost or organic material per year. When organic materials like food scraps and yard waste get sent to landfills, they emit methane as they decompose. Methane is considered a climate super pollutant and is 28 times more potent than carbon dioxide. Landfills are the third largest source of methane emissions in California and also emit air pollutants, including PM<sub>2.5</sub> which are detrimental to human health.<sup>18</sup> Furthermore, analysis from the Natural Resources Defense Council argues that when we landfill edible food, we also should consider the lifetime emissions of getting food from farm to fork to landfill, including water inputs, fertilizer, packaging, labor, and GHGs emitted during shipping.<sup>19</sup> Reducing food waste by prioritizing human consumption and increasing options for composting are critical for mitigating methane emissions.

CalRecycle has provided a suite of recommendations and requirements for jurisdictions to comply with SB 1383. Livermore primarily plans to meet the requirements of SB 1383 by a holistic strategy of expanding organics collection, edible food recovery, conducting outreach and education programs, and ensuring that stakeholders comply through an inspection program. Partnership with stakeholders like Tri-Valley Haven will be critical to the success of Livermore’s food recovery strategy, which ties into SB 1383 implementation as well. SB 1383 is state law and therefore, must be implemented by the City. The costs to the City are expected to include planning and implementation costs while each household is expected to see an increase of waste costs of approximately \$17 per year. More information is available in Appendix C.








18. <https://calrecycle.ca.gov/organics/slcp/>

19. <https://www.nrdc.org/food-waste>

## W-1 ACTIONS

### W-1.1 Implement the requirements of SB 1383

Implement SB 1383, which includes expanded organics collection, edible food recovery, municipal compost procurement, outreach and education programs, and an inspection and compliance program.

GHG Reduction	Benefits					City Cost	Timeline
<b>2030:</b> 19,379 MT CO <sub>2</sub> e  <b>2045:</b> 22,646 MT CO <sub>2</sub> e							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Short-Term

### W-1.2 Maintain or exceed the City's solid waste diversion goal

Maintain or exceed the City Council mandated goal of 75 percent solid waste diversion every year.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Short-Term

### W-1.3 Reduce landfill waste at public events

Increase reuse, recycling, and composting and encourage reduction/reuse at temporary public events by mandating the use of recycling and organics collection co-located at every garbage can; encourage reusable food ware, when relevant, according to the California State Retail Food Code.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term

### W-1.4 Improve waste management in commercial industries

Develop policies to reduce waste and increase reuse in the food industry (e.g., restaurants, facilities serving prepared food and prepackaged food, home meal delivery services), hospitality industry, and other commercial industries. Efforts may include adopting ordinances for compostable food ware, a ban on single-use individual toiletry bottles in hotels/motels, grant/discount programs for switching to reusables, and working with home meal delivery services (e.g., Blue Apron), etc. to reduce single-use packaging and encourage reuse. Provide resources for multilingual technical assistance and financial incentives for low-income entrepreneurs.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-Term



**W-1.5 Reduce construction waste**

Require construction sites to separate waste for proper diversion and reuse or recycling, consistent with CALGreen voluntary requirements.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Mid-term

**W-1.6 Improve reuse and repair**

Partner with state and other public institutions to develop and implement programs that improve reuse and repair, such as Fix-it-Clinics and tool-lending libraries. Work with retailers to develop programming around reuse and repair.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$\$	 Mid-Term

**W-1.7 Work with community partners to recover food**

Support community partners such as the Alameda County Community Food Bank and Tri-Valley Haven to divert edible food waste and support food insecure community members.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	 \$	 Short-Term

## Strategy W-2: Expand use of low-carbon and recycled building materials

Embodied carbon, which can be defined as the GHGs emitted to construct a building, is a significant source of carbon emissions in the building and materials sector and comprises 11 percent of global GHG emissions.<sup>20</sup> Embodied carbon emissions for buildings in Livermore are not included in the GHG inventory for this CAP, as the manufacturing of building materials takes place outside of Livermore’s boundaries. Nonetheless, the CAP includes actions to reduce embodied carbon emissions in construction.

This strategy takes place at the local, regional, and statewide level, as construction practices and norms happen beyond the bounds of a single jurisdiction. As part of Livermore’s CAP actions, the City will explore standards for embodied carbon performance in new buildings, while ensuring that housing and rent costs would not be negatively impacted. The costs associated with moving towards low-carbon building materials includes outreach and engagement costs to the City, while new construction could see marginal costs increases of around 1 percent.<sup>21</sup>

### W-2 ACTIONS

#### W-2.1 Raise awareness for low-carbon and recycled building materials

Work with local, regional, and state partners to promote the availability and cost-effectiveness of low-carbon and/or recycled construction materials.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	\$	

#### W-2.2 Explore standards for new construction that limit embodied carbon emissions

Consider implementing embodied carbon performance standards and material-efficient building practices, with exemptions for cost barriers as needed to prevent these changes from directly increasing housing or rent costs.

GHG Reduction	Benefits	City Cost	Timeline
Not quantified	 Public Health  Resilience and GHG Reduction  Community Connectivity  Green Economy  Environmental Quality	\$	

20. <https://www.buildinggreen.com/feature/urgency-embodied-carbon-and-what-you-can-do-about-it>

21. <https://rmi.org/insight/reducing-embodied-carbon-in-buildings>

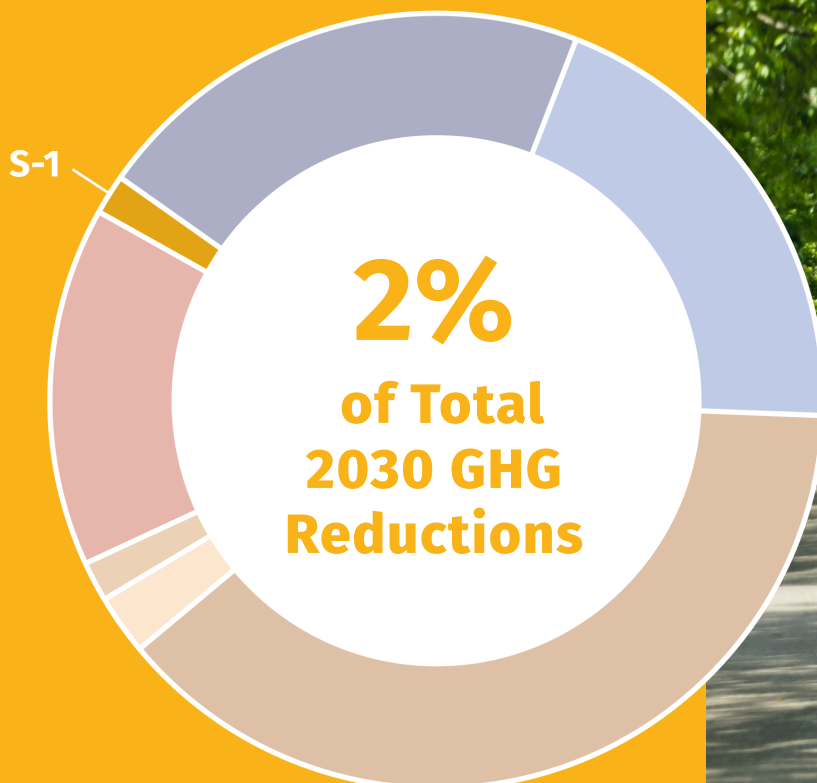
# Carbon Sequestration

## 2030 Objectives

- Maximize local carbon sequestration
- Plant 200 trees by 2025 and 1,000 trees by 2030
- Update City landscaping standards to expand shade tree requirements for new development
- Provide free or reduced cost-trees to residents in Livermore
- Preserve open spaces
- Implement carbon-farming projects
- Explore technology-based carbon capture and storage opportunities

## GHG Reductions

□ Strategy S-1 = 2,008 MT CO<sub>2</sub>e



## Strategy S-1: Maximize local carbon sequestration

Livermore’s carbon neutrality strategy includes carbon sequestration or “negative emissions” mechanisms that remove carbon from the atmosphere. Lawrence Livermore National Laboratory (LLNL) is a leader in developing pathways to achieve carbon neutrality and eventually a carbon negative future. LLNL recent report, “Getting to Neutral: Options for Negative Carbon Emissions in California” cites three key ways California can sequester enough carbon to reach carbon neutrality:

- Capture and store carbon through natural and working lands (lowest cost)
- Convert waste biomass to fuels and store carbon dioxide (moderate cost)
- Implement direct air capture and carbon dioxide storage (highest cost)


The CAP prioritizes nature-based actions such as increasing the urban tree canopy, updating landscaping standards, preserving existing open space, and implementing soil carbon farming projects that maximize the carbon sequestration potential of natural lands. Nature-based solutions provide relatively small amounts of sequestration but maximize other benefits and minimize costs. Over time, the City will track opportunities to cost-effectively sequester carbon through biomass conversion and direct air capture.

Nature-based actions for carbon sequestration have numerous benefits, including improving environmental quality, reducing urban heat through increased shade, and improving quality of life through expanded green spaces and access to open spaces and natural landscapes. Costs for these actions include staff time for planning and implementation and the cost of materials for new tree planting and urban greening initiatives. Partnerships will be essential for implementing carbon farming projects and exploring technology-based carbon capture opportunities.

### S-1 ACTIONS








#### S-1.1 Expand tree canopy cover in the city

Consistent with Action H-1.2, utilize the City’s new street tree inventory to identify areas of the city with low tree canopy cover. Conduct tree planting efforts in these areas, with a focus on underserved and vulnerable populations. Update the City’s Tree Preservation Ordinance to expand canopy coverage and climate-ready tree species. Additionally, identify strategies to repurpose timber waste (rather than incineration or chipping).

GHG Reduction	Benefits					City Cost	Timeline
<p><b>2030:</b> 58 MT CO<sub>2</sub>e</p> <p><b>2045:</b> 58 MT CO<sub>2</sub>e</p>							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Mid-term

### S-1.2 Implement carbon farming projects using SB 1383-compliant organic materials

SB 1383 requires Livermore to procure approximately 7,297 tons of compost or other organic material annually. Partner with agricultural and public agency stakeholders, including the parks district and school district, on carbon farming projects to apply SB 1383-compliant organic material locally.

GHG Reduction	Benefits					City Cost	Timeline
<b>2030:</b> 1,950 MT CO <sub>2</sub> e <b>2045:</b> 2,376 MT CO <sub>2</sub> e							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$\$	Mid-term

### S-1.3 Update the City's landscaping standards

Update standards to expand requirements for shade trees and plant species that sequester a high amount of carbon. Ensure that the new trees are native and/or low or very low water needs per Water Use Classification of Landscape Species (WUCOLS).

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Mid-term

### S-1.4 Preserve open spaces

Continue the City's open space preservation efforts to preserve open space as conservation or working land to maintain carbon sequestration and other benefits.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$\$	Ongoing

### S-1.5 Explore technology-based carbon capture and storage opportunities

Partner with carbon-restoration leaders, including the national laboratories, to explore opportunities for technology-based carbon capture and storage projects.

GHG Reduction	Benefits					City Cost	Timeline
Not quantified							
	Public Health	Resilience and GHG Reduction	Community Connectivity	Green Economy	Environmental Quality	\$	Long-term

## 3-4. Municipal Strategies & Actions



The CAP includes several municipal strategies that complement the other mitigation and adaptation strategies within the plan. Municipal operations contribute a relatively small proportion of overall community GHG emissions. However, actions to reduce these emissions are important to show community leadership and promote more sustainable uses of local resources. GHG-emissions reductions from municipal strategies and actions were not quantified to avoid double counting with reductions from other strategies.

The municipal strategies and actions include electrification of municipal buildings, vehicle fleets, and reductions in energy usage, water, and waste. The municipal strategies also include utilization of public lands for local carbon sequestration and improving the resilience at critical municipal facilities. Each of the strategies builds on adaptation and mitigation strategies already outlined in the plan and represent a key part of the City's plan to achieve its climate goals.

### Strategy M-1: Enhance resilience at public facilities.

#### M-1 ACTIONS

##### **M-1.1 Demonstrate the feasibility of community wide energy resilience through a municipal pilot project**

Through the development of a municipal microgrid project at a critical facility, the City will demonstrate the feasibility of expanding local electricity generation and storage to improve community resilience.

##### **M-1.2 Expand renewable energy and battery storage projects**

Install renewable energy and battery back-up systems at municipal facilities (City Hall, Police Department, Water Reclamation Plant) to increase energy independence and reliability during blackouts, extreme heat events, and other emergency incidents

##### **M-1.3 Retrofit municipal facilities to withstand climate-related hazard conditions**

Ensure that City facilities are sufficiently hardened to withstand climate-related hazard conditions, such as weatherization for extreme storm events and better seals to outdoor air during wildfire smoke days.

## Strategy M-2: Electrify municipal facilities and operations.

### M-2 ACTIONS

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#### M-2.1 Opt-up municipal EBCE accounts to 100 percent renewable electricity

Opt-up municipal accounts to 100 percent renewable electricity by 2023.

#### M-2.2 Conduct energy audits of City facilities and evaluate life cycle costs of energy upgrades

Complete energy audits for all City facilities and implement feasible recommendations for fuel switching and efficiency upgrades. Develop a policy for the City which would require all new building upgrades to include lifecycle costing over 30 years and tie this directly to energy consumption and building electrification. This would include the building's operational and maintenance costs and ensure that the City has the most cost-effective (and sustainable) buildings possible.

#### M-2.3 Electrify existing buildings and increase energy efficiency

Adopt a retrofitting policy for City-owned buildings such that electrification and energy efficiency retrofits are incorporated into City buildings as part of building upgrades and repairs identified in the Capital Improvement Program.

#### M-2.4 Replace gas-powered landscaping equipment

Transition to all-electric landscaping equipment, including leaf blowers, for municipal operations. Use this to promote all-electric equipment in the community, providing information on the City website outlining available incentives for residents and businesses.

## Strategy M-3: Electrify the City's vehicle fleet and encourage City employees to utilize alternative transportation and teleworking opportunities.

### M-3 ACTIONS

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#### M-3.1 Prepare a Fleet Electrification Plan

Prepare a Fleet Electrification Plan that outlines the transition of the municipal fleet to EVs where possible.

#### M-3.2 Expand EV charging at public facilities

Install new public and employee EV chargers at City-owned facilities.

#### M-3.3 Increase bike facilities at public buildings

Establish bike lockers at City facilities that are usable by employees and the public. Add bike locker facilities at off-street parking lots.

#### M-3.4 Increase teleworking opportunities

Adopt an internal policy to allow City employees to work from home on a regular basis, as specific job positions allow.

## Strategy M-4: Conserve water in municipal landscaping and improve on-site stormwater management.

### M-4 ACTIONS

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#### M-4.1 Conserve water in City landscaping

Implement water conservation strategies, such as increasing efficiency and use of recycled water, in City landscaping and grounds maintenance procedures.

#### M-4.2 Convert existing turf areas on municipal sites

Reduce water use by converting existing turf areas to drought tolerant and/or native landscaping.

#### M-4.3 Convert impermeable surfaces on municipal sites

Identify impermeable surfaces that can be targeted for a transition to increased infiltration.

## Strategy M-5: Purchase more sustainable products to reduce waste from City operations.

### M-5 ACTION

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#### M-5.1 Adopt a green purchasing policy

Adopt an Environmentally Preferable Purchasing Policy for municipal operations.

## Strategy M-6: Utilize public lands to increase local carbon sequestration and reduce urban heat island effect.

### M-6 ACTIONS

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#### M-6.1 Expand open space management

Expand management of City-owned public lands and landscaping to improve carbon sequestration; evaluate and ensure that landscaping plans utilize native species where feasible.

#### M-6.2 Coordinate with other public agencies and stakeholders on carbon sequestration

Coordinate with other public agencies, including the parks district and school district, and other stakeholders on carbon-sequestration efforts including soil-carbon farming and carbon capture and storage.



## 3-5. Implementation Strategies & Actions

The most important facet of Livermore's CAP is how the strategies and actions are implemented in the community and how success is monitored over time. Dedicating City resources to climate efforts, tracking implementation progress, considering climate change in all City plans and processes, and communicating important initiatives to

residents and business will be key to the successful implementation of the CAP. This section includes a framework for ensuring successful implementation of the strategies and actions listed in the CAP. Implementation actions like hiring or designating a climate action manager will be important drivers for the CAP's overall success.

### Strategy I-1: Make climate impacts and resilience a standard consideration during planning and development processes.

The City can facilitate consistent implementation of the CAP by building climate mitigation and resilience into its regular decision-making structures. Since climate will touch nearly all of the community in one way or another, it makes sense to make climate a core decision-making variable.

#### I-1 ACTIONS

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##### **I-1.1 Evaluate climate impacts and risk in development review**

Implement an internal process to consider climate change impacts and risks during development review. Amend the standard Planning Commission and City Council agenda report template to include a statement on how the project or program supports or addresses CAP goals.

##### **I-1.2 Consider climate impacts and risk in Capital Improvement Program projects**

Ensure that new infrastructure will be designed with forecasted changes in climate (precipitation, temperature, wildfire) in mind. Utilize the Livermore Vulnerability Tool, as well as Google Environmental Insights Explorer tools and data, to evaluate the potential climate impacts when assessing new public infrastructure projects. Utilize materials that reduce environmental impact, such as low-carbon concrete and drought tolerant plants.

##### **I-1.3 Conduct a carbon fee study**

Conduct a study and explore an ordinance requiring development fees from projects that exceed a determined threshold of carbon emissions. Dedicate revenues to implement CAP programs.

##### **I-1.4 Evaluate the financial risks of climate impacts**

Evaluate existing and potential financial risks posed by climate change to both the City and community. Recommend strategies to mitigate these risks as available and appropriate, including options for insurance products, green infrastructure bonds, real estate strategy and other appropriate mechanisms.

##### **I-1.5 Integrate mitigation and adaptation planning in other City plans**

Coordinate mitigation and adaptation planning with other City plans, including the Tri-Valley Local Hazard Mitigation Plan, General Plan, ATP, Green Infrastructure Plan, Emergency Operations Plan, Development Code, and Specific Plans.

## Strategy I-2: Dedicate City resources to CAP implementation and consistently monitor progress.

While most of the strategies and actions developed for the CAP are cost effective and feasible, it will still take resources to implement. By designating a climate action manager, tracking progress, and prioritizing equitable implementation, the City can better implement the CAP for everyone in the community.

### I-2 ACTIONS

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#### I-2.1 Designate a Climate Action Manager

Create a new Climate Action Manager position responsible for implementing CAP strategies and actions by drafting ordinances, managing technical studies, leading outreach efforts, updating the online portal, networking with partners and stakeholders, and pursuing grant opportunities.

#### I-2.2 Establish local incentives, rebates, and streamlined permitting to facilitate CAP implementation

Establish local incentive and rebate programs to assist residents and businesses in areas such as building electrification, weatherization, water conservation, and EV charging. Streamline permitting processes to further incentivize implementation of CAP efforts.

#### I-2.3 Create a CAP tracking program

Develop a tracking program for CAP efforts to track annual implementation progress.

#### I-2.4 Report implementation progress

Report progress on CAP implementation annually to the City Council on strategy progress and establish accountability in achieving CAP goals. Report GHG emissions and CAP information to a Public Disclosure Program, such as the Carbon Disclosure Program and SEEC Clear Path.

#### I-2.5 Prioritize equitable implementation

Implement CAP strategies and actions through an equity lens. Work to ensure that communities who are most impacted by climate change, including people of color, low-income families, and people experiencing homelessness, benefit the most from adaptation and mitigation efforts.

#### I-2.6 Utilize Assistance Programs and Pursue Funding Opportunities

Pursue funding opportunities to implement CAP actions. Utilize guidance, resources, and technical expertise from partners like East Bay Community Energy and StopWaste. Expand staff capacity through programs like Civic Spark and Climate Corps.

## Strategy I-3: Create a public outreach campaign to educate the community about CAP initiatives.

Many of the strategies and actions in the CAP Update can only be initiated by the City. In the end, it will take the entire community to make behavioral changes, ranging from the appliances the community buys to how the community moves around the City. However, the community cannot make these changes without the right information. The City will take a leadership role in communicating with the public, listening to hurdles, and making corrections along the way.

### I-3 ACTIONS

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#### I-3.1 Create a brand and identity

Develop a consistent brand for all climate action campaign activities, which may be used in logos and hashtags.

#### I-3.2 Promote transparency to the public

Communicate the City's climate action goals and progress to the public regularly, with information displayed prominently on physical and digital outlets citywide.

#### I-3.3 Engage with the community regularly

Hold regular climate action outreach events, such as workshops, presentations, focus groups targeted at specific community groups, public contests or challenges, and an annual event such as Earth Day or New Year's Green Resolutions. Inform the community on potential climate change impacts, as well as weatherization and other actions that community members can take to increase resilience in their home or business.

#### I-3.4 Target commercial stakeholders and both public and private institutions

Develop workforce trainings and information that is specifically targeted to large commercial stakeholders in the city. This may include businesses in the agriculture and viticulture sector, parks district, contractors, realtors, restaurants, school district, retail stores, and landscapers. Encourage climate change resilience planning and strategies in private companies, institutions, and systems essential to a functioning Livermore.

#### I-3.5 Target rental and multifamily property owners

Conduct targeted outreach to rental and multifamily property owners to incentivize upgrades for tenants, including electrification and weatherization.

#### I-3.6 Expand outreach and education to Livermore's youth

Partner with the school district to expand on current outreach targeted towards students within Livermore to provide opportunities for education and action implementation.

#### I-3.7 Establish an online resource portal

Develop an online portal that provides climate action information and resources for all stakeholders and community members. Content may include resources on rebates and regulations, guides for reducing individual GHG emissions and preparing for climate emergencies, and a calendar of upcoming climate action events.

#### I-3.8 Increase social resilience

Increase community resilience/social capacity by supporting Neighbors Helping Neighbors programs. These programs enable neighbors to exchange contact information, acquire supplies, and establish a neighborhood plan to assist each other, particularly vulnerable residents, during climate emergencies.

## Strategy I-4: Foster green innovation in Livermore.

The future of the economy is green. Green job growth has accelerated in recent years, regularly outperforming other sectors.<sup>22</sup> Livermore is already at the forefront of these types of jobs and with the Lawrence Livermore National Laboratory and other local institutions, the City is in prime position to be at the forefront of green technology and other industries. These actions will help support this growth into the future.

### I-4 ACTIONS

#### I-4.1 Expand the local green economy

Coordinate economic development efforts identified in the 2021–2025 Economic Development Strategy with CAP actions. Attract companies and organizations to Livermore that will expand the local green economy and are innovators in sectors related to climate action and resilience.

#### I-4.2 Partner with the national laboratories

Partner with Lawrence Livermore National Laboratory and Sandia to identify new technologies and potential pilot projects.

22. <https://www.epi.org/publication/bp349-assessing-the-green-economy/#:~:text=Greener%20industries%20grow%20faster%20than,was%200.034%20percentage%20points%20higher.>



Livermore Farmers Market

# CHAPTER 4. Implementation Plan



# 4-1. Implementation Plan Overview

The City of Livermore developed the CAP to be a visionary yet feasible roadmap to both decrease GHG emissions and improve overall resilience to climate change. The timelines, costs, legislative environment, and benefits assumed in this plan will continue to evolve as new information and opportunities become available. Therefore, this CAP should be viewed as a strategic framework that will be reevaluated over time.

This chapter describes the nine priority areas on which the City will focus during the first five years of CAP implementation. While other actions will likely be implemented as opportunities arise, the City will focus its resources on these foundational actions. Together, these actions will significantly reduce GHG emissions, improve resilience, spark innovation and collaboration, and engage the community.

The implementation plan also outlines the City's approach to funding and financing the priority actions, tracking and reporting implementation progress, and updating the CAP to respond to changes in legislation, technologies, and priorities.

## TEAM LIVERMORE

Making meaningful progress towards reducing Livermore's GHG emissions and improving resilience starts with City leadership. The City's efforts can act as catalysts for change throughout the wider community, however, successful implementation of the CAP also depends on participation from community partners, residents, and businesses. Figure 4-1 describes the communitywide efforts that will be required transition to a resilient and carbon-free Livermore.

**Figure 4-1. Team Livermore**



**CITY:** The City can adopt ordinances, build infrastructure, streamline permitting, and connect the community to resources.



**BUSINESS:** Businesses can adopt new technologies and behaviors, utilize programs and incentives, and promote the benefits of adopting more sustainable business practices.



**PARTNERS:** Partners like EBCE, Quest, and the national labs provide education, leadership, financial assistance, and technical expertise.



**RESIDENT:** Residents can adopt new technologies and behaviors, utilize programs and incentives, and promote the benefits of living more sustainably.

## 4-2. Five-year Priority Areas

The City identified nine priority areas on which to focus for the first 5 years of CAP implementation. These priority areas were selected, because they are critical to jumpstart and sustain CAP implementation, are cost-effective and feasible steps to significantly reduce emissions, and improve resilience and align with existing efforts

and available resources in the city, region, and state. This section includes more detailed costs, responsible departments, implementation timelines, and budget availability for the actions in these priority areas. The nine priority areas for the next five years are summarized in Figure 4-2.

**Figure 4-2. Livermore's Five-year Priority Areas**

-  **1. Lay the Groundwork**
-  **2. Decarbonize Electricity and Materials**
-  **3. Electrify Buildings and Vehicles**
-  **4. Partner with Livermore's National Laboratories**
-  **5. Engage with the Community Regularly**
-  **6. Support Related City Efforts**
-  **7. Utilize Assistance Programs and Funding**
-  **8. Study Heat and Drought Strategies**
-  **9. Develop a Neighborhood Retrofit Program**

## FUNDING AND FINANCING

While some of the City’s priority areas are already budgeted for and in some cases already underway, other actions will need additional funding or financing to be implemented. Action costs vary widely throughout the CAP and while many actions are low or no cost, other infrastructure related projects like microgrids and bike lanes can require significant upfront

funding. However, many tools exist for cities to cover upfront costs including federal and state grants, low interest financing, bonds, and public/private partnerships. For a complete description of the costs and funding approaches the City can deploy as well as several case studies for specific measures see Appendix C.

### PRIORITY AREA 1: Lay the Groundwork



The City’s first step is to lay the groundwork required to jumpstart implementation. As part of this focus area, the City will establish a brand and identity for the City’s ongoing climate efforts, create an online resource hub for residents to learn about climate actions, build a tool to track and communicate implementation progress, and hire a Climate Action Manager to spearhead CAP implementation and drive change throughout the city. These foundational actions will be completed within the first year.

Action	Responsible Department	Action Start Date	Community Cost	City Costs	Budgeted
I-3.1 Create a brand and identity	CDD - Planning	In progress	\$\$\$	\$	Yes
I-3.7 Establish an online resource portal	CDD - Planning	In progress	\$\$\$	\$	Yes
I-2.3 Create a CAP tracking program	CDD - Planning	Q4 -2022	\$\$\$	\$	Yes
I-2.1 Designate a Climate Action Manager	CDD - Planning	Q1 - 2023	\$\$\$	\$	Yes

CMO - City Manager's Office

CDD - Community Development Department

PWD - Public Works Department



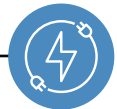
## PRIORITY AREA 2: Decarbonize Electricity and Materials



A foundational aspect of Livermore's carbon-neutrality strategy is to use carbon-free electricity. Once Livermore's electricity is carbon-free, not only will emissions from electricity drop significantly, but also will transform fossil fuel uses that are electrified by ultimately making them carbon-free.

Action	Responsible Department	Action Start Date	Community Cost	City Costs	Budgeted
M-2.1 Opt-up municipal EBCE accounts to 100% renewable electricity	CDD - Planning	Complete	\$\$\$	\$\$\$	Yes
M-5.1 Adopt a green purchasing policy	PWD - Environmental Services	Complete	\$\$\$	\$\$\$	Yes
B-2.1 Opt-up community EBCE accounts to 100% renewable electricity	CDD - Planning	Q1 -2023	\$\$\$	\$\$\$	Yes
W-2.1 Expand awareness of low-carbon and recycled building materials	CDD - Planning	Q1-2024	\$\$\$	\$\$\$	No
W-2.2 Explore standards for new construction that limit embodied carbon emissions	CDD - Planning, Engineering, Building	Q1 - 2024	\$\$\$	\$\$\$	No

## PRIORITY AREA 3: Electrify Buildings and Vehicles



Once Livermore's electricity is carbon-free, the next priority will be to electrify buildings and vehicles to reduce GHG emissions and improve air quality.

Action	Responsible Department	Action Start Date	Community Cost	City Cost	Budgeted
B-1.1 Require new construction to be all-electric	CDD - Planning	In progress	\$\$\$	\$\$\$	Yes
T-1.4 Establish standards for EV charging	CDD - Planning	In progress	\$\$\$	\$\$\$	Yes
B-1.3 Conduct a cost analysis and feasibility study for existing building electrification requirements	CDD - Planning, Building	Q1 - 2024	\$\$\$	\$\$\$	No
M-3.1 Prepare a Fleet Electrification Plan	PWD - Maintenance	In progress	\$\$\$	\$\$\$	Yes
M-3.2 Expand EV charging at public facilities	CDD - Planning, Engineering	In progress	\$\$\$	\$\$\$	Yes

## PRIORITY AREA 4: Partner with Livermore’s National Laboratories



Livermore is home to two national laboratories that conduct cutting edge research and hold a wealth of knowledge and expertise in the fields of energy and climate change. The City will deepen its collaboration with the labs to field pilot projects on cutting edge technologies. Specifically, the City will partner with Lawrence Livermore National Laboratory on carbon farming and other sequestration technologies, microgrids and energy resilience, and opportunities to utilize biogas from the City’s wastewater treatment facility. The City will also pursue a partnership with Sandia National Laboratory to identify opportunities to expand the use of hydrogen fuels. The City will pursue these efforts throughout the first 5 years. However, actual projects will largely rely on the ability to secure grant funding.

Action	Responsible Department	Action Start Date	Community Cost	City Cost	Budgeted
I-4.2 Partner with the National Laboratories	CDD - Planning	In progress	\$\$\$	\$	Yes
E-1.2 Expand microgrid deployment	CDD – Planning, Engineering PWD	Q1 - 2023	\$\$\$	\$\$\$	No
B-2.5 Explore hydrogen and renewable fuel opportunities	CDD - Planning	Q1 - 2023	\$\$\$	\$	Yes

## PRIORITY AREA 5: Engage with the Community Regularly



While the City can take meaningful action to reduce emissions and improve resilience, partnership and collaboration with the community is imperative to successful CAP implementation. Therefore, the City will prioritize engagement with the community, including Livermore’s youth, through a variety of communication channels and community events. The City will also explore opportunities to establish an ongoing community advisory or working group to assist with climate efforts. Additionally, the City will regularly report implementation progress to the community.

Action	Responsible Department	Action Start Date	Community Cost	City Cost	Budgeted
I-3.2 Promote transparency to the public	CDD – Planning, CMO	Q4 -2022	\$\$\$	\$	Yes
I-3.3 Engage with the community regularly	CDD – Planning, CMO	Q4-2022	\$\$\$	\$\$\$	Yes
I-3.6 Expand outreach and education to Livermore’s youth	CDD – Planning	Q1-2023	\$\$\$	\$\$\$	Yes
I-2.4 Report implementation progress	CDD - Planning	Q4-2023	\$\$\$	\$	Yes

## PRIORITY AREA 6: Support Related City Efforts



Many existing City efforts are supported by the CAP and vice versa. Combining these efforts and identifying synergies is a major priority of the City. In the first 5 years, the City will integrate climate mitigation and adaptation into other City plans, such as the General Plan Update and Local Hazard Mitigation Plan Update, implement SB 1383 and the Active Transportation Plan, and replace gas-powered landscaping equipment.

Action	Responsible Department	Action Start Date	Community Cost	City Cost	Budgeted
W-1.1 Implement the requirements of Senate Bill 1383	PWD – Environmental Services	In progress	\$\$\$	\$\$\$\$	Yes
I-1.5 Integrate mitigation and adaptation planning in other City plans	CDD – Planning; PWD	In progress	\$\$\$	\$\$\$\$	Yes
T-3.1 Accelerate implementation of the Livermore Active Transportation Plan	CDD – Planning, Engineering	Q4-2022	\$\$\$	\$\$\$\$	Partial
M-2.4 Replace gas-powered landscaping equipment	PWD - Maintenance	Q1-2023	\$\$\$	\$\$\$\$	No
T-4.1 Promote a jobs housing match	CDD – Planning	In Progress	\$\$\$	\$\$\$\$	Yes
T-4.4 Facilitate complete and walkable neighborhoods	CDD – Planning	In Progress	\$\$\$	\$\$\$\$	Yes

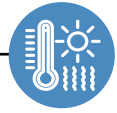
## PRIORITY AREA 7: Utilize Assistance Programs and Funding



The major limiting factors of Livermore’s previous CAP was funding and staff time. For the CAP Update, Livermore will focus on securing additional funding from both the State and other sources (as defined in Appendix C). Additionally, partners like East Bay Community Energy and StopWaste provide both guidance and resources, in areas such as building electrification and energy resilience, that the City will utilize to maximize its capacity. The City is not alone in its efforts to reduce emissions and improve resilience for the community.

Action	Responsible Department	Action Start Date	Community Cost	City Cost	Budgeted
I-2.6 Utilize assistance programs and pursue funding opportunities	CDD – Planning, Engineering PWD	In progress	\$\$\$	\$\$\$\$	Yes
I-3.5 Target rental and multifamily property owners for outreach and education related to incentive programs	CDD	In progress	\$\$\$	\$\$\$\$	Partial

## PRIORITY AREA 8: Study Heat and Drought Strategies



Two of Livermore’s most pressing climate challenges are extreme heat and drought. Within the first 5 years, the City will begin additional planning efforts to better define strategies that mitigate heat, conserve water resources, and expand the urban forest.

Action	Responsible Department	Action Start Date	Community Cost	City Cost	Budgeted
H-1.1 Study heat vulnerability	CDD – Planning PWD – Maintenance	Q1 - 2025	\$\$\$	\$\$\$	Partial
D-1.1 Study on-site water reuse	CDD – Planning PWD – Water Resources	Q1 - 2025	\$\$\$	\$\$\$	No

## PRIORITY AREA 9: Develop a Neighborhood Retrofit Program



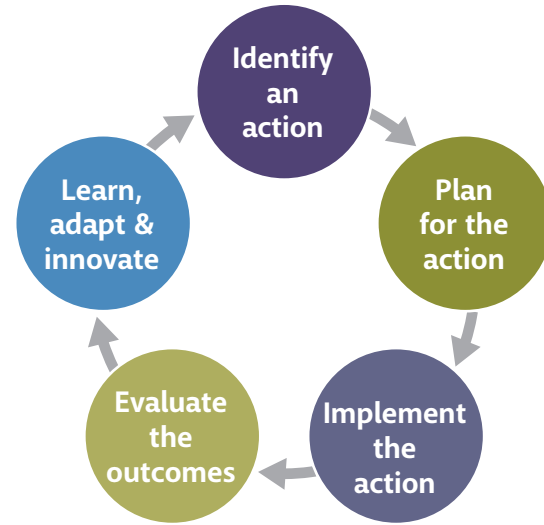
The City will coordinate with partners to develop a holistic neighborhood retrofit program that will provide the information and resources needed for Livermore’s community members to upgrade their buildings to be more resilient, healthy, and decarbonized. The program will include solutions to weatherize homes and businesses, expand solar and battery systems, convert natural gas to electric equipment, improve air quality, plant trees and drought friendly landscaping, and reuse on-site water.

Action	Responsible Department	Action Start Date	Community Cost	City Cost	Budgeted
B-1.2 Incentivize electric retrofits in existing buildings	CDD PWD	Q1 - 2026	\$\$\$	\$\$\$	No
E-1.3 Improve resilience of residential buildings	CDD PWD	Q1 - 2026	\$\$\$	\$\$\$	No
H-1.3 Create a neighborhood cooling program	CDD PWD	Q1 - 2026	\$\$\$	\$\$\$	No
WF-1.3 Facilitate building retrofits that maintain indoor air quality	CDD PWD	Q1 - 2026	\$\$\$	\$\$\$	No

## 4-3. Progress Tracking and Reporting

Climate action planning is infinitely iterative, as shown in Figure 4-3. As strategies and actions are implemented, it is imperative to track and evaluate the overall impact of each effort. The City will track CAP implementation in its CAPDash tracking tool, report progress annually to City Council, and update the CAP every 5 years. If the City determines specific actions are not achieving the anticipated emissions reductions or resilience improvement, the City will revise its strategy to stay on track to meet its goals.

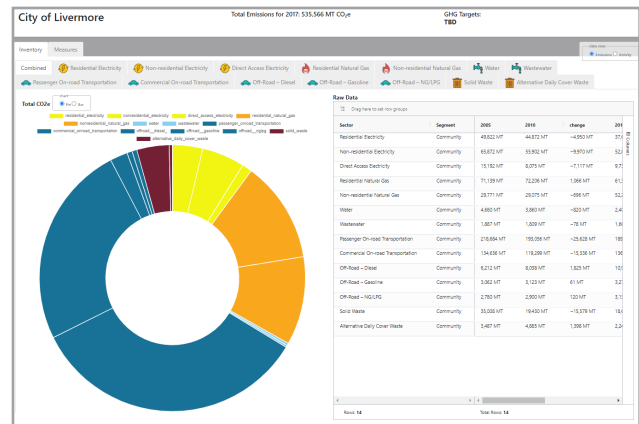
**Figure 4-3. CAP Implementation and Monitoring Process**



### CAPDASH

CAP implementation will be tracked in CAPDash, which is a customizable, web-based dashboard developed by Rincon Consultants, Inc. that allows Livermore to track the implementation of each strategy. See Figure 4-4 for an example of the CAPDash dashboard. The City will also conduct GHG-emissions inventories on a bi-annual basis, which will be available for the community to review via CAPDash.

**Figure 4-4. CAPDash**



### ANNUAL REPORTS

City staff will report implementation progress to the City Council every year, beginning in 2024. The annual reports will help hold the City accountable to the commitments in the plan and identify barriers to implementation that may need additional focus.

### FIVE-YEAR CAP UPDATES

As technology evolves and the State adopts new mandates, the City may need to revise its existing strategies and actions or develop new ones. The City will update the CAP every 5 years to adjust its approach as necessary. The next CAP update should be completed by the end of 2027.

## 4-4. Community Activation Guide

### YOU CAN HELP CREATE A HEALTHY AND RESILIENT LIVERMORE.

Addressing climate change will require more than just action from the City of Livermore itself. Individuals, businesses, and community groups all have a critical role to play in achieving the City's climate action goals. You can help create a healthy and resilient Livermore by taking individual actions today.

#### **Purchase renewable electricity**

East Bay Community Energy (EBCE) provides electricity to customers in Livermore. Enroll your account in the Renewable 100 service option to support locally generated renewable energy.

#### **Install solar panels & batteries**

Solar and battery systems reduce your electricity emissions and allow you to store solar energy for use at night or during power outages.

#### **Weatherize your home or business**

Weatherize your home or business to save energy, lower your utility bills, stay cool during heat waves, and maintain indoor air quality during smoke events.

#### **Install a heat pump & electric appliances**

Install electric, energy-efficient appliances when your old appliance breaks or is no longer working efficiently.

#### **Plant trees in your neighborhood**

Plant trees in your neighborhood to reduce heat, sequester carbon, absorb stormwater, and provide habitat.

#### **Install water-wise & fire-safe landscaping**

Reduce your water use by replacing your lawn with drought-tolerant landscaping and use water-efficient irrigation. Additionally, adopt fire-safe landscaping practices if you live in an area at risk for wildfires.

#### **Bike, walk, or take transit**

Biking, walking, skateboarding, scootering, taking public transit, and carpooling are all good alternative transportation options to reduce your transportation footprint.

#### **Drive an electric vehicle**

Purchase or rent an electric vehicle to reduce emissions when you do need to drive.

#### **Compost your yard & food waste**

Divert organic waste from the landfill by composting your yard and food waste. Livermore Sanitation provides composting to garbage pickup subscribers for residential use at no charge.

#### **Install a water conservation kit**

Taking advantage of water conservation kits from Cal Water and the City that provide free or subsidized water-efficient showerheads, faucet aerators, and toilet leak detection tabs is a great way to start.

#### **Use permeable hardscapes**

Install permeable hardscape alternatives like loose gravel, permeable asphalt, grass pavers, and permeable interlocking pavers to prevent flooding.

### Looking for more ideas?

The City is building an online resource hub to help the community identify and implement climate actions. The resource hub will be available by the end of 2022 at [LivermoreResilientHub.com](https://livermoreresilienthub.com)

# Closing Remarks

While climate change may seem like an overwhelming challenge and we may not all agree on the solutions, we can all agree that everyone wants a safe and healthy climate for Livermore's future. Thinking about what we can do locally can also be daunting in the context of a global threat. One thing is for certain and that is while one city can't solve the problem alone, without action at the local level the problem won't be solved.

California is a leader in climate action in the U.S. and Livermore can be a leader in California—environmental stewardship is in Livermore's DNA. There is a role for all of us in this climate action plan—the actions we take individually and collectively can make a difference.

The quality of life in Livermore for future generations depends on the actions we take today.

**In 2050,  
Livermore  
will be a place  
where...**

**"we are safe and sustainable."**

**"all citizens benefit from the foresight & courageous actions of past community leaders, who drove through proven solutions to mitigate the larger effects of climate change."**

**"we respect our neighbors, our guests, and our planet."**

**"residents, agriculture, open spaces/wildlife, and businesses co-exist in a healthy ecosystem."**

**"we are prepared for resulting natural disasters."**

**"the air is clean and healthy; residents and visitors easily move around by walking, riding bikes, and driving electric vehicles; more well-designed housing is available for workers and families to live closer to jobs and schools, and City facilities and equipment are environmentally appropriate."**

▲ Livermore resident responses to Climate Action Plan survey.

# Appendices





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