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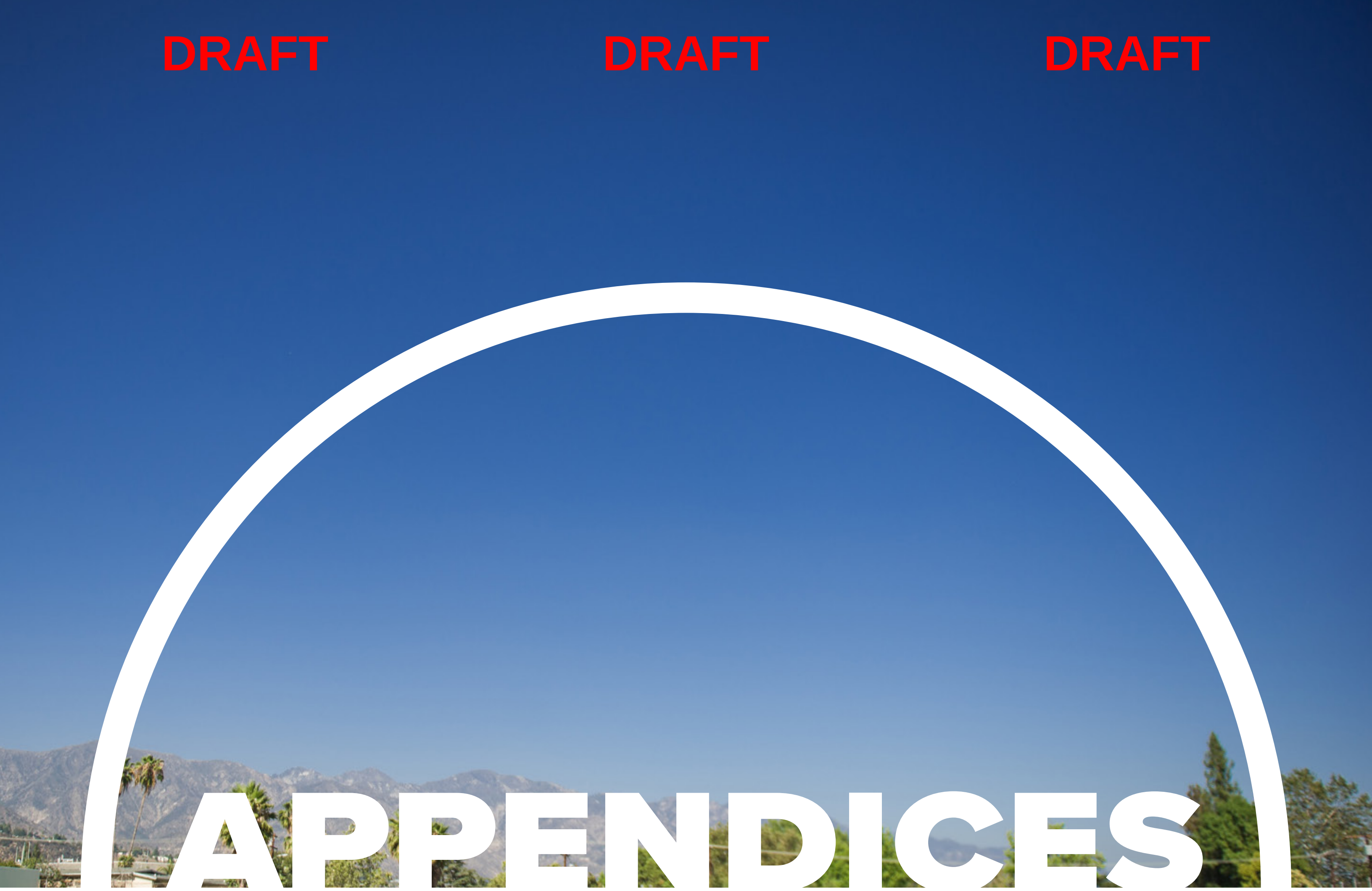

APPENDICES

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APPENDIX A:
Vulnerability Assessment

Prepared by:

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1. Executive Summary

The City of La Cañada Flintridge (La Cañada) is located in the Crescenta Valley, extending up the slopes of the San Rafael Hills on its western side and the foothills of the San Gabriel mountains on its eastern side. Roughly 25 miles east-northeast from the Pacific Ocean, its inland location with summertime temperatures already hotter than other areas of Los Angeles means it will be more vulnerable to extreme heat, as global temperatures continue to rise. Likewise, its geography means that it will continue to be vulnerable to wildfires at higher elevations and flooding and mudslides at lower elevations. Air pollution from wildfire smoke will likely be an increasing climate risk.

La Cañada has already undertaken efforts to reduce these risks, including through projects outlined in the 2019 Local Hazard Plan Update. However, plans and actions to date have not considered the changing frequency and severity of climate risks. This Vulnerability Assessment is intended to assist La Cañada in understanding how climate hazards it faces will change under future emissions scenarios and how those changes will impact the community sectors - built and natural assets, people, economy - that make La Cañada what it is. The Vulnerability Assessment will help inform adaptation strategies developed as part of the larger Climate Action and Adaptation Plan. The Vulnerability Assessment is an appendix to the CAAP. The documents should be read together.

In keeping with California Senate Bill 379, the assessment relies on resources provided by the California Governor's Office of Emergency Services (OES) including Cal-Adapt and the California Adaptation Planning Guide to describe how the *frequency* and *intensity* of climate hazards are changing.

Purpose of SB 379

Senate Bill No. 379 of the California Legislature requires local jurisdictions to address climate adaptation and resiliency strategies in either the local hazard mitigation plan or an update to the safety element of a jurisdiction's General Plan, depending on the date of adoption of a local hazard mitigation plan. The update includes a climate vulnerability assessment "identifying the risks that climate change poses...and the geographic areas at risk," along with a set of goals and strategies to address those risks.

2. Introduction

Natural variability in the climate and weather produce extreme events like droughts, wildfires, and floods over long time periods. While natural, living systems respond to and even rely on these phenomena, our dense settlement and production of greenhouse gas emissions have greatly changed climate hazards and their impacts.

Increased capture of solar radiation from GHG emissions, generally referred to as global warming or climate change, is having massive and long-term effects on climatic conditions and global energy systems like the water cycle, jet stream and ocean currents. Generally, the oceans are rising and temperatures are increasing. Disruptions in jet stream patterns have caused highly "unseasonal" weather. Some climatic changes like average annual maximum temperatures will be felt on a gradual, generational time scale. For the purposes of this assessment, discussion will focus on changes in climate-related hazardous events. Naturally occurring hazards are expected to occur more frequently and with greater intensity, putting our infrastructure, environment, housing, and populations at greater risk.

Indicators of Climate Change in California, a report prepared by the Office of Environmental Health Hazard Assessment, describes the rapidity with which climate change has impacted the state so far. Included in that report are the following statements[1]

- Average temperatures have increased by 2.5° Fahrenheit since 1895
- Eight of the ten warmest years on record occurred between 2012 and 2022
- The 2012 to 2016 drought was the most extreme since instrumental records began, producing a moisture deficit not seen in the last 1,200 years. It is consistent with a trend of California becoming increasingly dry.
- The unprecedented scale of tree deaths in California forests has increased fuel loads, increasing the risk of large, severe wildfires.
- Ten of the 20 largest wildfires since 1950 burned in 2020 and 2021.

As intense as these climate indicators are, models developed by the scientific community and recommended by the California Governor's Office of Emergency Services (OES) indicate that climate hazards are expected to grow more severe. The State Hazard Mitigation Plan lists fire, flood, mudslide (and earthquake) as the primary hazards based on number of events, deaths, and cost. Climate change, it says, will result in "more frequent incidence of severe events, such as extreme rainfall, wind, wildfire, extreme heat, and extended drought."[2]

These models provide the technical underpinning for understanding La Cañada' climate risk and are described in greater detail in later sections. Unfortunately, because the sources of emissions are global , the negative impacts of climate change are expected to continue, even as California and La Cañada reduce their respective emissions. The global backdrop of continuing GHG emissions is the imperative for La Cañada to consider the changes to its climate risks on the local level, in accordance with SB 379.

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[1] Office of Environmental Health Hazard Assessment, California Environmental Protection Agency (2022). Indicators of Climate Change in California. Sacramento, California

[2] California State Hazard Mitigation Plan, California Office of Emergency Services, 2018, Section 4.3 – p. 129

3. Background

California has been divided into 16 different climate zones based on shared climate characteristics within each zone. The California Energy Commission developed this climate geography to develop appropriate efficiency standards and to help builders and building officials understand the energy needs for heating and cooling throughout the year in those zones[3].

La Cañada is part of climate Zone 9, an inland valley. It is described by Pacific Gas & Electric as being "famous for growing citrus because the summers are hot and winters never frost." According to an undated PG&E document, Zone 9 has as many heating degree days as cooling degree days.[4]

Separated from the tempering influence of the ocean by the Santa Monica Mountains, the Verdugo Mountains, and the San Rafael Hills, La Cañada has historically had hot summers (highs of 90℉ and wintertime lows in the low 40s F. Santa Ana winds bring particularly hot dry air into La Cañada in summer and fall. In the winter, atmospheric rivers can soak the foothills and higher elevations of the San Gabriel mountains, causing downstream flooding and landslides.

3.1 Climate Hazard History in La Cañada

Climate hazards are caused from a complex interaction of atmospheric phenomena and on-the-ground conditions. This is described succinctly in La Cañada's Safety Element of the General Plan.

> *The combination of southern California's Mediterranean climate, with its winter and spring rainfall and hot dry summers, a preponderance of highly flammable vegetation within and adjacent to La Cañada Flintridge, the steep topography within the City, and the frequency of high wind velocity from the Santa Ana winds creates optimum conditions for wildfires and debris flows.*[5]

In other words: climate, terrain, vegetation, and short-term weather all influence the type and intensity of climate hazards. La Cañada has experienced many climate hazards over its recorded history starting most famously with the Crescenta Valley New Years Day flood of 1934 which jump-started flood control projects in the area, including the Verdugo Wash.

The frequency of these hazards provides a baseline for considering future hazards, even if La Cañada continues to change and the rate of climate change is increasing. Greenhouse gas emissions will change the *frequency* and *intensity* of experienced climate hazards but will mostly not introduce new hazards altogether.

Many of these experienced hazards are enumerated in Table 1, Governor-proclaimed disasters. Table 1 indicates the relative prevalence of climate hazards over the past 30 years - typically considered a climate period - that reach the level of disaster declaration.

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[3] EZ Building Climate Zone Finder, accessed November 22, 2022 https://caenergy.maps.arcgis.com/apps/webappviewer/index.html?id=5cfefd9798214bea91cc4fddaa7e643f
[4] California Climate Zone 9, accessed Nov 22, 2022, https://www.pge.com/includes/docs/pdfs/about/edusafety/training/pec/toolbox/arch/climate/california_climate_zone_09.pdf
[5] La Cañada General Plan, Chapter 5: Safety Element, Section 5.2 Setting

Table 1. Governor Proclaimed Disasters in Los Angeles County, 1991-2022

Disaster Type[6]	Disaster Description	Date
Drought	Drought	January 1, 2014
	Drought	October 1, 2021
Storm, Flood, and Landslide	Winter Storms	February 1, 1992
	Late Winter Storms	December 1, 1992
	Severe Winter Storms	January 1, 1995
	Late Winter Storms	February 1, 1995
	El Niño	February 2, 1998
	Flash flooding	November 12, 2003
	Winter Storms	January 1, 2005
	Severe rainstorms	March 1, 2005
	Winter storms	January 17-21, 2010
	Winter storms	December, 2010 – January, 2011
	Rainstorms	July 18, 2015
	Rainstorms	October 1, 2015
	Storm System	January 1, 2017
	Winter storms	January-February, 2019
	Winter Storms	December 1, 2021
	Tropical Storm Kay	September 9, 2022
Wildfire	Wildfire (Firestorms)	October 27 & 28, 1993
	Wildfire (Firestorms)	October 1, 1996
	Wildfires	October – November, 2003
	Wildfires	October 21, 2007
	Wildfires	October 1, 2008
	Wildfires	November 1, 2008
	Wildfires	August – September, 2009
	Wildfire (Powerhouse Fire)	May 30-June 11, 2013
	Wildfires	June-July, 2015
	Wildfire (Sand Fire)	July 22, 2016
	Wildfire (La Tuna Fire)	September 1, 2017
	Wildfires (Creek and Rye Fires)	December 1, 2017
	Wildfire (Hill & Woolsey Fires)	November 1, 2018
	Wildfire (Saddleridge Fire)	October 10, 2019
	Wildfires (Kincade and Tick Fires)	October 25, 2019
	Wildfire (High winds and wildfires)	October 27, 2019
	Wildfire	August 1, 2020
	Wildfire (Slater, Bobcat, and Oak Fires)	September 1, 2020

Over the past 30 years, wildfires have been the most frequent climate events, followed by storms and landslides. Since the Governor declares disasters at a county-wide scale and since La Cañada is less than 1% of the area of LA County, it is difficult to ascertain from this data set alone what disasters have impacted La Cañada.

[6] Chronological list of governor-proclaimed disasters for property tax purposes (since October 20, 1991), https://www.boe.ca.gov/proptaxes/disaster-list.htm. Note that the list excludes two climate disasters (wind, freeze) each with only one occurrence and unrelated disasters like civil disorders, industrial disasters, etc

Also notably absent from the table or poorly captured by the date column are several multi-year droughts. As of this writing (winter 2022), California see-sawed from experiencing persistent severe drought to record snowfalls. If the frequency and severity of hazards affecting La Cañada may be difficult to ascertain from the list, the list nevertheless provides a baseline of hazard types in the area.

Based on this history and Cal-Adapt's projections described later, this vulnerability assessment has been framed around three climate-related groups of hazards:

1. Temperature, Extreme Heat & Drought
2. Precipitation, Flooding, & Landslides
3. Wildfires & Air Pollution

Reports produced by other jurisdictions may include different climate variables and climate hazards or categorize the variables and hazards differently based on their climate conditions. Landslides particularly are influenced by a "cascade" of previous events: drought, wildfire, and rain storm.

3.2 Temperature, Extreme Heat & Drought

Climate hazards like droughts, heat waves, and air pollution are stressors that are usually less dynamic than floods or wildfires. Droughts occur on a slower timeline and can last longer than other climate hazards. Droughts may not cause a loss of property or impair infrastructure like other hazards, but prolonged droughts impact the environment, the economy, and residents' quality of life. The La Cañada Local Hazard Mitigation Plan declares:

> Historical drought data regarding La Cañada indicate four significant droughts over the last 50 years, with drought occurring in 16 of those 50 years. Based on risk factors and this history, droughts likely will continue to occur in the La Cañada area. Moreover, as temperatures increase, the probability of future droughts will likely increase as well. Therefore, droughts likely will occur in La Cañada at varied severities in the future, even after the conclusion of the [2012-2016] drought.[7]

Similarly, across La Cañada, several extreme heat events were experienced in the past 20 years, including the past seven years being more than one degree celsius over the preindustrial average.[8] These hot temperatures have yet to declare a federal disaster. Heat waves have become stronger across the region, including mid-summer night-time heat waves and increases in day-time heat waves. Though heat waves are invisible, they can have great impacts on human health, particularly for vulnerable populations.

3.3 Precipitation, Flooding, & Landslides

La Cañada is the Spanish name for "the canyon" or the "ravine." The city varies in elevation from about 970 feet to about 2,400 feet at the highest neighborhood, along the mountain front, east of Pickens Canyon. Many residents live in steep terrain areas in this "urban interface". According to the FEMA 2016 Flood Insurance Study for Los Angeles County, which specifically included La Cañada Flintridge, the city has a lower risk of flooding than other cities but has a higher risk for

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[7] City of La Cañada Flintridge." *Local Hazard Mitigation Plan*, 19 July 2019, pg. 157
[8] Kaplan, Sarah, and John Muyskens. "The Past Seven Years Have Been the Hottest in Recorded History, New Data Shows." *The Washington Post*, WP Company, 13 Jan. 2022, https://www.washingtonpost.com/climate-environment/2022/01/13/global-temperature-record-climate-change

mudflow.[9] There was a large flood in 1934 but civil engineers built large drainage systems to move the excess water safely through the valley. Although this has been helpful, there is concern that after periods of drought and vegetation die-off, flash flooding and mudslides may overwhelm and clog the drainage system.

Flooding and mudslides not only can cause loss of life but also can result in damages to buildings, landscapes and roads. La Cañada Flintridge has a high density population with lots of vegetation and this "debris" can be very damaging when sweeping down the steep slopes and through the city. Preparations for flooding, evacuations, and clean-ups are all made more difficult by these circumstances. With 2,341.8 inhabitants per square mile it can cause very crowded evacuation routes. People living closer to the mountains and away from the main highways are also included in the flash flood zone.[10] More than 20,000 people with only two main highways creates a cause for concern that people would not have time to evacuate. Special attention should also be placed on the elderly populations to ensure that they understand evacuation plans and have proper transportation available to them.

The steep canyons and ravines are the most susceptible for mudflow. All residents living in those areas could be considered vulnerable. There are 798 properties in La Cañada that have greater than a 26% chance of being severely affected by flooding over the next 30 years, according to Risk Factor, a webtool created by the nonprofit First Street Foundation.[11]

La Cañada has experienced numerous severe winter storms that have caused flooding. Floods are caused by the duration, intensity, and spatial distribution of precipitation interacting with terrain and land use characteristics like ground cover. In other words, floods are not exclusively a climate hazard. They are the result of a climate phenomenon in interaction with physical conditions. These local conditions that influence flooding range from short-term characteristics such as vegetation cover and soil moisture to long-standing features like the size of storm sewers. Similarly, the impact of floods depends on what is flooded: The storms of 1934 caused flooding of properties and damaging structures in La Cañada, causing $5,000,000 worth of damages to the town devastating buildings, citrus groves, villages and highways beyond repair.[12] Since it started participating in the National Flood Insurance Program (NFIP) in 1978, 40 claims have been submitted totaling $1,500,107 worth of damages.[13]

The main issue with the flooding in this particular valley is the heavy and erosive debris that comes with it. Mudslides occur when tons of dirt and sand mix with the excess water and create a landslide of debris. Between 1971 and 2010 La Cañada experienced 13 major landslides, each causing an average of $417,112,474 dollars of damage.[14] As a result of the canyons surrounding La Cañada it puts them at very high risk of floods resulting in mudslides.

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[9] "City of La Cañada Flintridge." *Local Hazard Mitigation Plan*, Section 8.2.2.2. pg. 81 https://cityoflcf.org/wp-content/uploads/2019/08/LHMP_Final_8-7-19.pdf
[10] *U.S. Census Bureau Quickfacts: La Cañada Flintridge City, California*: https://www.census.gov/quickfacts/fact/table/lacanadaflintridgecitycalifornia/PST045221
[11] "Find Your Property's Climate Risks in La Cañada." *Risk Factor*, https://riskfactor.com
[12] TROXELL , HAROLD C, and JOHN Q PETERSON. *FLOOD IN LA CANADA VALLEY CALIFORNIA*. 1 Jan. 1934
[13] City of La Cañada Flintridge. *Local Hazard Mitigation Plan*, 19 July 2019, pg. 86, 87 section 8.4.2.2 & 8.4.2.3
[14]Ibid

3.4 Wildfires & Air Pollution

Wildfires are very familiar to La Cañada. The 2009 Station Fire which started just north of the City ultimately spared it, but forced evacuations and significant disruptions to daily life.[15] The entire City is in a Very High Fire Severity Zone.[16]

The Local Hazard Mitigation Plan describes the City's threat from wildfires:

> One challenge Southern California faces regarding the wildfire hazard is from the increasing number of houses being built on the wildland-urban interface. Every year the growing population has expanded further and further into the hills and mountains, including forest lands. The increased "interface" between urban and suburban areas and the open spaces created by this expansion has produced a significant increase in threats to life and property from fires and has pushed existing fire protection systems beyond original or current design and capability. Property owners in the interface are not aware of the problems and threats they face. Therefore, many owners have done very little to manage or offset fire hazards or risks on their own property. Furthermore, human activities increase the incidence of fire ignition and potential damage.[17]

Of course, wildfires can start from any number of human sources and not only during dry weather. Like floods, wildfires present the greatest risk to life and property when they cross the wildland urban interface into developed areas. However, the spread and duration of wildfires is less predictable than floods. Wildfires are most likely to spread through embers directed by wind and the air currents of the fire itself.

These air currents can bring particulate matter hundreds of miles from the fire. Summer can already produce poor air quality due to photochemical (sunlight) smog and the long-term suspension of particulate matter that rain in the winter and spring dissolves. Pollution is classically trapped in valleys during high pressure. These periods of air pollution increase the health risk for people with pre-existing respiratory conditions and/or who experience occupational hazards through outdoor work.

According to the California Office of Environmental Health Hazard Assessment (OEHHA), "Particulate Matter 2.5...can have adverse effects on the heart and lungs, including lung irritation, exacerbation of existing respiratory disease, and cardiovascular effects. The International Agency for Research on Cancer (IARC) determined PM to be carcinogenic to humans and causally associated with lung cancer."[18] The US EPA has set a relatively new standard for PM2.5 of 12 µg/m3, down from 15 µg/m3, however OEHHA reports that "adverse health effects are seen at concentrations below the US EPA's current standard".[19] Data from La Cañada (collected between 2015 and 2017) indicates PM2.5 between 11 µg/m3 and 12 µg/m3 - healthy according to the EPA, but worse than the average for California. Given that baseline air quality is only slightly better

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[15] Sara Cardine & Andy Nguyen, *10 Years On, Station Fire Remains Burned into Minds of Locals and Fire Officials*, August 21, 2019, https://www.latimes.com/socal/la-canada-valley-sun/news/story/2019-08-21/10-years-on-station-fire-still-burned-into-minds-of-locals-fire-officials
[16] *La Cañada Flintridge - Osfm.fire.ca.gov*. https://osfm.fire.ca.gov/media/5826/la_canada_flintridge.pdf
[17] 2019 City of La Cañada Flintridge Local Hazard Mitigation Plan, p. 121
[18] CalEnviro Screen 4.0, https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf, p. 38
[19] *ibid*

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than the EPA standard, added pollution from wildfires even far from La Cañada can easily create unhealthy levels of PM2.5 [20]

3.5 Risk Matrix

The following risk matrix provides a qualitative assessment of risks specific to La Cañada based on their frequency and impact. Based on this assessment, the threat posing the greatest hazard to the City is the threat of Wildfire & Air Pollution.

Figure 1. Risk Matrix

		Impact		
		Small	**Moderate**	**High**
Frequency	**Very High**			
	High		Precipitation, Flooding & Landslides	Wildfire & Air Pollution
	Moderate			Temperature, Extreme Heat & Drought
	Low			

4. Future Changes to Climate Hazards

There are several sources of information about future climate hazards and their impact on La Cañada. Described below is information from several State, County, and local documents and tools. These sources are not exhaustive, nor are they entirely in agreement, however, together they provide a helpful composite.

4.1 California's Fourth Climate Change Assessment – Los Angeles Region Report

California's fourth climate change assessment was produced in 2018. Given the size and physical diversity of California, the assessment was divided into region-specific reports. The Los Angeles Region report reveals that temperatures in the area rose by approximately 2°F between 1950 and 2005. However, the expected temperature rise by mid-century has been revised. Current projections suggest that temperatures in the Los Angeles region could increase by as much as 4.5°F by mid-century if emissions continue. Furthermore, if emissions persist until the end of the century, the temperature rise could reach a significant 5.8°F.[21] It's important to note the projections show spatial patterns, with coastal regions experiencing relatively lower warming due to the buffering effect of the ocean, while interior regions are projected to experience the highest increases. Extreme heat events are also expected to become more intense and frequent, with hotter days and an increase in the number of extremely hot days projected.

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[20] Office of Environmental Health Hazard Assessment, Cal EnviroScreen 4.0 PM 2.5 Indicator Map, https://oehha.ca.gov/calenviroscreen/indicator/air-quality-pm25 *accessed* *Dec 17, 2022*

[21] California's Fourth Climate Change Assessment. 2018. Los Angeles Region Report

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According to the report, despite small changes in average precipitation, dry and wet extremes are both expected to increase. By the late 21st century, the wettest day of the year is expected to increase across most of the LA region, with some locations experiencing 25-30% increases under representative concentration pathway (RCP) 8.5. Increased frequency and severity of atmospheric river events are also projected to occur for this region.

Sea levels are projected to continue to rise in the future, but there is a large range based on emissions scenarios and uncertainty in feedbacks in the climate system. Roughly 1-2 feet of sea level rise is projected by the mid-century, and the most extreme projections lead to 8-10 feet of sea level rise by the end of the century.

Wildfires in the Los Angeles region are influenced by multiple factors, including the area's dry and warm climate, periodic Santa Ana winds, vegetation distribution, topography, urban-wildland interfaces, fire suppression efforts, and human activities. The majority of wildfires occur during the summer and fall, with a significant portion happening during Santa Ana wind events. While historical trends show no significant changes in Santa Ana-driven fires, the average size of non-Santa Ana fires during the summer has increased. Future projections suggest a potential increase in the number and size of wildfires, with over 60% more burned area expected for Santa Ana-driven fires and over 75% more for non-Santa Ana fires by the mid-21st century. However, there are uncertainties in current wildfire models, and further research is needed to improve accuracy and understanding.

4.2 LA County Climate Vulnerability Assessment

4.2.1 Temperature, Extreme Heat & Drought

Extreme heat is a growing concern in Los Angeles County, with rising temperatures projected to increase in frequency, severity, and duration. Heat waves have become more frequent, longer, and more severe, impacting the region significantly. By mid-century, the county is expected to experience a tenfold increase in the number of heat waves. The countywide daily maximum temperature is also projected to rise by an average of 5.4°F, reaching a mid-century average of 98.6°F. Additionally, drought poses a significant hazard, leading to water shortages, increased wildfires, and impacts on air quality. Climate change increases the likelihood of severe and prolonged droughts across the southwestern United States, with climate models projecting more than a 6.5% increase in the occurrence of megadroughts between the mid and end of the century. These climate hazards exacerbate environmental conditions, driving further impacts on human and natural systems, highlighting the need for increased preparedness and adaptation efforts.

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4.2.2 Precipitation, Flooding, & Landslides

Inland flooding, extreme precipitation, coastal flooding, mudslides, and landslides are significant climate hazards in Los Angeles County. Inland flooding occurs due to heavy precipitation events that overwhelm natural waterways and stormwater infrastructure. Climate projections for inland flooding and extreme precipitation are limited, highlighting the need for further understanding of future flood risks. Coastal flooding poses a risk to low-lying areas, with sea-level rise exacerbating inundation during high tides and storms. By mid-century, all of LA County's coastline is projected to experience at least moderate exposure to coastal flooding. The State of California projects sea-level rise to reach approximately 2.5 feet by mid-century and 6.6 feet by the end of the century, further amplifying the coastal flooding risk. Mudslides and landslides, often triggered by extreme precipitation following wildfires, pose risks in the mountainous areas of the county. Future changes in precipitation patterns, including more severe periods of high-volume rainfall, are projected to increase the risk of inland flooding. These climate hazards necessitate the prioritization of climate-resilient development strategies and further investigation for a comprehensive understanding of vulnerability in LA County.

4.2.3 Wildfires & Air Pollution

Climate change poses significant challenges to both wildfire risk and air quality in the Los Angeles region. The combination of hot and dry weather, low moisture levels, and strong winds during fall and winter create ideal conditions for severe wildfires. Particularly vulnerable is the San Gabriel Mountains, including the Angeles National Forest, which are projected to experience a substantial increase in the area burned by wildfires. An Additional 2.2 hectares of LA County land is projected to burn each year by mid-century. These wildfires contribute to higher levels of particulate matter (PM), including PM 2.5, which has detrimental effects on air quality. Moreover, extreme heat speeds up the production of ground-level ozone and increases the release of volatile organic compounds (VOCs), further compromising air quality. Climate-related factors such as extreme precipitation, flooding, drought, and elevated dust levels also contribute to worsened outdoor and indoor air quality, potentially leading to respiratory illnesses. Addressing these challenges is crucial to protect public health and mitigate the impact of climate change on the region's air quality.

4.3 Local Hazard Mitigation Plan

4.3.1 Temperature, Extreme Heat & Drought

The California State Hazard Mitigation Plan says drought "can affect people's health and safety including health problems related to low water flows, poor water quality, or dust."[22] Industries that depended on water sources may be affected. No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Environmental losses consist of damage to plants, animals, wildlife habitat, and air and water quality. This causes forest and range fires which degrades the landscape quality. The loss of biodiversity and soil erosion quickly follow.

Heat is a huge factor in the amount of water in the ground and according to the LHMP "power outages or roaming blackouts may occur as a result of extreme heat events that strain and overheat circuits. During a blackout, all critical facilities and infrastructure that are reliant upon electricity for power will be severely impacted unless they are connected to a backup power source." This targets many vulnerable populations or anyone who depends on electricity.

4.3.2 Precipitation, Flooding, & Landslides

The largest impact on communities from flood events is the loss of life and property. Populations can be affected by unsafe food, contaminated drinking and washing water and poor sanitation, mosquitoes and animals, molds and mildews, hazards when re-entering and cleaning flooded homes and buildings as well as the mental stress and fatigue that comes from flooding. There is a long-term concern among the affected populations that their homes can be flooded again in the future. Planning has been put in place involving "building codes, zoning codes, and various planning strategies to address the goals that aim to restrict development in areas of known hazards and applying the appropriate safeguards." Flooding can also affect the economy. Many businesses have to close meaning people aren't buying things and many are out of work while many structures have damage in need of repair. Critical Facilities that are vital to the health and safety of the City are the ones that must stay open before, during and after an emergency. Water treatment and infrastructure that help remove run-off are important facilities to mitigate against floods. Crescent Valley Water District, La Cañada Irrigation District, Mesa Crest Water Company, and the Valley Water Company work together to provide water for the City of La Cañada Flintridge citizens. When these districts don't work together it can have an adverse impact on the environment. Pollution in the water can later affect agriculture. Developing dams can affect the path in which water flows naturally. The amount of property in the floodplain, as well as the type and value of structures on those properties, should be calculated to provide a working estimate for potential flood losses.

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[22] "City of La Cañada Flintridge." *Local Hazard Mitigation Plan*, pdf. pg. 160, section 12.4.2

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4.3.3 Wildfires & Air Pollution

With 21,000 people at risk, wildfires should be taken as a serious matter. The entire City of La Cañada has been identified as a high risk area for brush fires because of its steep hillsides and gradual slopes. Many of the homes are nestled into thick forests with many trees. The scenic roads and winding driveways make La Cañada a very difficult place to evacuate and leave combustible elements of houses right in the path of destruction. Since the City is primarily residential structures, it puts the economic impact in this jurisdiction in the "tens of millions."[23] Water availability is a problem because of the lack of fire hydrants found in neighborhoods. With no water, vegetation and structures fuel a fire that can be very unpredictable. It is hard to anticipate where the fire will go because of diversity in building materials and accessibility to fire breaks and space for firefighters to do their jobs. With fires causing a direct effect on the number of homes left in the city, air pollution starts causing an effect on vulnerable populations and the entire community's quality of life. Heavy smoke is not easily dissipated because of the valley in which La Cañada sits. Heavier smoke tends to sink into the lower parts of elevation and can cause outside activities to be much more difficult.

4.4 Cal-Adapt & Adaptation Planning in California

The OES issued the **California Adaptation Planning Guide (APG)** to help municipalities and all stakeholders involved in the vulnerability assessment process with recommendations and tools to develop a scientifically grounded, relevant, and actionable adaptation plan.

One of the public resources provided by OES to be used in consultation with the (APG) is a web-based climate projection tool called Cal-Adapt. **Cal-Adapt provides historical and projected climate information, including "local snapshots" of several different climate phenomena under different emissions scenarios through 2100.** The global climate models selected by OES are particularly well matched to California's climate.

Cal-Adapt was used for this vulnerability assessment to predict what future temperature and precipitation La Cañada will experience based on scenarios of future global emissions or RCP 4.5 and RCP 8.5, adopted by the International Panel on Climate Change. These emissions scenarios are based on models of population growth, economic growth, food production, technological advancement, political activities to curb greenhouse gas emissions and other factors. RCP 2.6 represents a "very stringent" pathway, in which emissions start declining by 2020 and go to zero by 2100. It is not included in Cal-Adapt. RCP 4.5 represents a global growth scenario in which emissions continue to 2040 and then decline. RCP 8.5 represents a "business as usual" scenario in which emissions continue unabated. Because these scenarios and models are global, they do not consider how La Cañada reduces its emissions.

[23] "City of La Cañada Flintridge." *Local Hazard Mitigation Plan*, pg. 124, section 10.4.2.3

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Cal-Adapt plugs these global emissions scenarios into global climate models (GCMs) to produce local information about areas in California, including La Cañada. Cal-Adapt describes the process on its Guidance on Using Climate Projections webpage[24], from which the text below is reproduced.

> Climate scientists create projections of future climate using powerful tools called global climate models. Global climate models are complex pieces of computer software that crunch through thousands of mathematical equations representing the scientific theory of how the climate system works. They can be used to simulate climate over past periods, or to run experiments in which scientists impose certain conditions on the model to see how the climate system responds. A future climate projection is the product of global climate model experiments in which scientists impose upon the model some scenario of the future atmospheric concentration of greenhouse gases [eg. RCP 4.5 and RCP 8.5].
>
> When climate scientists run a climate model, they divide the area of study into a grid, and the model performs calculations for each individual cell within the grid. The output from those calculations can then be visualized on a map, similar to the visualizations in Cal-Adapt [shown in Figures 3-9]. In climate model projections, for any given snapshot in time, each grid cell is represented by a single value for temperature, precipitation, or other climate variable of interest.
>
> The grid cells in most global climate models are very large—from 100 to 600 kilometers [roughly 100 to 375 miles] squared. This coarse resolution is OK when scientists are studying climate on the global scale, but it is not very useful when we are trying to understand climate change on smaller scales. We know that present-day climate varies greatly from region to region in California, and so we expect future climate to vary accordingly. But that detail is lost in the global climate models, in which all of California may be represented by just a few grid cells. To be able to plan for the future, we need to produce higher-resolution projections of future climate. Climate scientists do just that by using various techniques to "downscale" global climate model output to finer spatial scales. The data in Cal-Adapt is taken from a selection of global climate models and downscaled to about 7-kilometer [roughly 4.5 mile] resolution.

[24] https://v2.cal-adapt.org/resources/using-climate-projections/

Understanding Cal-Adapt Graphs

The Cal-Adapt graphs presented in this Vulnerability Assessment display several data types that demonstrate the anticipated changes in variables such as temperature, extreme heat, drought, precipitation, and wildfire as climate change progresses. types of data illustrating how variables like temperature, extreme heat, drought, precipitation, and wildfire are expected to change as climate change continues. In this section, we will explain how the information is displayed on the La Cañada graphs (refer to Figure 2, 3, 4).

The historical observed values for each year, depicted by the gray line on figure 2, represent the natural climate variation. Despite the long-term warming trend, certain years may still be cooler or warmer than others.

In Figure 3, the dark blue line represents the most likely outcome for whatever variable or the depicted variable. It is derived from averaging multiple climate models, smoothing out the year-to-year variability predicted by each model. However, this line does not suggest the elimination of year-to-year variability. The shaded blue area surrounding the line represents the complete range of climate projections across all models for that variable. If one model predicts a high value while another predicts a low value, this information is reflected in the shaded area. To summarize, under a medium emissions scenario, La Cañada could experience any value within the shaded blue area but is most likely to align with the value on the blue line.

The same explanation for the image holds true under a high emissions scenario, shown in light purple (Figure 4). The colored areas around lines represent projections under different emissions scenarios, RCP 4.5, displayed in a light blue color, represents continued global emissions until 2040 (medium emissions scenario) and RCP 8.5, shown in a light purple color, represents continued global emissions throughout the century (high emissions scenario). The purple line represents the most likely outcome for the variable, and the shaded area around the line represents the full range of climate projections for the variable across all models.

When both emissions scenarios are graphed (Figure 4), the darker purple-gray area represents the possible values which are projected in both medium emissions and high emissions scenarios. For some climate variables like temperature, the distinction between emissions scenarios becomes more apparent as the century progresses, with less overlap between the blue and purple shaded areas. This indicates that reducing emissions will result in lower temperature increases. However, for other variables such as precipitation, there is no significant visual difference between the blue and purple shaded areas, suggesting that the range of precipitation values remains relatively consistent regardless of the emissions scenario.

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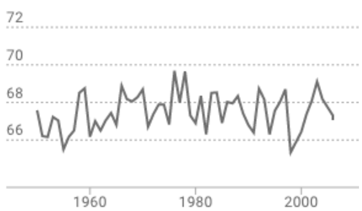

Figure 2 - Historical Trends

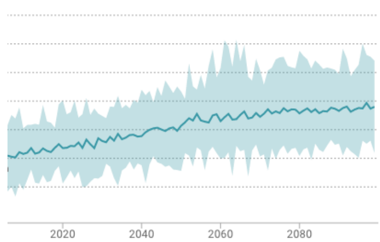

Figure 3 - Projections under different emissions scenarios

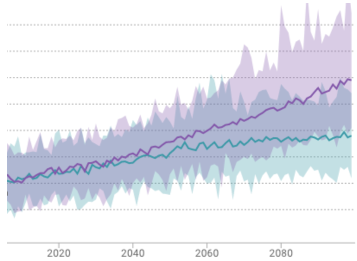

Figure 4 - Projections under different emissions scenarios

4.4.1 Flooding

Figure 5 shows the observed and projected annual precipitation for La Cañada. The graph indicates that there is expected to be little change in annual average precipitation in a medium or high emissions scenario for La Cañada. As shown in Table 2, average annual precipitation is projected to decrease marginally.

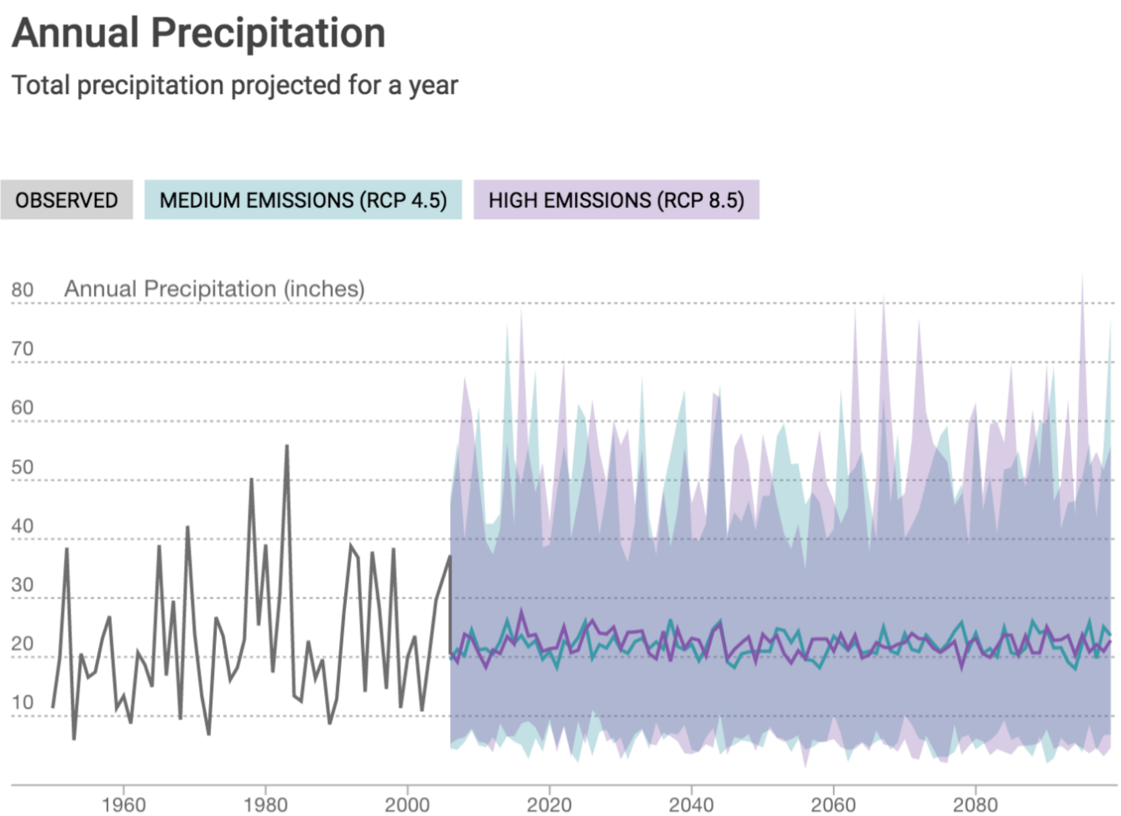

Figure 5: Annual total precipitation, observed and projected under medium and high emissions scenarios. The shaded area represents the range of likely annual precipitation totals in each scenario; the colored lines represent the most likely precipitation total in each scenario. Produced using Cal-Adapt.

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Period	Years	Emissions Scenario	Average	Range of Averages	Units
Baseline	1961-1990	Observed	22.6		inches
Mid-Century	2035-2064	Medium (RCP 4.5)	21.8	16.9-28.3	inches
End-Century	2070-2099	Medium (RCP 4.5)	22.4	17.1-26.7	inches
Mid-Century	2035-2064	High (RCP 8.5)	22.0	16.6-29.2	inches
End-Century	2070-2099	High (RCP 8.5)	22.1	14.1-32.5	inches

Table 2: Annual total precipitation, observed and projected under medium and high emissions scenarios over 30-year periods according to Cal-Adapt. The numbers in the average column represent the averages of the most likely outcome over the 30-year periods. The numbers in the range of averages column represents the averages from all climate models over the 30-year periods. The range of averages is generally greater in the high emissions scenario, indicating the greater uncertainty under high emissions, especially by the end of the century.

Even if annual precipitation is expected to remain consistent as an annual average, the timing of rainfall is expected to vary from the existing seasons. Winters may be wetter and spring and autumn may be drier. The variability may include more intense, infrequent rainfall causing flooding and landslides, preceded and followed by longer dry spells without any precipitation. The maximum 1-day precipitation event is expected to increase marginally.

Flooding is likely to increase as a result of an increased number of days with extreme rainfall events. That increased risk may be compounded with an increase in the number of wildfires in the San Gabriel and San Rafael Mountains that reduce the ability of plants and soils to absorb rainfall. Conversely, back-to-back extreme rainfall events in late winter may fall on areas already saturated and unable to absorb rainfall. The result in either case is a change in the intensity and pattern of flooding. Determining flood risk requires hydrologic and hydraulic analyses that are outside the scope of this assessment - FEMA produced 100-year and 500-year flood maps for La Cañada in 1987 and updated them in 2008, however these maps are not considered current or comprehensive[25].

[25] "City of La Cañada Flintridge." *Local Hazard Mitigation Plan*, pg. 81, section 8.2.2.2

Maximum 1-day Precipitation

The maximum daily precipitation amount for each year. In other words, the greatest amount of daily rain or snow (over a 24 hour period) for each year.

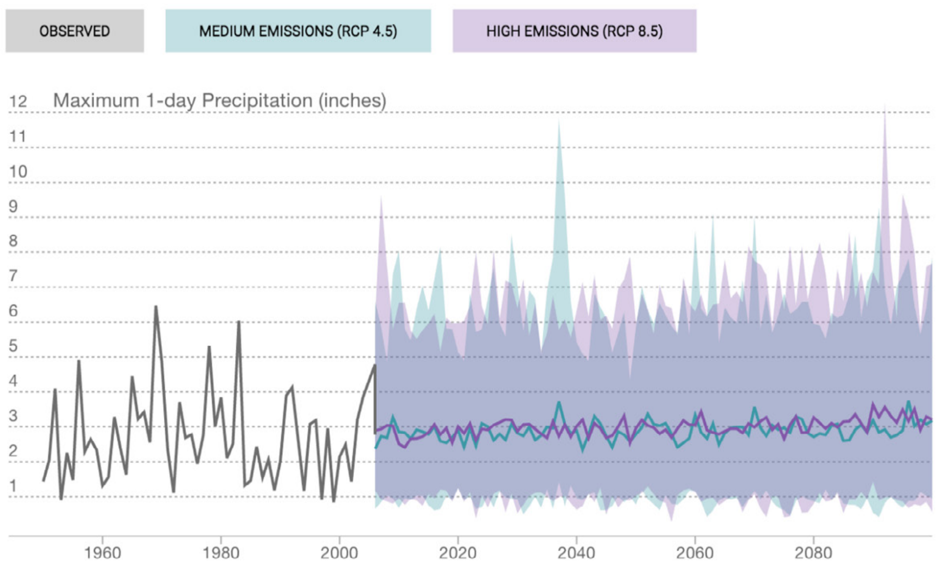

Figure 6: Maximum 1-day precipitation, observed and projected under medium and high emissions scenarios. The shaded area represents the range of likely precipitation totals in each scenario; the colored lines represent the most likely total in each scenario. Produced using Cal-Adapt.

Period	Years	Emissions Scenario	Average	Range of Averages	Units
Baseline	1961-1990	Observed	2.9		inches
Mid-Century	2035-2064	Medium (RCP 4.5)	2.9	2.4-3.3	inches
End-Century	2070-2099	Medium (RCP 4.5)	3.0	2.5-3.5	inches
Mid-Century	2035-2064	High (RCP 8.5)	2.9	2.4-3.6	inches
End-Century	2070-2099	High (RCP 8.5)	3.1	2.4-4.1	inches

Table 3: Maximum 1-day precipitation, observed and projected under medium and high emissions scenarios over 30-year periods according to Cal-Adapt. The numbers in the average column represent the averages of the most likely outcome over the 30-year periods. The numbers in the range of averages column represents the averages from all climate models over the 30-year periods.

For the area including La Canada, the California Dept. of Transportation (Caltrans) uses a slightly different indicator of extreme precipitation, the 1-100 year or 1% annual storm. A 2019 analysis by Caltrans predicts a 5%-10% increase in maximum amount of rainfall under a high emissions scenario.[26]

[26] 2019 Climate Change Vulnerability Assessments, District 7: Los Angeles and Ventura Counties https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/air-quality-and-climate-change/2019-climate-change-vulnerability-assessments

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4.4.2 Temperature, Extreme Heat & Drought

As shown in Figure 7, the annual average maximum temperature is expected to increase over the rest of the 21st century. Under the high emissions scenario (RCP 8.5), temperature is projected to increase nearly 8° F, nearly twice as much as under a medium emissions scenario (RCP 4.5). Table 4 indicates the certainty of temperature increases. Even the low end of the range of averages is higher than the observed average, 1961-1990.

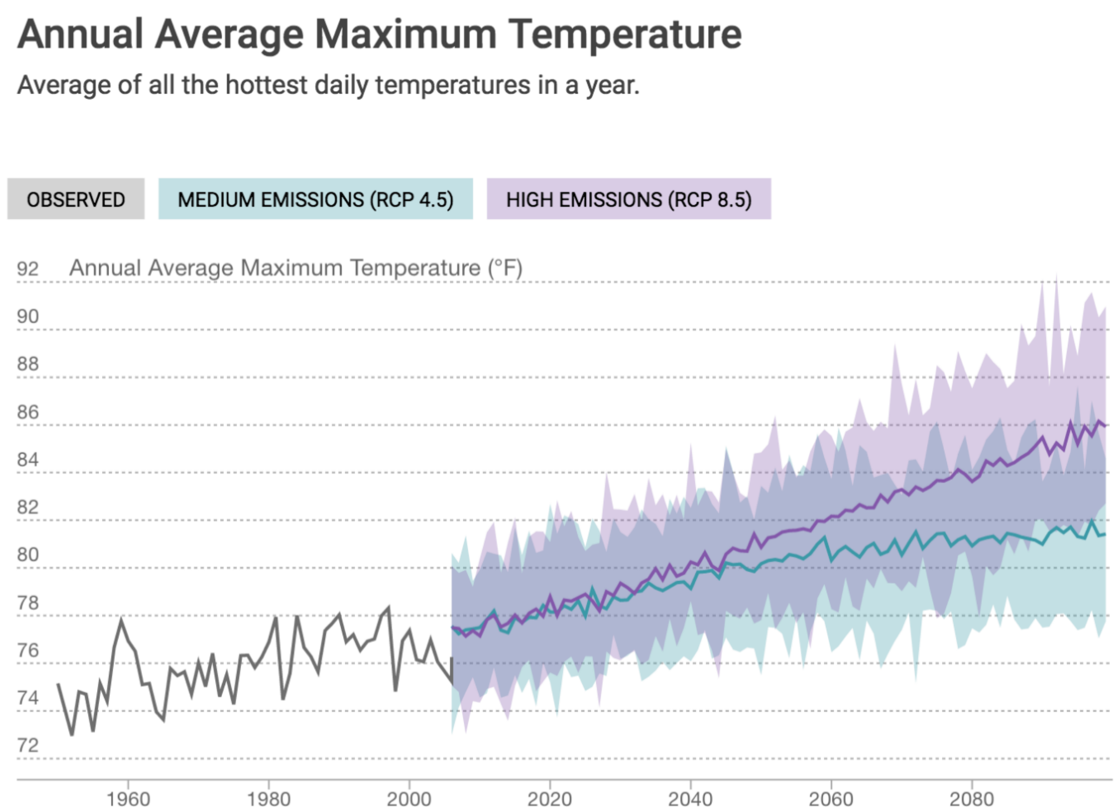

Figure 7: Annual average maximum temperatures, observed and projected under medium and high emissions scenarios. The shaded area represents the range of likely temperatures in each scenario; the colored lines represent the most likely temperature in each scenario. Produced using Cal-Adapt.

Period	Years	Emissions Scenario	Average	Range of Averages	Units
Baseline	1961-1990	Observed	75.9		°F
Mid-Century	2035-2064	Medium (RCP 4.5)	80.1	77.7-82.7	°F
End-Century	2070-2099	Medium (RCP 4.5)	81.3	79.1-84.3	°F
Mid-Century	2035-2064	High (RCP 8.5)	81.0	78.5-83.2	°F
End-Century	2070-2099	High (RCP 8.5)	84.5	81.5-88.3	°F

Table 4: Annual Average Maximum Temperature, observed and projected under medium and high emissions scenarios over 30-year periods according to Cal-Adapt. The numbers in the average column represent the averages of the most likely outcome over the 30-year periods. The numbers in the range of averages column represents the averages from all climate models over the 30-year periods.

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Average temperatures and days with extreme heat are expected to increase, increasing evaporation and evapotranspiration (release of water vapor by plants) in turn. Residential water use for landscaping may increase in response. Future droughts will be defined not just by precipitation and temperature, but by water supply storage levels across the water system and water use by end users. In other words, drought is not an entirely natural phenomenon.

Heat waves are widely predicted to increase in severity, frequency, and duration. Cal-Adapt provides predictions for the duration of future heat waves.

Extreme Heat Days

Number of days in a year when daily maximum temperature is above a threshold temperature of 98.7 °F

Note: Threshold temperature used in this tool is location specific. It is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed at a location.

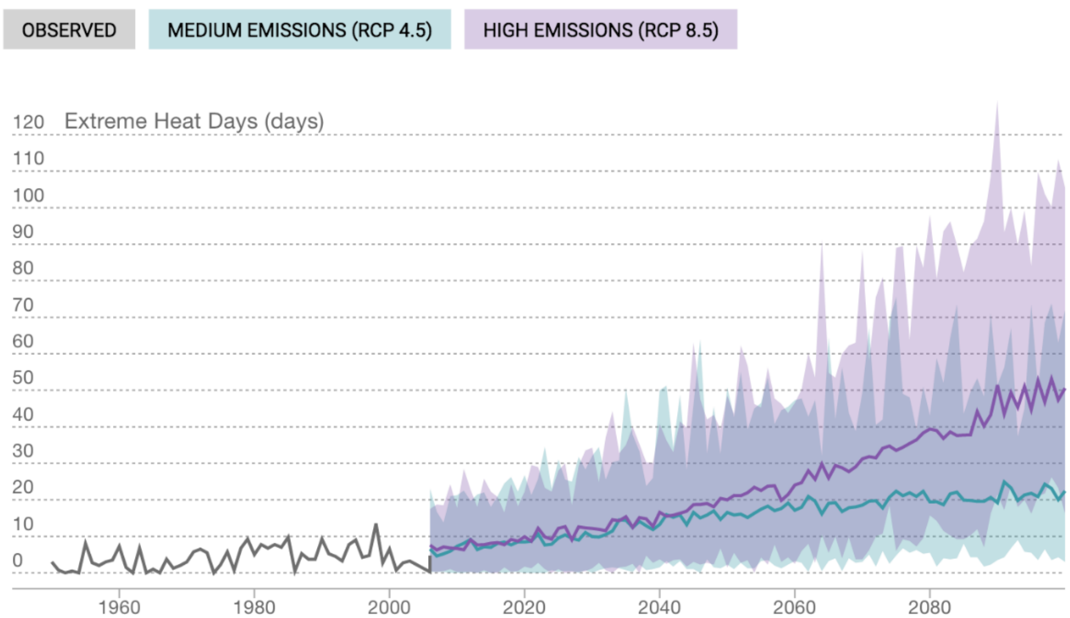

Figure 8: Number of extreme heat days, observed and projected under medium and high emissions scenarios. The shaded area represents the range of likely number of extreme heat days in each scenario; the colored lines represent the most likely number of extreme heat days in each scenario. Produced using Cal-Adapt.

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Period	Years	Emissions Scenario	Average	Range of Averages	Units
Baseline	1961-1990	Modeled Historical	3	2-4	days
Mid-Century	2035-2064	Medium (RCP 4.5)	16	9-38	days
End-Century	2070-2099	Medium (RCP 4.5)	21	14-55	days
Mid-Century	2035-2064	High (RCP 8.5)	20	13-41	days
End-Century	2070-2099	High (RCP 8.5)	41	28-88	days

Table 5: Number of extreme heat days, observed and projected under medium and high emissions scenarios over 30-year periods according to Cal-Adapt. The numbers in the average column represent the averages of the most likely outcome over the 30-year periods. The numbers in the range of averages column represents the averages from all climate models over the 30-year periods.

As shown in Figure 9, the number of extreme heat days (defined as days with high temperatures above 98.7F for La Cañada) is expected to increase dramatically by mid-century. By the end of the century, Cal Adapt projects as many as 10 times as many extreme heat days, extending over a months' worth of days.

As dramatic as the expected increase in high temperatures and the number of extreme heat days is the expected increase in the number of warm nights. Cool nights provide natural relief from heat for humans, animals, and plants. Warm nights compound the problem of high daytime temperatures, particularly for the elderly and people living with medical conditions. They also expand La Cañada's total energy demand measured in cooling degree days.

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Warm Nights

Number of days in a year when daily minimum temperature is above a threshold temperature of 68.8 °F

Note: Threshold temperature used in this tool is location specific. It is defined as the 98th percentile value of historical daily maximum/minimum temperatures (from 1961–1990, between April and October) observed at a location.

OBSERVED | MEDIUM EMISSIONS (RCP 4.5) | HIGH EMISSIONS (RCP 8.5)

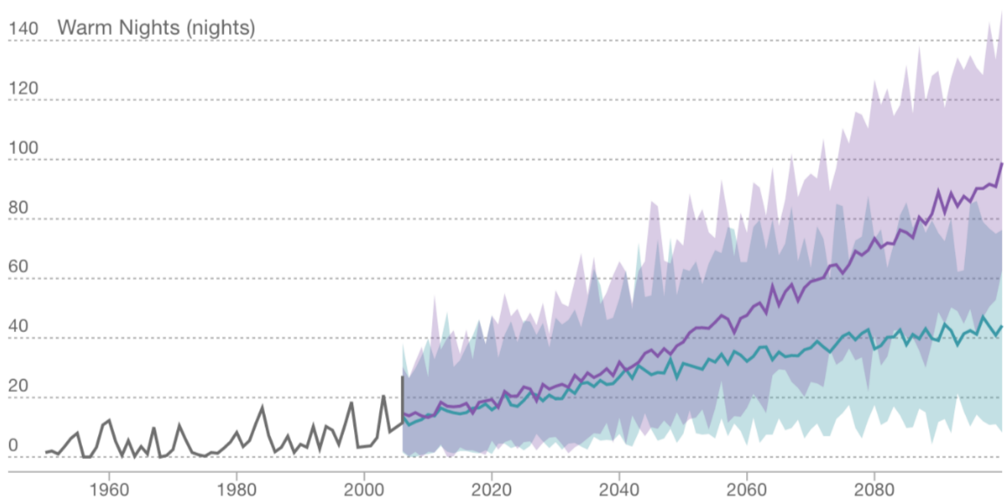

Figure 9: Annual number of warm nights (daily minimum temperatures above 68.8), observed and projected under medium and high emissions scenarios. The shaded area represents the range of likely temperatures in each scenario; the colored lines represent the average of most likely temperatures in each scenario. Produced using Cal-Adapt.

Period	Years	Emissions Scenario	Average	Range of Averages	Units
Baseline	1961-1990	Observed	4		nights
Mid-Century	2035-2064	Medium (RCP 4.5)	30	18-50	nights
End-Century	2070-2099	Medium (RCP 4.5)	40	23-58	nights
Mid-Century	2035-2064	High (RCP 8.5)	39	24-58	nights
End-Century	2070-2099	High (RCP 8.5)	76	53-102	days

Table 6: From an observed baseline of 4 nights a year, La Cañada is expected to experience a 10-fold increase of warm nights, with 30 warm nights in the near term and the possibility of more than two months worth of warm nights in the long term.

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4.4.3 Wildfires

Remarkably, given the expected increases in average and extreme temperatures, the annual average area of La Cañada burned by wildfires is projected to remain roughly the same (approximately 115 acres/year) or *decrease* by the end of the century, according to Cal-Adapt. This prediction may be based on an assumption that urbanization over the next fifty years will reduce vegetative fuel load in La Canada and increase reliability of fire-fighting water access and resources - even as the wildfire risk to forested areas adjacent to La Canada increases.

Cal-Adapt provides predictions for an additional climate indicator, the Keetch-Byram Drought Index (KBDI) which describes the predicted wildfire *risk*, instead of the predicted wildfire *impact* (acres burned). Measured on a scale of 0-800, the number represents the amount of precipitation (in 100ths of an inch) needed to saturate the soil with moisture. A KBDI of 600 or greater (6 inches) represents the threshold beyond which drought is considered severe and wildfire risk is extreme.

KBDI > 600

Number of days in a year where Keetch-Byram Drought Index (KBDI) > 600. KBDI provides an estimate for how dry the soil and vegetative detritus is.

KBDI is cumulative. The KBDI values increase on dry and warm days and decrease during rainy periods. In California we would expect KBDI to increase from the end of the wet season (spring) into the dry season (summer & fall). The list below explains what values of KBDI represent:

0–200	Soil moisture and fuel moistures are high, low wildfire risk.
200–400	Soil and fuels start to dry, average wildfire risk.
400–600	Onset of drought with moderate to serious wildfire risk.
600–800	Severe drought, extreme wildfire risk and increased wildfire occurrence.

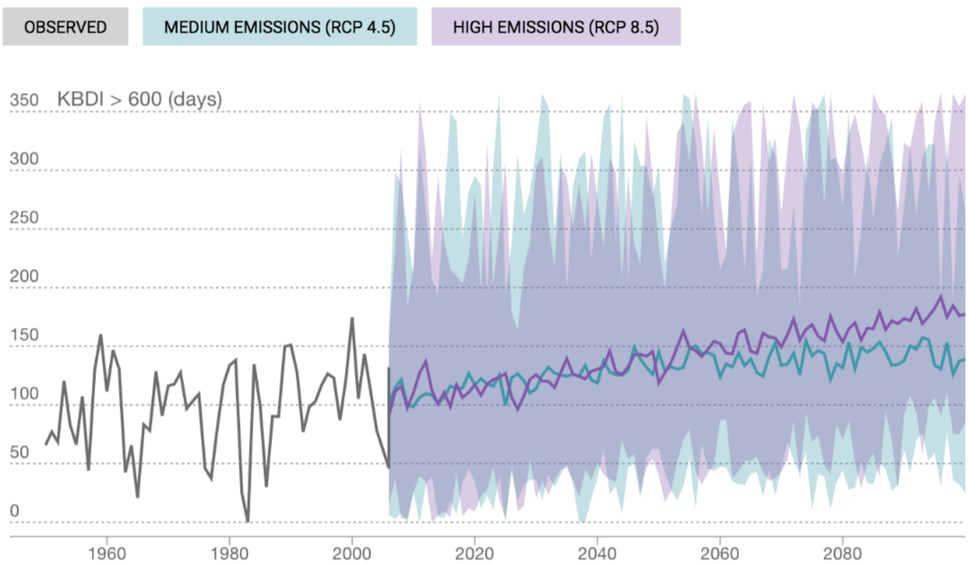

Figure 10: Number of days with a KBDI index above 600, projected under medium and high emissions scenarios. The shaded area represents the range of likely number of days in each scenario; the colored lines represent the most likely number of days in each scenario. Produced using Cal-Adapt.

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Period	Years	Emissions Scenario	Average	Range of Averages	Units
Baseline	1961-1990		93		days
Mid-Century	2035-2064	Medium (RCP 4.5)	134	100-175	days
End-Century	2070-2099	Medium (RCP 4.5)	141	90-174	days
Mid-Century	2035-2064	High (RCP 8.5)	140	104-177	days
End-Century	2070-2099	High (RCP 8.5)	169	128-202	days

Table 7: Number of days with KBDI above 600 projected under medium and high emissions scenarios over 30-year periods. The average number of days above 600 is expected to increase under both medium emissions and high emissions scenarios.

4.3.4 Air Pollution/Air Quality

The Los Angeles County Climate Vulnerability Assessment describes a projected increase of wildfire burn area in the San Gabriel Mountains as high as 50 percent by the end of the century under a high emissions scenario.[27] "Areas particularly exposed include the mountainous band of LA County near the Angeles National Forest." Even if this increase in wildfires in the mountains does not translate to a 1:1 increase in wildfires in La Canada, wildfires are likely to become a greater part of daily life as smoke from these wildfires impacts air quality. Wildfires produce high concentrations of particulate matter, and other harmful air pollutants like nitrogen oxides, Volatile Organic Compounds (VOCs), carbon monoxide, and ozone.

The Los Angeles County Climate Vulnerability Assessment projects that climate change will "exacerbate poor air quality in the region, which already experiences some of the worst air quality [levels of particulate matter and ozone] in the country"[28]

[27] Los Angeles County Climate Vulnerability Assessment, p. 28
[28] *ibid*, p. 32

5. Impacts on La Cañada Assets/Community Sectors

Information about the impacts of climate hazards was supplemented by a series of public meetings, and through an internal review process. Specifically, the CAAP Task Force was asked to rank what natural and built assets and facilities and what sectors of the economy were most important to La Cañada' quality of life. Results receiving 40% or more are shown below.

5.1 Natural Environment

5.1.1 Local Assets

Hundreds of miles long and crossing from ocean to desert, California has always been known for its diverse plants and animals. La Cañada in particular has had many species introduced, but has many native plants and animals that thrive throughout the city. Some of these include the Great-tailed Grackle, Fuschia Flower Gooseberry, Pineapple-weed, the Glossy Pillar and the California Peony.[29] These have been able to thrive because of the amount of open space around La Cañada. Approximately 819 acres of land are owned by the federal government, state, county or the Los Angeles Flood Control District and provide space for plants and animals to live. There is a 24 mile trail system and 5 city parks for public use.[30] Providing green spaces is not only good for the ecosystem, but is also good for public health and helps the city maintain visual pleasure.

5.1.2 Description of Impacts & Sensitivities

Temperature, Extreme Heat & Drought

One impact of extreme temperatures and extended heat waves on the natural environment will be heat stress on plants with the potential for slow native species die-out and replacement by non-native species. These tipping points will depend on many factors including species and age. Average temperatures and the number of extreme heat days are projected to increase throughout the century, according to Cal-Adapt. Higher temperatures combined with less consistent rain will impact both water supply and outdoor water demand. Managed landscapes will require greater care and watering. Home gardeners and city staff may find formerly tried and true ornamental plants less reliable – or untenable due to new ordinances or demand management measures. The capacity of native, non-native, and ornamental plants to survive in a hotter, drier climate is not known.

Precipitation & Flooding

Located at the foot of the San Gabriel Mountains, La Cañada Flintridge is exposed to the effects of increased precipitation and resultant flooding, which can considerably impact its rich natural environment. Heavy rainfall can cause the city's streams to rapidly overflow, leading to substantial disruptions in the local ecosystem populated by diverse native and non-native species. These events can lead to widespread soil erosion, displacing plant life, upsetting animal habitats, and potentially shifting non-native species to new regions, thus destabilizing the ecological balance. Downed trees may be more common as trees rooted in soils saturated from previous storm events contend with heavy winds. The city's cherished green spaces and hiking trails, central to the local environment and recreational life, can sustain severe damage due to heavy rainfall and flooding. This could necessitate closures for repair, depriving residents of their favorite outdoor activities and impacting the city's aesthetic charm. Flooding can also cause damage to the city's public parks, leading to losses of trees and other plant life and requiring substantial restoration efforts.

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[29] "Observations." *INaturalist*, https://www.inaturalist.org/observations?place_id=4290&view=species

[30] *Open Space and Recreation Element - La Cañada Flintridge, California*. https://cityoflcf.org/wp-content/uploads/2019/09/General_Plan_Open-Space_Recreation.pdf

Wildfires & Air Pollution
According to the City's Local Hazard Mitigation Plan, La Cañada Flintridge has been designated as being completely in a very high fire hazard severity zone. The surrounding San Gabriel Mountains to the North and San Rafael Hills to the South are considered to be interface areas, presenting great potential for wildfires within La Canada Flintridge, as well as the potential to create unhealthy levels of air pollution within City limits.

5.2 Built Environment

5.2.1 Local Assets

Buildings
La Cañada is a vibrant city in L.A. County with a total of 6,750 homes, ranking it 79th in the county. The majority of these homes, 80%, are owned outright, indicating a strong sense of stability within the community. The city features essential amenities such as schools, a library, a community center, city hall, fire stations, a sheriff station, a post office, and a hospital. La Cañada's buildings, including critical response buildings, can serve as vital resources for shelter, commerce, and daily life during emergencies. Additionally, the city offers a variety of shops and restaurants along Foothill Boulevard, contributing to its unique character. Moreover, La Cañada is home to the Jet Propulsion Laboratory, further highlighting its significance.

Infrastructure
Infrastructure is very important for evacuation and keeping the necessary systems running before, during and after a hazard event. Freeways, streets and bridges provide adequate evacuation routes and transportation throughout the city. Highway 210 runs northwest and southeast while Highway 2 runs northeast providing access to the mountains and south towards Glendale. There are 38 bridges in La Cañada, most of which were built in the 1970's. 95.6% of them are in satisfactory condition or better.[31] The nearest airport to La Cañada is Hollywood Burbank Airport which is 16 miles from downtown, or a 17 minute drive. The larger Los Angeles International Airport is located 32 miles away, or roughly 45 minutes. Only costing $1.75 with student and senior discounts available, public transportation is a very economic and environmentally friendly way to get around.[32] However, access from La Cañada is limited, as rail lines do not extend to the city.

There are three waste disposal services in La Cañada that provide trash, recycling, compost pickup, and street sweeping. There are four water companies and facilities that help treat water and manage our most important resource. The same companies provide sewage collection and irrigation throughout the city. Private water and utility facilities are also included in this category because they function in a public capacity.

[31] "Bridge Statistics for La Canada Flintridge, California (Ca)Condition, Traffic, Stress, Structural Evaluation, Project Costs." *Bridge Statistics for La Canada Flintridge, California (CA) - Condition, Traffic, Stress, Structural Evaluation, Project Costs*, http://www.city-data.com/bridges/bridges-La-Canada-Flintridge-California.html
[32] "Metro: Bus, Rail, Subway, Bike & Micro in Los Angeles." *LA Metro*, 1 Dec. 2022, https://www.metro.net

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The Everbridge emergency notification system allows Crescenta Valley Water District (CVWD) to instantly send critical messages to residents and businesses across multiple communication devices and help educate communities on their water use and emergency information.

The Southern California Edison company is the main source of electricity in the whole city. Mainly helping provide electricity to residential homes, many businesses and commercial buildings use electricity from the same company. La Cañada's cost for electricity is 87% higher than the rest of the country.[33] The electricity companies say using more solar power would reduce the cost. The SoCal gas company is the only company that provides gas to La Cañada and is located in Monterey Park, CA.

There are 6 cell towers in La Cañada that provide cell service and wifi to the city and surrounding areas. AT&T has the best service to access the internet and has been rated number one in best wifi for that area.[34] Having these systems work together helps a city mitigate hazards by allowing communication, transportation and access to electricity and water during and after an emergency.

5.2.2 Description of Impacts & Sensitivities

Temperature, Extreme Heat & Drought

Increases in temperature and extended heat waves will change the cooling needs of all building types and may tax the energy grid. Pacific Gas & Electric's Public Safety Power Shutoffs (PSPS) to reduce wildfire risks during heat waves will require alternative and off-grid energy sources to cool residential, commercial, and government buildings.

In general, homeowners in La Cañada have the financial resources to adopt new technologies to manage heat and produce and store renewable energy. Fixed income homeowners and renters have less of an adaptive capacity.

Most transportation infrastructure will be unaffected by extreme heat and drought. Risk of asphalt softening is limited to extended temperatures above 100°F. Safety power shut offs and brownouts caused by heat can cause outages of traffic signals and street lights. Extreme heat will increase use of private vehicles at the expense of walking, biking, and taking public transit.

Temperature changes and extreme heat throughout the region will impact the availability of the water supply. Today, over 90% of the water consumed is imported from the Colorado River and the State Water Project in Northern California. If the La Cañada Suburban District is partially protected from the risk of decreased snowpack in the Sierra Nevada mountains, supply is projected to decrease by 48-65% by 2100.[35] The projected decrease underscores how many of the critical systems and natural resources of La Cañada extend beyond its borders where climate change may produce more extreme impacts.

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[33] "Residential Services." *City of La Cañada Flintridge*, 6 May 2022, https://cityoflcf.org/public-works/residential-services

[34] "Top 7 Internet Providers in La Canada Flintridge, CA." *BroadbandNow*, 11 Jan. 2023, https://broadbandnow.com/California/La-Canada-Flintridge

[35] "Water." *La Cañada Irrigation District*, 1 Feb. 2019, https://www.lacanadaid.org/water/#:~:text=Today%2C%20over%2090%25%20of%20the,Project%20(Northern%20California)%20waters

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Water supply issues are heavily regulated and very much in the public eye, in contrast to the climate risk of extreme heat. To a degree, water suppliers are already preparing for climate change. CalWater is developing new water supplies to improve reliability, including fresh water pumps to fill the delta with fresh water and keep the rising salt water out of it. The impacts from climate change to La Cañada water availability may come indirectly through external adaptive measures like increased regulations, including updates to the State's Model Water Efficient Landscape Ordinance, prohibitions, price increase from their already high water payments and demand management measures, rather than severe restrictions.[36]

Safety power shut offs and brownouts caused by heat can disrupt pumps in the water supply and wastewater systems.

Precipitation & Flooding

Severe precipitation and repeated flooding may increase stream bank erosion and flooding, causing scour under the numerous bridges and creek crossings. Buried pipes may be exposed and/or damaged. Storm sewers may get backed up and cause localized flooding. With multiple heavy storms occurring yearly by the end of the century, wear and tear on roads and within pipes may require repair and replacement more frequently than planned for.

La Cañada has experienced limited flooding of homes or structures, although there are many buildings that have a 0.2 percent annual chance of flooding, according to FEMA flood maps. Hydrologic and hydraulic modeling outside of this report scope would be needed to understand how the risk of flooding in specific areas may increase in the future.

Wildfires & Air Pollution

Wildfires pose a greater hazard to structures, including homes, and above ground assets than to underground assets. Air pollution from wildfires outside of La Cañada does not have a significant impact on buildings and infrastructure, simply requiring changing filters on buildings and vehicle fleets more frequently.

5.3 Economy

The impact of climate hazards on the economy are hard to predict. Climate extremes will generally cause more wear and tear of physical assets, leading to shorter lifespans and faster replacement cycles for buildings and infrastructure. Increased spending on maintenance will be needed. Disasters cause a drop and then rise in expenditures, following Federal assistance and insurance payouts, though in sum disasters produce both environmental and economic losses.

[36] California, State of. "Climate Change and Water." *Department of Water Resources*, https://water.ca.gov/Programs/All-Programs/Climate-Change-Program/Climate-Change-and-Water

5.3.1 Description of Local Assets

La Cañada is known for being a very wealthy city. Only 3.3% of the population is in poverty. 80% of homes are owned. Currently there are 48 homes for sale ranging from a one acre plot of land going for $699k to a 5 bedroom home costing $11M. The median home price is $2.4M. Property taxes only take 2% of homes total value. Beyond housing, living in La Cañada is expensive: the average cost of living for a family of four is $4,454 per month.[37] 39.1% of the population works in finance and insurance, scientific and technical services or in educational services, all earning around $100k/year.[38] This can be compared to the 20.7% of people employed nationally who work in those well paying fields. La Cañada has more people in those industries per capita. The average household income is $258,391. La Cañada collects the highest legal local sales tax at 9.5% which provides adequate funds to the city. The city has many fees that one may encounter while living there including renting city facilities, paying for building and photography permits, false alarm police response fees and licenses for tobacco and alcohol sales.[39] This money not only provides funds to keep the city's infrastructure intact and keep classroom sizes small, but also provides small businesses grants to help them through tough times like pandemics. Overall La Cañada is ranked the best place in California to raise a family because of how well the city takes care of itself, due to its tax base and natural advantages.[40]

5.3.2 Description of Impacts & Sensitivities

Temperature, Extreme Heat & Drought

Temperature, extreme heat, and drought are most likely to cause a negative effect on the economy as residents and businesses spend more on air conditioning (and California-wide on food) to maintain the same quality of life. Outdoor living is important to quality of life and outdoor comfort is an important free asset for restaurants and retail businesses. However, temperature increases and more extreme weather may impact quality of life for residents of La Cañada.

Decreasing comfort negatively impacts worker productivity and may disrupt outdoor businesses like landscaping and construction. Temperature-related mortality is also a projected loss. Power outages and brownouts caused by extreme heat will also negatively impact the economy through everything from loss of perishable items to adding uncertainty to business operations. Expensive solutions for managing electricity unreliability like diesel generators add negative environmental externalities. At the same time, the COVID-19 pandemic has been longer lasting and more far reaching than most of the direct climate hazards of the near future.

Precipitation & Flooding

Property damage and temporary disruption of utilities and infrastructure can create temporary or extended loss of operations for businesses, particularly for businesses with non-durable goods. Even perceptions of flood risk and flood safety can influence the housing market.

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[37] "La Canada Flintridge, CA: Cost of Living, Salaries, Prices." *Livingcost.org*, 7 Aug. 2022, https://livingcost.org/cost/united-states/ca/la-canada-flintridge

[38] "POPULATION BY OCCUPATION." *Economy in La Canada Flintridge, California*, https://www.bestplaces.net/economy/city/california/la_canada_flintridge

[39] "Master Fee Schedule." *City of La Cañada Flintridge*, 3 Oct. 2022, https://cityoflcf.org/masterfeeschedule/.

[40] Wire, Stacker via Nexstar Media. "Study Ranks the Best Places to Raise a Family in California." *KTLA*, KTLA, 13 Aug. 2022

Wildfires & Air Pollution

Temporary disruption of utilities and infrastructure from wildfire-related PSPS can create temporary or extended loss of operations. When poor air quality keeps people in their home, they are less likely to spend in La Cañada's stores and restaurants.

5.4 Vulnerable Populations

5.4.1 Description of Local Populations

La Cañada Flintridge, a city with a population of 20,114,[41] offers its residents a high standard of living characterized by a high income level and quality of life. Comprising merely 0.52% of Los Angeles's size,[42] La Cañada maintains a low-density residential structure, with most of its land divided into large plots for single-family homes. The backbone of the community is the 59% of people over the age of 35. Throughout the past few years the demographic trends towards an older and more diverse community. Many of these people are commuting because of the type of work that pays enough to live in LA County. There is evidence of economic growth when the number of commuters, home prices and employment increase. Although 26% of the community is above the age of 55, La Cañada has held a high standard of public health.[43] According to City-Data.com, "58% of La Canada Flintridge residents report that their diet is generally healthy."[44] This could be due to the fact that not many people work outside. With 11.2% of the population being executives and supervisors and 8.7% of the population being lawyers, surgeons and physicians, many people have good health insurance and do not have to work outside in the elements. Therefore the population has been staying steady. The infrastructure itself has a lot to do with what kind of population is attracted to the area. With 62 golf courses within twenty miles of the area,[45] La Cañada attracts a more leisurely lifestyle. According to Google there are 54 gyms including yoga and martial art studios, workout facilities and private training centers. The population has a very low obesity rate. There are 10 hospitals within 10 miles of the city making sure everyone is safe and healthy. There are no homeless shelters so the one community center provides shelter during emergencies.

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[41] *U.S. Census Bureau Quickfacts: La Cañada Flintridge City, California*. www.census.gov/quickfacts/lacanadaflintridgecitycalifornia

[42] Curtis, Hon. Jonathan. *Profile of the City of La Canada Flintridge*. Southern California Association of Governments (SCAG) Regional Council, May 2019

[43] "Health and Nutrition of La Canada Flintridge, CA Residents." *Health and Nutrition of La Canada Flintridge, CA Residents: Sexual Behavior, Medical Conditions, Reproductive Health, Mental Health, Consumer Behavior, Physical Activity, Oral Health, Taste & Smell, Audiometry, Diet Behavior & Nutrition, and More*, http://www.city-data.com/health-nutrition/La-Canada-Flintridge-California.html

[44] "La Cañada Flintridge, California." *La Canada Flintridge, California (CA 91103) Profile: Population, Maps, Real Estate, Averages, Homes, Statistics, Relocation, Travel, Jobs, Hospitals, Schools, Crime, Moving, Houses, News, Sex Offenders*, http://www.city-data.com/city/La-Canada-Flintridge-California.html

[45] "La Canada, California Golf Courses." *GolfLink*, https://www.golflink.com/golf-courses/ca/la-canada

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5.4.2 Description of Impacts & Sensitivities

Temperature, Extreme Heat & Drought

Projected temperature changes will impact the seasonality and frequency of outdoor recreation, biking and walking, and even passive enjoyment of the outdoors. Outdoor comfort will increase in winter, spring, and fall and decrease in summer. Parks, yards, and other outdoor areas will become undesirable during heat waves, and parking lots and streets may become dangerous to certain populations during extreme heat.

From medical and sociological research, we know that certain populations are more vulnerable to extreme heat. However, not all of these populations exist in La Cañada. Based on the City's Local Hazard Mitigation Plan, the vulnerable populations present in La Cañada include the elderly, youth, and the economically disadvantaged. Only a small percentage of the City's population is considered economically disadvantaged. Other populations that could be considered disadvantaged include people with chronic or pre-existing medical conditions, people with disabilities, and people with limited English proficiency. If projected temperature changes are experienced, incidences of heat stroke, hospitalization, and heat-related mortality will increase first and foremost within these groups.

Day laborers in landscaping and construction are a vulnerable population who may commute into La Cañada to work outdoors. La Cañada does not have experience providing services or communications to this population, so managing their health risk will be a challenge.

Precipitation, Flooding, & Landslides

In La Cañada Flintridge, extreme precipitation, flooding, and landslides could significantly impact the city's vulnerable populations. The elderly residents, making up 26% of the population might be at a greater risk due to potential mobility limitations and the physical stress associated with such events. Similarly, the community's youth could face amplified safety risks during these extreme weather scenarios. The small number of economically disadvantaged portion of the city's population, along with commuting day laborers engaged in outdoor work, could confront severe hardships due to potential loss of property or work, and may lack the resources to recover quickly.

The city's infrastructure plays a role in its vulnerability to these hazards as well. Damage to roads and public transportation routes could disrupt the lives of all residents, particularly those relying on public transportation. The community center, the only emergency shelter in the city, could be overwhelmed in large-scale flooding or landslide events, making the lack of alternative shelter options a critical concern. Moreover, residents with chronic or pre-existing medical conditions, disabilities, and those with limited English proficiency may encounter additional challenges during these extreme weather events, from comprehending emergency notifications to accessing necessary medical care, further emphasizing the need for proactive and inclusive emergency planning.

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Wildfires & Air Pollution

La Cañada Flintridge, with its close proximity to expansive forests, vast vegetation areas, and mountainous terrain, is particularly susceptible to the threat of wildfires. This risk is heightened for residents living near mountains where large trees and dense brush are present. The region's drought conditions add to this risk, drying out the vegetation and enabling fires to climb swiftly up canyons, thereby increasing the vulnerability of nearby homes. Preparing for, evacuating from, and recovering after wildfires can pose distinct challenges for the city's vulnerable populations. These groups include people with limited mobility or functionality, those with chronic or pre-existing medical conditions which could be worsened by poor air quality, and individuals with limited financial resources. Additional vulnerable groups include children, seniors, those with limited access to public transportation, and individuals for whom English is a second language.

The lack of wildfire insurance and inadequate knowledge of the need to regularly reassess the value of homes can leave families unable to rebuild after a fire. Even within affluent La Cañada, some residents may be asset-rich but cash-poor or lack funds necessary for fire mitigation in their tree-dense yards. Air pollution, exacerbated by local and distant wildfires, can significantly impact the city's residents, particularly those with respiratory conditions and those who work outdoors. However, familiarity with N-95 masks due to the Covid-19 pandemic may provide a degree of protection. Looking ahead, the General Plan Safety Element Assessment created in 2020 with the Board of Forestry and Fire Protection and the California Department of Forestry and Fire Protection will be crucial in planning for future risks, emphasizing community education, infrastructure resilience, and environmental stewardship.

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6. Summary

La Cañada appears better off than many other areas in California with regards to climate change. La Cañada is not directly coastal so it will not experience the impacts of sea level rise, but its relative proximity to the Pacific Ocean should temper climate extremes somewhat in the near term. Earthquakes are projected to be a relatively more common and more damaging hazard than any single climate hazard.

Many of the impacts of climate change on La Cañada will not be direct but instead reverberations from nearby. La Cañada depends on the natural environment, the water supply system, and the energy grid outside of its borders. So the availability and affordability of water and energy within La Cañada are likely to be jeopardized by climate change across the Bay Area and California as a whole.

Within La Cañada itself, by mid-century particularly under a high emissions scenario, the number of extreme heat days are projected to increase substantially. Heat and poor air quality from wildfires outside of La Cañada are most likely to impact the quality of life, particularly for vulnerable populations, and increase energy demands for additional building air cooling/filtering. Extreme heat, poor air quality, and blackouts or PSPS that occur simultaneously will present novel emergency situations that have the potential to strain or overwhelm City resources.

Similarly and more uncertain will be the resilience of La Cañada natural and maintained landscapes. The annual precipitation amounts in La Cañada are not likely to change, but will become less consistent and in combination with expected temperature increases will in turn increase the amount of water that plants need. Considering pressure on the shared water supply system which La Cañada relies on, it is likely that water customers will face financial incentives and regulatory pressure to reduce daily water use.

In the winter and spring, seasonal storms which La Cañada has experienced in the past are likely to continue. Rainfall amounts that used to occur once every several years are projected to occur multiple times a year by the end of the century, increasing the need for maintenance and repair of stormwater infrastructure on building sites and across the city.

La Cañada government, residents, and businesses are somewhat prepared after living through years of drought and the Covid-19 pandemic. The scale of climate change and the need to reach new vulnerable populations during heat waves may be challenging.

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APPENDIX B:
CAAP Stakeholder Report

Prepared by:

blue strike

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CAAP
Stakeholder Report

Stakeholder Workshops
May 18, 6:00 – 8:00 p.m.
May 20, 1:00 – 3:00 p.m.

Attendance
Roughly 25 people per event
A list of names is on the last page of this report.

Location
City Council Chambers

Approach

As the City of La Canada Flintridge moves into the strategy development phase of the CAAP, the city conducted two workshops to better understand the high-level priorities of the community. The goal of these stakeholder events was to provide a discussion forum on a range of issues relating to the development and implementation of new and expanded environmental goals and strategies.

Kristin Cushman, CEO of Blue Strike Environmental facilitated the discussion, along with Ben Fordham with Blue Strike and Eleni Getachew with Impact Sciences. Emily Stadnicki, city staff, was in attendance.

Blue Strike presented the stakeholders with strategies that are considered best practices in the climate industry, organized into four sectors: Transportation, Energy, Resource Conservation, and the Green Community. As each best practice was introduced, the conversation revealed how relevant each was to the city and uncovered existing gaps and opportunities worth discussing.

In the gap analysis section of this report, each best practice is listed, followed by baseline findings and reactions as well as gaps that need to be further addressed. From this baseline and gap analysis, we created a first draft of preliminary recommended strategies that we might want to further vet as a CAAP Committee.

In the TOP 10 “Bang for your Buck'' section, we have compiled a list of the one thing that each stakeholder would hope to see enacted in the CAAP. Each stakeholder was asked “What one thing would be on your wishlist that you would like to see in the CAAP?” and “What is one thing that you think is realistic that you hope to see in the CAAP?”.

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GAP Analysis

Transportation

Initiate a car free day for the school district

Baseline

- A large percentage of students live outside of the city limits. Many parents shuttle their kids to school but would like to have another option. Kids use the public transit after school to get around.

Gaps

- There is no school bus system.
- There are no solutions for transporting kids to private school.

Recommendation

- Revisit initiating a school bus route.
- Expand and promote car sharing programs.
- Improve safety by adding more sidewalks around town.

Improve connectivity of transportation network

Baseline

- There is an existing cross-town shuttle but it is not electric.
- People did not think a Scooter program would make sense along Foothill.
- An estimated 15% of students live outside of the district.

Gaps

- There was concern that the bus was not frequent enough; the website is not reliable.
- The bus route does not expand into the neighborhoods; concern about the steep hills.
- As school lets out, it is often that the buses are so crowded that students can't get on.
- There are no easy transit options to move people beyond the city.
- Need more reliable links to get to the Metro.
- Cost

Recommendation

- Expand and promote car sharing programs.
- Expand transit route and frequency;
- Estimated 20-30 minute wait between pick up times.
- Transition bus and/to all electric.
- Consider rideshare options to LAX, similar to the beach bus.
- Assess and promote Park- n- Ride options for commuters outside of the city.
- Consider an eBike sharing program in and around the city.
- Consider hybrid schedules for people who work in and out of the city.

Explore preferred EV-only parking spaces in high traffic areas

Baseline

- There was a lot of interest in better supporting EV parking in town; by a show of hands, roughly 90% of the people owned EVs.

Gaps

- Although people liked the idea of preferred parking spaces, they all charge at home so didn't feel the need to add charging stations.
- Two EV charging stations not working

Recommendation

- Conduct an assessment to understand if current EV charging infrastructure is sufficient for visitors.
- Consider high traffic areas where preferred parking could be implemented (grocery stores, Town Center, etc.)
- Consider an anti-idling campaign.

Set goal of all new City vehicle purchases as EVs by 2030

Baseline

- There are three city-owned vehicles.
- Overall discussion on how small the city's emissions will be; a large focus of the CAAP should be around residential behavior change programs and incentives.

Gaps

- None

Recommendation

- Establish a "purchasing standard" that requires the city to transition vehicles to all electric as new vehicles are purchased.

Incorporate a bike lane through town

Baseline

- There was little interest in biking; a few raised their hands and said they would bike more often if there was a bike route within the city.
- The streets are wide enough to earmark space for a bike lane along Foothill and in the neighborhoods.

Gaps

- The steep hills were a primary deterrent to biking.
- Crossing the bridge into town across 210 is not safe for walking or biking.
- The physical layout of the city makes walking and biking challenging.
- No organized bike parking infrastructure.

Recommendation

- Write a Bicycle and Pedestrian Plan

Energy

Consider renewable natural gas programs

Baseline

- Eliminating natural gas in residential homes was not well received.
- We spoke about some renewable natural gas programs that could be an option, but most were skeptical.
- Other REACH codes were discussed, and people seemed more interested in energy efficiency and solar.
- We discussed the commercial Green Business Program and how that could be transitioned into a residential program.
- Discussed long term concepts around creating a city run "virtual power plant", similar to the city of Lancaster.

Gaps

- There is no city staff dedicated to educating residents on where to find resources or to answer questions; need staff rather than another resource page on the website.
- Residential solar seems to have challenges due to the large number of trees.
- There are no incentive programs within the city to subsidize the cost of energy efficiency.

Recommendation

- Consider joining the Clean Power Alliance that would build revenue that could be reinvested in city projects and incentive programs.
- Promote the Green Business Program to commercial businesses.
- Consider possible local-level initiatives to implement city policies or incentives to reduce natural gas use.

Mandate energy retrofits at the time of property resale

Baseline

- People felt that education was a better approach than making a requirement (i.e. All remodels are required to transition to all electric).

Gaps

- Assess the need.
- Learn about CPACE which is a funding mechanism assigning retrofit cost to the value of your home.

Recommendation

- Establish REACH code: Upgrade electrical panel with sufficient capacity to serve electrical equipment and appliances, and electric vehicle.
- Offer a fast track permitting process for residential energy upgrades

Ban gas-powered lawn equipment

Baseline

- It was clear that this was a hot topic. By a show of hands, 90% of the people expressed anger around this topic.
- We discussed the recent vote by the City Council to not approve this ban.
- GHG emission inventory includes yard equipment and construction vehicles.

Gaps

- Need a better understanding of why this ban got voted down.

Recommendation

- Ban gas-powered lawn equipment.

Explore renewable energy and battery storage for City facilities

Baseline

- People liked this idea and suggested the City Hall building, High School, or Library

Gaps

- There are no emergency shelters with the ability to maintain power during a climate crisis.
- There is a need for a list of solar installers in the area, similar to the Tree Arborist list.
- Elementary school is going through renovation, but plans do not include solar.
- Need to prepare for Public Power Shut off events.

Recommendation

- Write a formal Emergency Preparedness Plan
- Communicate how to access this plan across all demographics within the city.
- Consider a residential and commercial "Bulk Purchasing" solar agreement to bring upfront costs down. Campaign: Solarize LCF.

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Resource Conservation

Require water-saving landscaping in all new construction

Baseline

- La Canada has a lot of land covered by residential lawns. By a show of hands, 50% said they would give up their lawns for more native plants.

Gaps

- No education around the state's native plant incentive programs.
- No control of the water companies

Recommendation

- Establish REACH code: Require irrigation with recycled water for common landscaping in single-family developments.
- Limit residential water use during drought months; establish enforcement strategies

Establish franchise agreement for waste hauling

Baseline

- There are multiple waste haulers which makes recycling programs confusing. They each have different recycling guidelines.

Gaps

- No Consistency
- Not enough education
- There is no focus on SB 1383 food waste and recovery ordinance.
- Schools offer a great opportunity to launch zero waste programs and education; start young.
- City trash cans not labeled; no recycling at City Hall. What about across town?

Recommendation

- Author a Franchise Agreement for the entire city.
- Expand diversion policies according to state mandated SB 1383 food recovery networks.
- Partner with the High School Environmental Club to pilot a zero-waste program.
- Partner with waste haulers to bring zero waste programs to all city sponsored community events.
- Consider a publicly accessible Reuse, Repair, Recovery, and Refurbishment outlet (partner with a local non-profit)
- Pair all city owned trash cans with a recycle bin

Design a Train the Trainer campaign to disseminate information around waste and energy initiatives

Baseline

- There fractured communication structures within waste, water, and energy utilities.

Gaps

- There is no formal structure for disseminating information beyond city channels.
- Need more consistent marketing.

Recommendation

- Establish Neighborhood Watch programs to create stronger, more mobilized communities.
- Create a database of resources and incentives to promote through city and community channels
    - Partner with nonprofits such as the Climate Coalition and the High School's Environmental Club.

Green Community

Create guidelines for improved stormwater management and thermal comfort in new construction

Baseline

- There was concern about the lack of planning around stormwater capture.

Gaps

- Need a formal plan.

Recommendation

- Write a Stormwater Management Plan in partnership with the County

Improve the use of sustainable materials in new construction

Baseline

- The city is replacing median strips with native plants. People like this.

Gaps

- Suggest a ban on plastic grass.
- Is there a city policy to use reflective materials when replacing a roof**?**

Recommendation

- Explore Passive House standards.
- Increase the number of LEED certified buildings.
- Continue to expand the replacement of median strips with native plants

Identify areas of town that could be targeted for community gathering places

Baseline

- Consider tearing down one of the gas stations on Foothill for more green space
- Suggested a Pollinator Garden on Edison Row or Fourth and Olive.
- Suggested space near the high school administrative office.
- There is no need for community gardens given the large properties. Are schools an opportunity?

Gaps

- The city still uses insecticides.
- Green space has decreased in recent years.

Recommendation

- Target Section 5 as a Sustainability Commons area to create a best practice and showcase for the CAAP.
- Designate 10% percent of land as green space.

* The one area that was not brought up is Housing or food

Climate Resilience

- Tie climate resilience into city general planning
- Identify locations for emergency locations
    - Make sure these locations have microgrids

TOP 10 “Bang for your Buck” List

What is one thing that you think is realistic that you hope to see in the CAAP?

More community charging stations.
Route 33 and 3 buses have very low ridership.
Better disposal at restaurants.
Ban gas powered lawn equipment and subsidize the transition to electric.
Reach out to the Arroyos and Foothill Conservancy about native habitat in open spaces.
Provide information on the cost savings of electric powered lawn versus gas powered equipment.
Ban astroturf.
Offer the schools more solar powered resources.
Promote water reclamation.
Don’t waste money on bike lanes. We are not going to bike our way out of climate change.
Need a stormwater plan implemented before next rainy season.
Put recycling bins next to all trash cans.
Promote induction stovetops.
Manage tree trimmings so that existing trees provide shade over streets.
Provide trolleys on the hillsides.
Join the Clean Power Alliance.
Buy out the gas station on Angeles Crest and put in an EV Center.
Ban gas powered lawn blowers.
Create an LLC to join a CCA.
Create a pollinator garden on the Edison right-of-way behind Armstrong Nursery.
Add 20 more EV charging stations.
More CAAP outreach from the city and its consultants.

What one thing would be on your wishlist that you would like to see in the CAAP?

Phase out natural gas.
No free parking.
Don’t reinvent the wheel; work with similar sized cities to brainstorm.
Pass all electric building & Renovation codes.
Solar panels on schools.
Go all electric and hydrogen from renewable sources.
Solar panels on every roof.
Make LCF safe for pedestrians and bikes all over town.
Capture runoff water.
Make people want to move to LCF for our schools and our green community.
Can we transform Kinetic energy from our cars into energy?
Install enough solar + storage to power 100% of our electrical needs.
Finish sewer projects.
Sidewalks.
More meetings to inform us of changes and what else is needed?
Require Passive House building standards.
Join the Clean Power Alliance.

Attendees

NAME	ORGANIZATION
Dana Coyle	LCF Resident
Mike Leininger	Chamber of Commerce, Community Center
Sue Dieta	Homeowner
David Kangritsch	LCF Resident
Judith Trumbo	LCF Climate Coalition
Hailey Chee	LCHS
Ron Dietel	Homeowner
Kim Bowman	City Council
Alex Koleda	LCHS
Charlotte Koleda	LCHS
Carol Caley	Climate Action Committee
Stephanie Tona	Community member
Yves Baetslé	
Mia Alva	Outlook Valley Sun
Julie Kane-Ritsch	LCF Climate Coalition
Mary Nelson	LCF Climate Coalition
Steven Berard	LCHS
Melid Li	LCHS
Kioni Baetsle	UC Berkeley
Karen Wong	LCF Climate Coalition
Margo Kidushin	
Nalini Lasiewicz	Lasiewicz Foundation
Anna Zueva	
Emilie Watts	
Rhiannon Liewer	
Mooria Greenwood	
Senir A Wong	
Linnea Lourenco	TLC
Jeff Booth	
Nina Jazmadarian	FMWD
Katie Poole	
Rody Stepherson	SRLF
John Hale	LCFCC
Thomas Shier	Citizen
Jacob Harp	LCHS
Elisa Booth	LCF Climate Coalition/LCHS
Hilam Petrizzo	Resident
Michael Gips	Resident
Julie Townsend	Resident
Ben Davis	LCHS/LCFCC
Max Smith	LCHS

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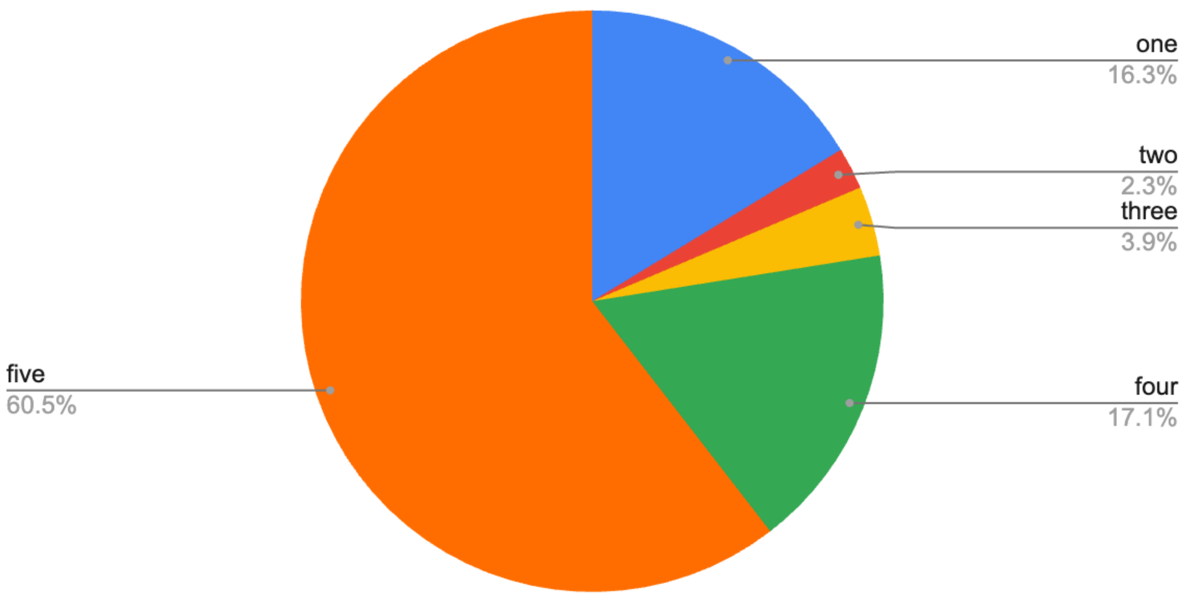
Survey Results

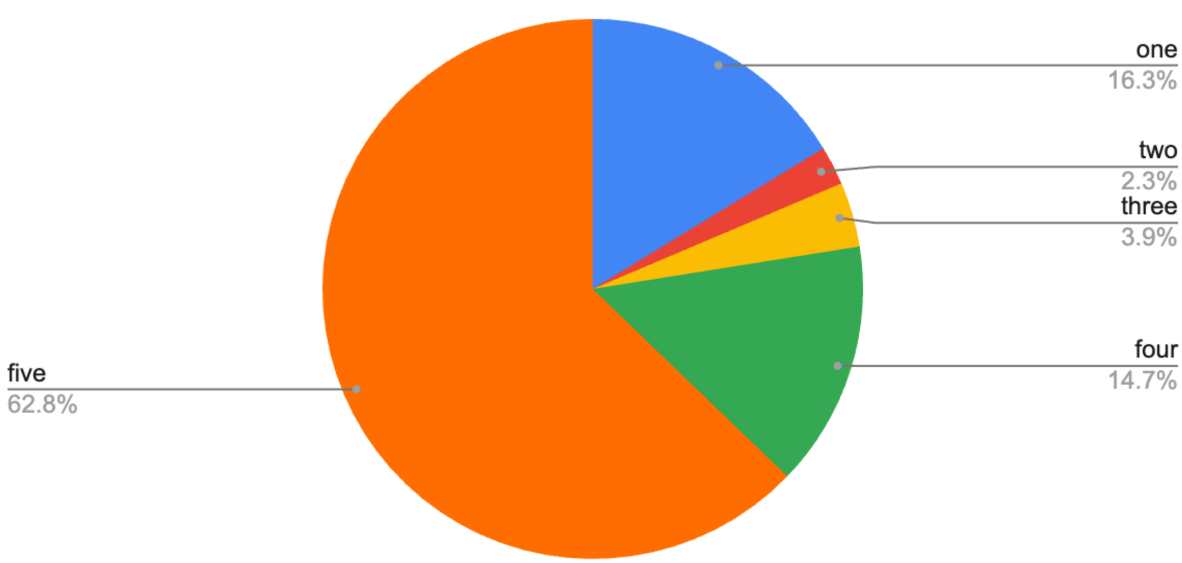
How worried are you about climate change?

(1 = not worried; 5 = very worried)



How important is it to you that the City do something about climate change?

(1 = not important; 5 = very important)



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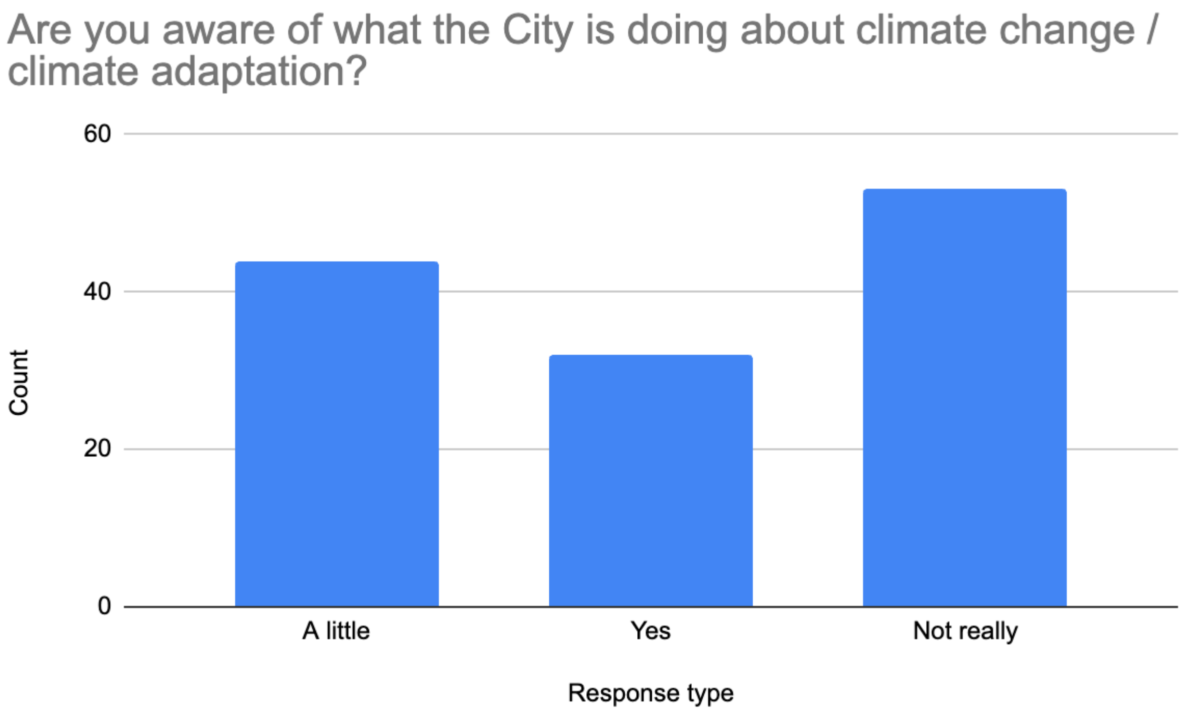
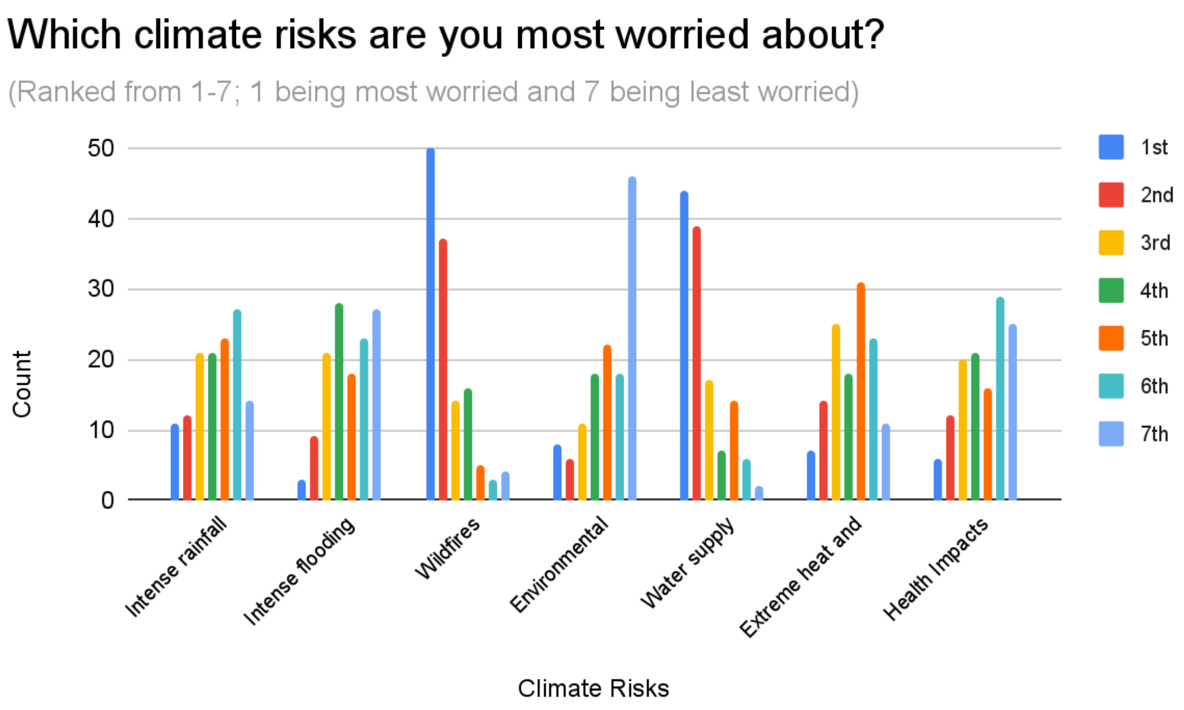

Are you aware of what the City is doing about climate change / climate adaptation?
60
40
20
0
Count
A little
Yes
Not really
Response type


Which climate risks are you most worried about?
(Ranked from 1-7; 1 being most worried and 7 being least worried)
50
40
30
20
10
0
Count
Intense rainfall
Intense flooding
Wildfires
Environmental
Water supply
Extreme heat and
Health Impacts
Climate Risks
1st
2nd
3rd
4th
5th
6th
7th

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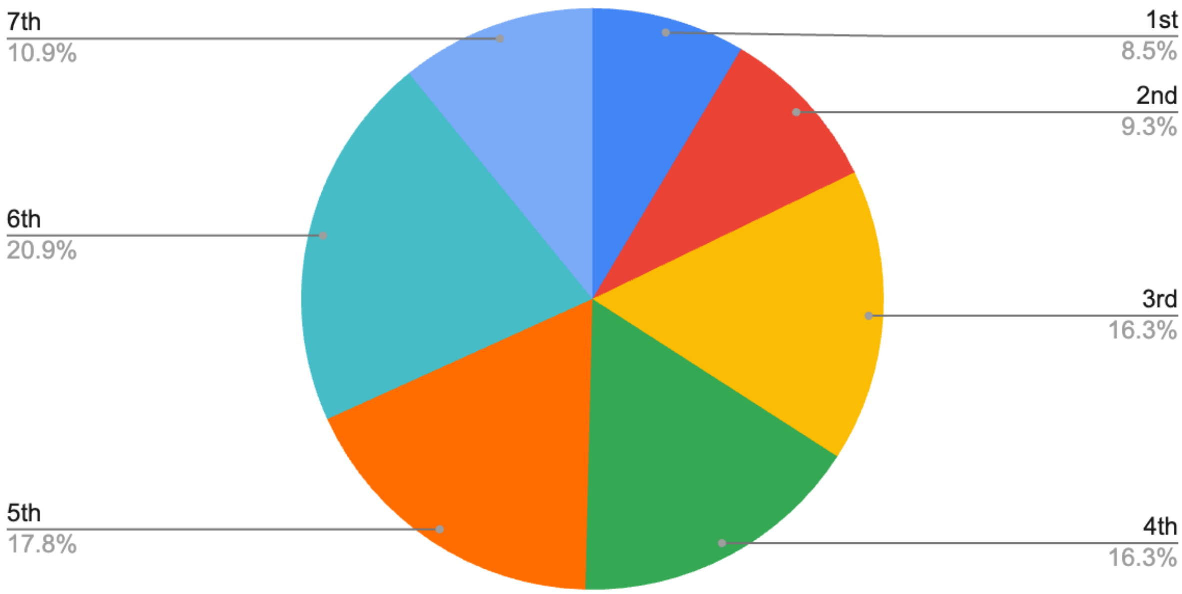
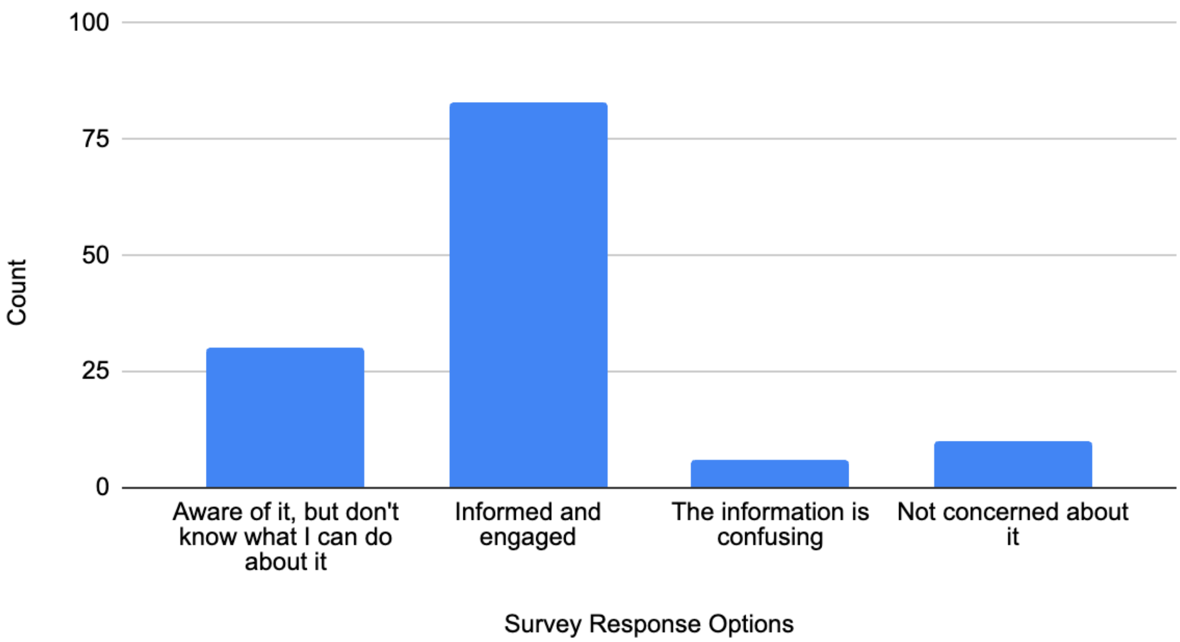
Level of Concern: Intense Rainfall

Percentage of respondents for each level 1-7 (1 = most worried, 7 = least worried)



How do you feel about climate change?



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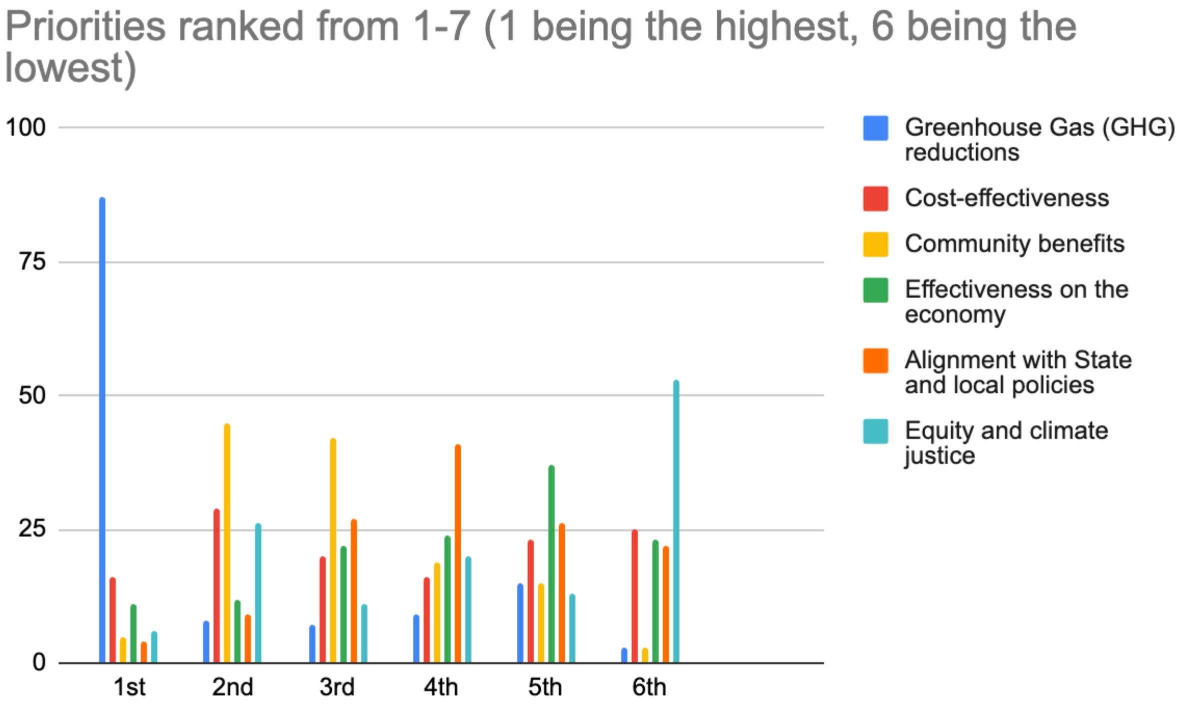
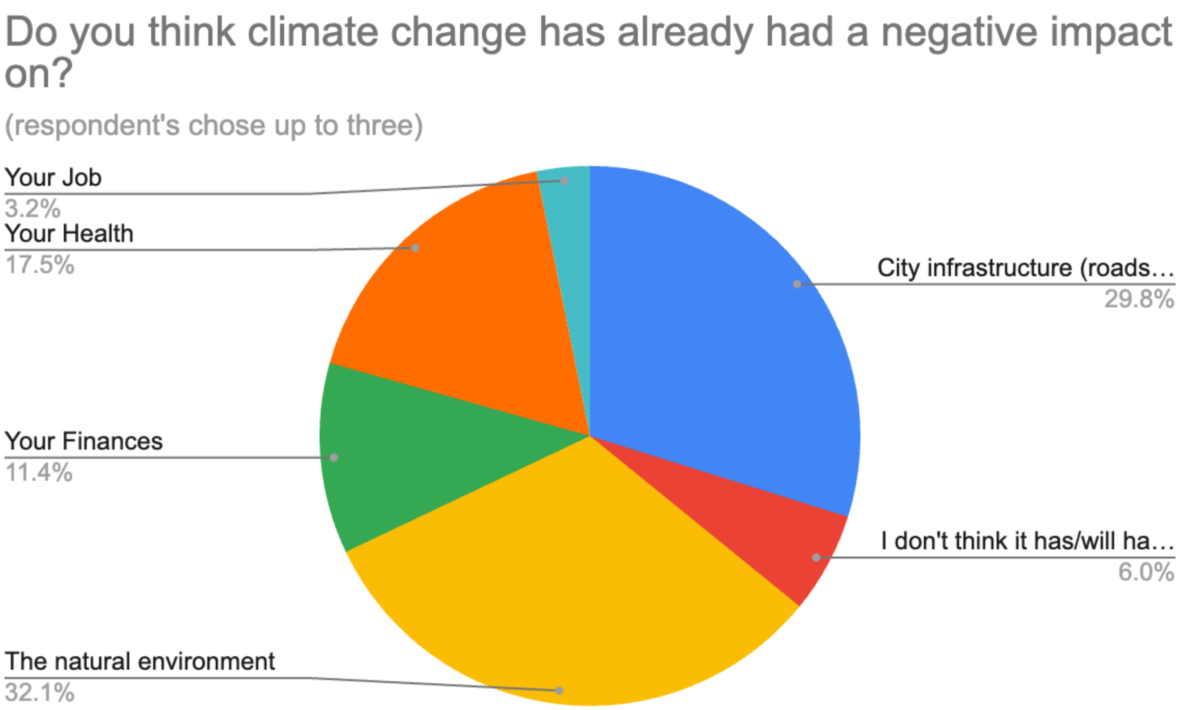
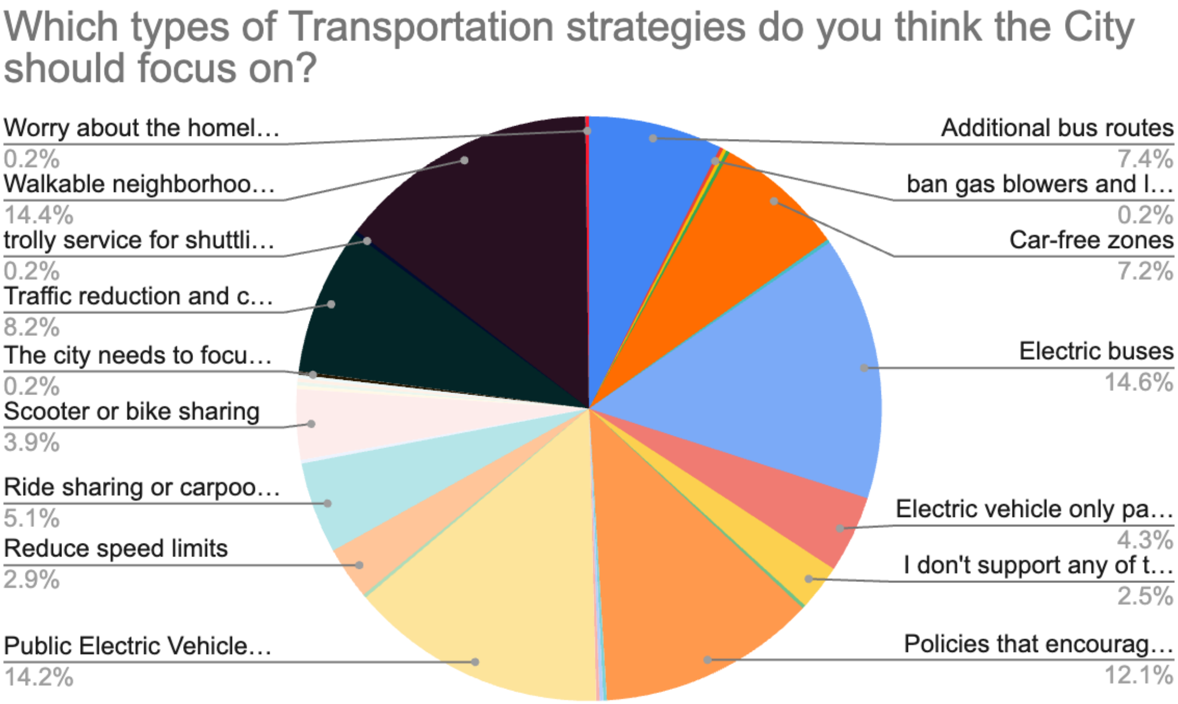
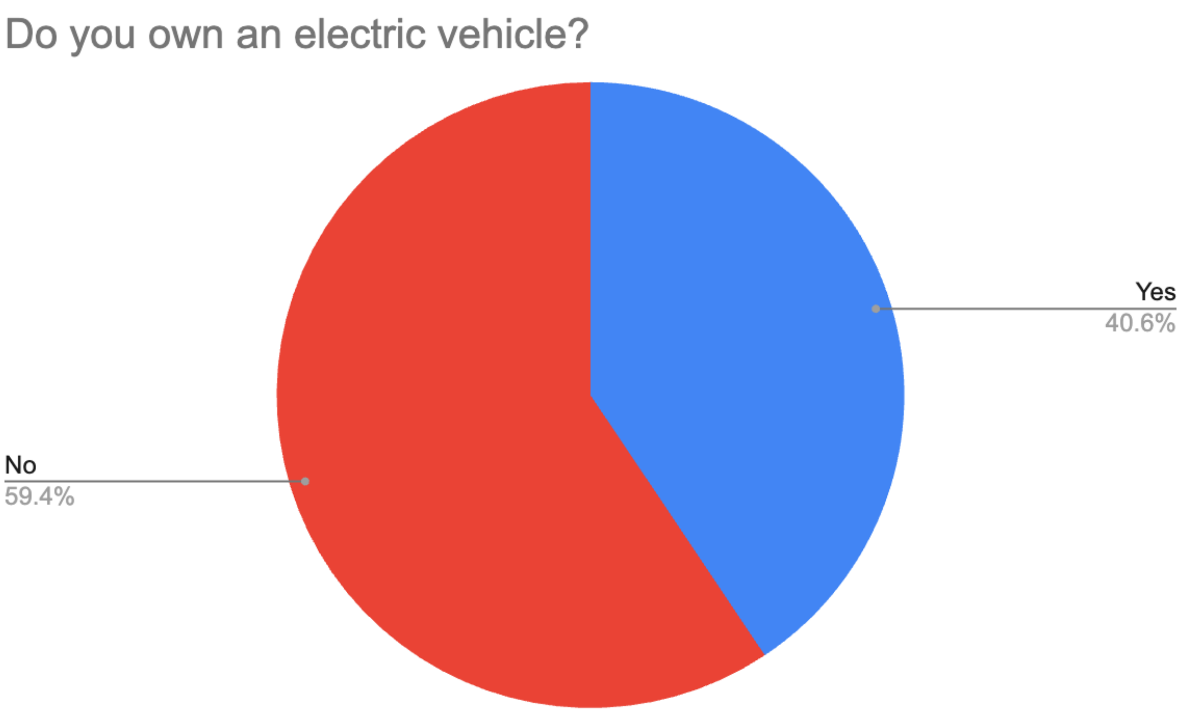
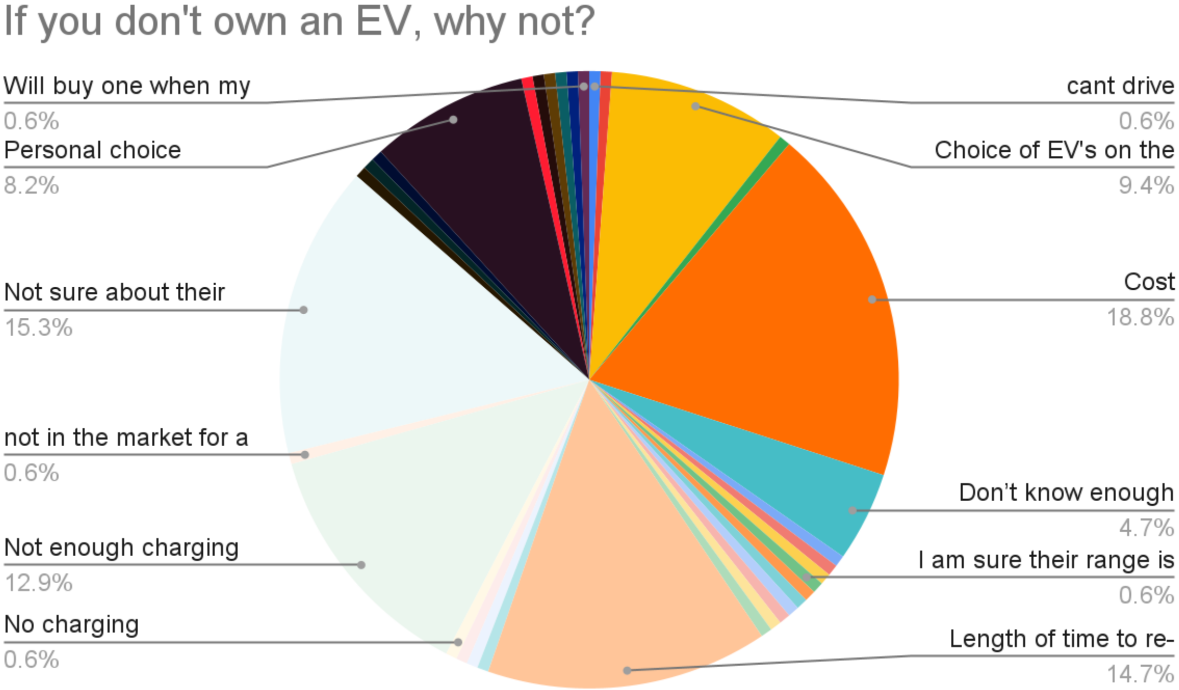
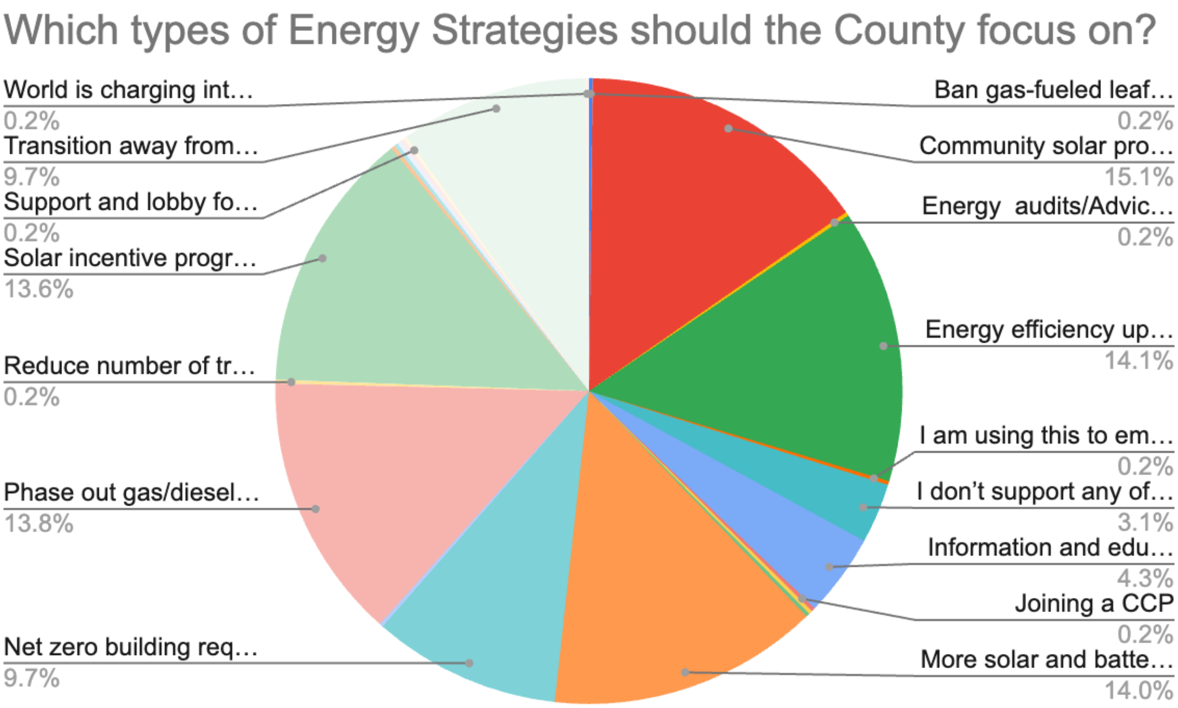

Priorities ranked from 1-7 (1 being the highest, 6 being the lowest)
100
75
50
25
0
1st
2nd
3rd
4th
5th
6th
Greenhouse Gas (GHG) reductions
Cost-effectiveness
Community benefits
Effectiveness on the economy
Alignment with State and local policies
Equity and climate justice


Do you think climate change has already had a negative impact on?
(respondent's chose up to three)
Your Job
3.2%
Your Health
17.5%
Your Finances
11.4%
The natural environment
32.1%
City infrastructure (roads…
29.8%
I don't think it has/will ha…
6.0%

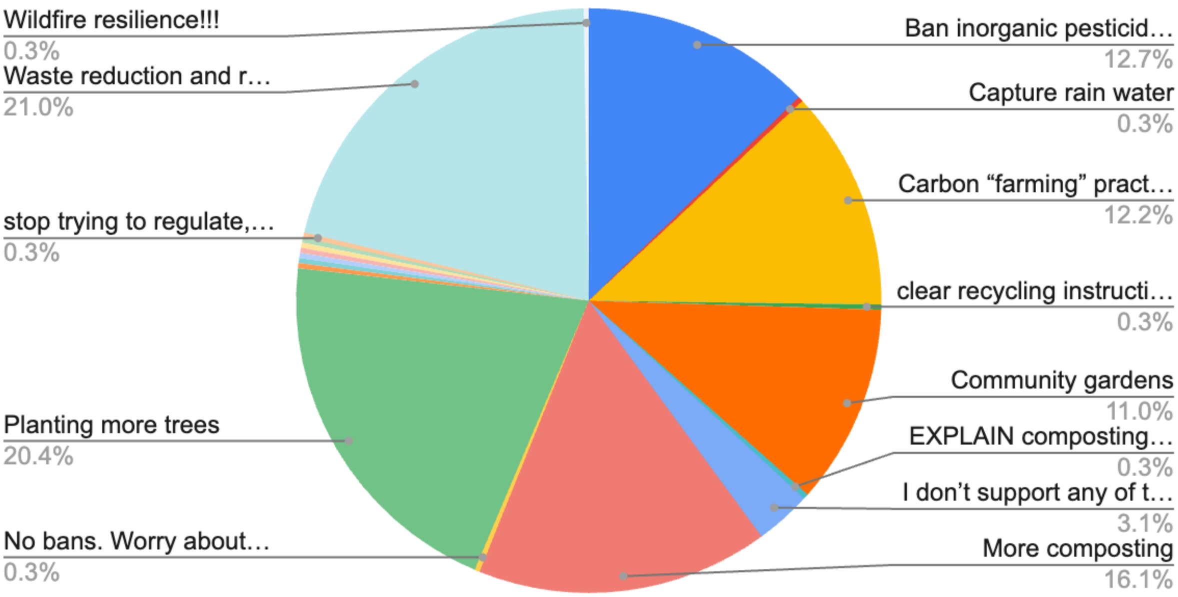

Which types of Transportation strategies do you think the City should focus on?
Worry about the homel…
0.2%
Walkable neighborhoo…
14.4%
trolly service for shuttli…
0.2%
Traffic reduction and c…
8.2%
The city needs to focu…
0.2%
Scooter or bike sharing
3.9%
Ride sharing or carpoo…
5.1%
Reduce speed limits
2.9%
Public Electric Vehicle…
14.2%
Additional bus routes
7.4%
ban gas blowers and l…
0.2%
Car-free zones
7.2%
Electric buses
14.6%
Electric vehicle only pa…
4.3%
I don't support any of t…
2.5%
Policies that encourag…
12.1%


Do you own an electric vehicle?
Yes
40.6%
No
59.4%

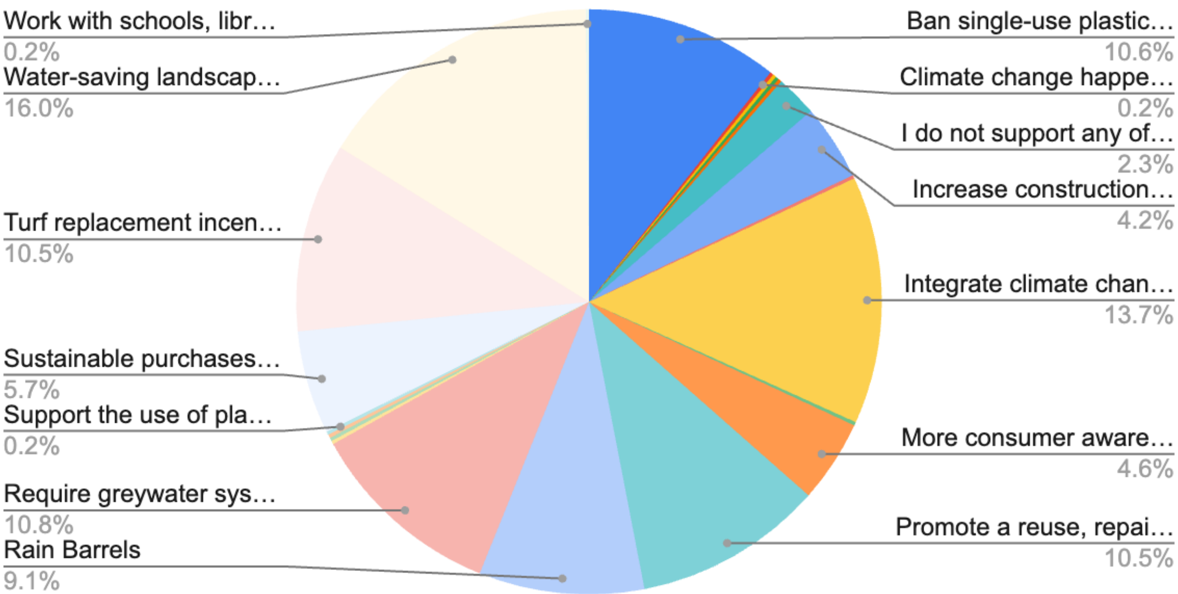

If you don't own an EV, why not?
Will buy one when my
0.6%
Personal choice
8.2%
Not sure about their
15.3%
not in the market for a
0.6%
Not enough charging
12.9%
No charging
0.6%
cant drive
0.6%
Choice of EV's on the
9.4%
Cost
18.8%
Don't know enough
4.7%
I am sure their range is
0.6%
Length of time to re-
14.7%


Which types of Energy Strategies should the County focus on?
World is charging int…
0.2%
Transition away from…
9.7%
Support and lobby fo…
0.2%
Solar incentive progr…
13.6%
Reduce number of tr…
0.2%
Phase out gas/diesel…
13.8%
Net zero building req…
9.7%
Ban gas-fueled leaf…
0.2%
Community solar pro…
15.1%
Energy audits/Advic…
0.2%
Energy efficiency up…
14.1%
I am using this to em…
0.2%
I don't support any of…
3.1%
Information and edu…
4.3%
Joining a CCP
0.2%
More solar and batte…
14.0%

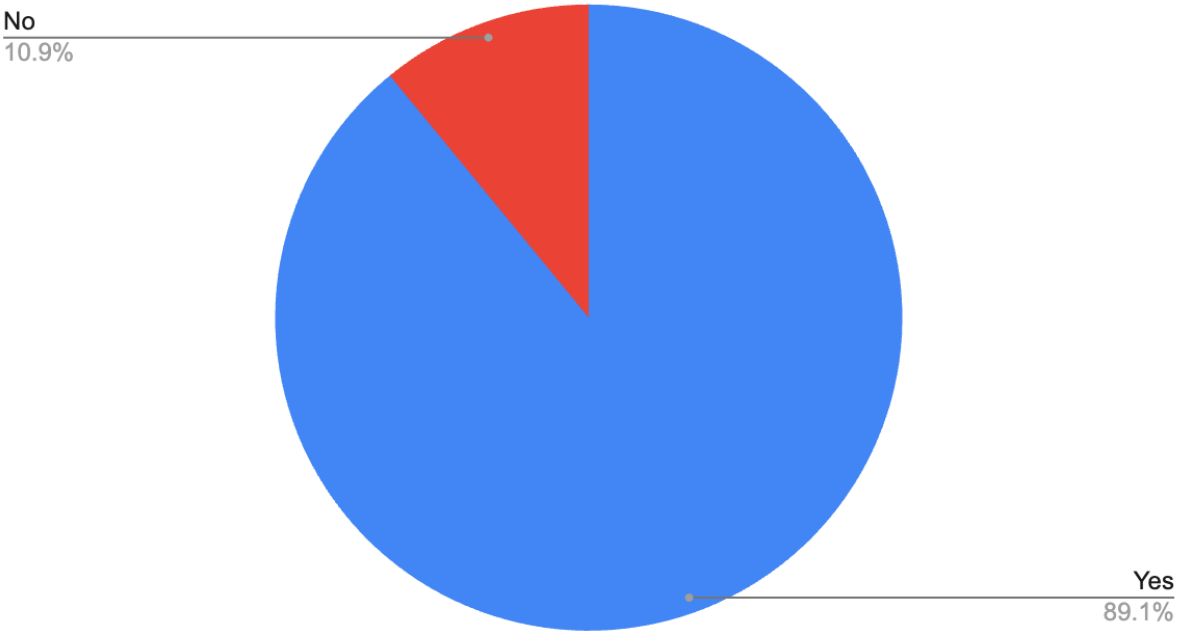
Which types of Green Community strategies should the County focus on?



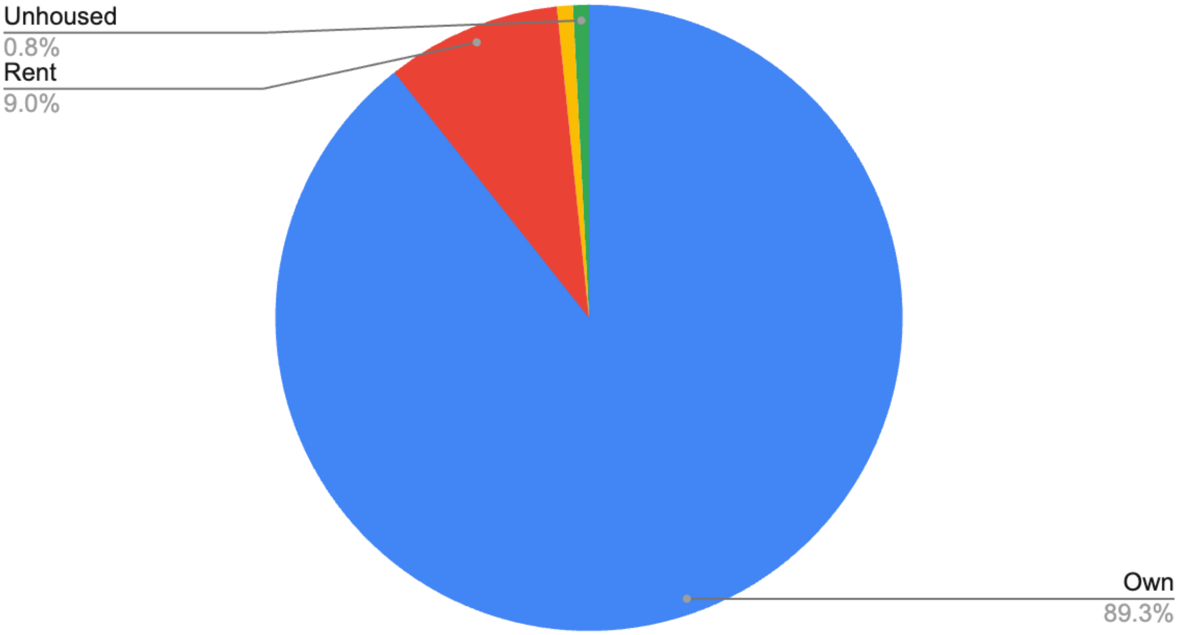
Which Resource Conservation strategies should the County focus on?



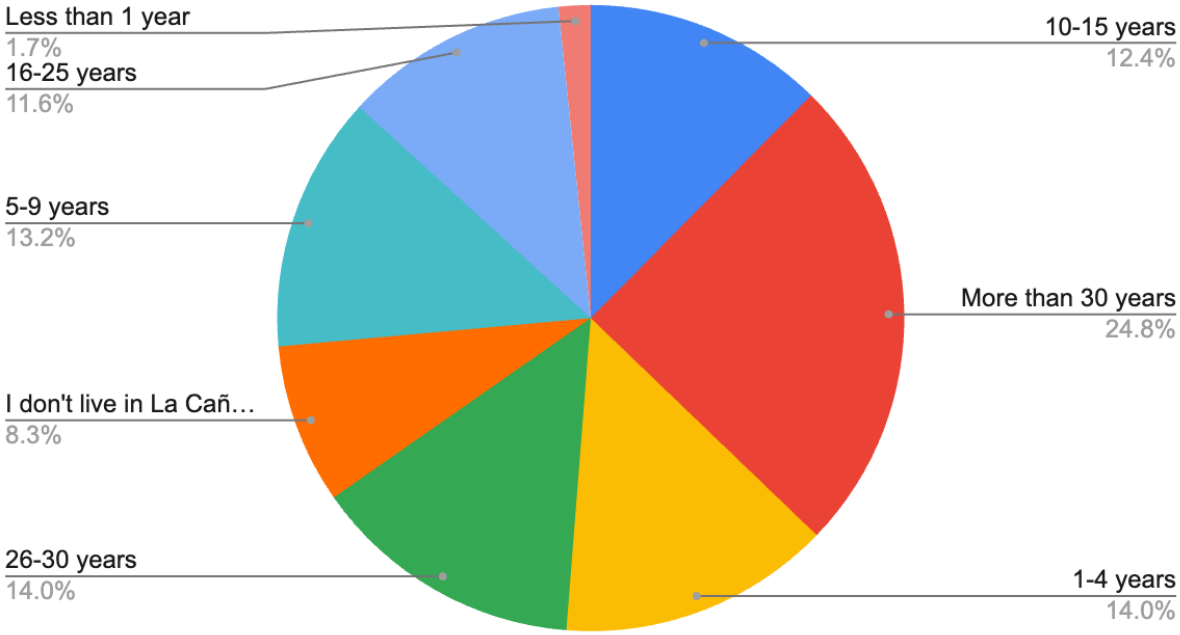
Do you live in La Cañada Flintridge?



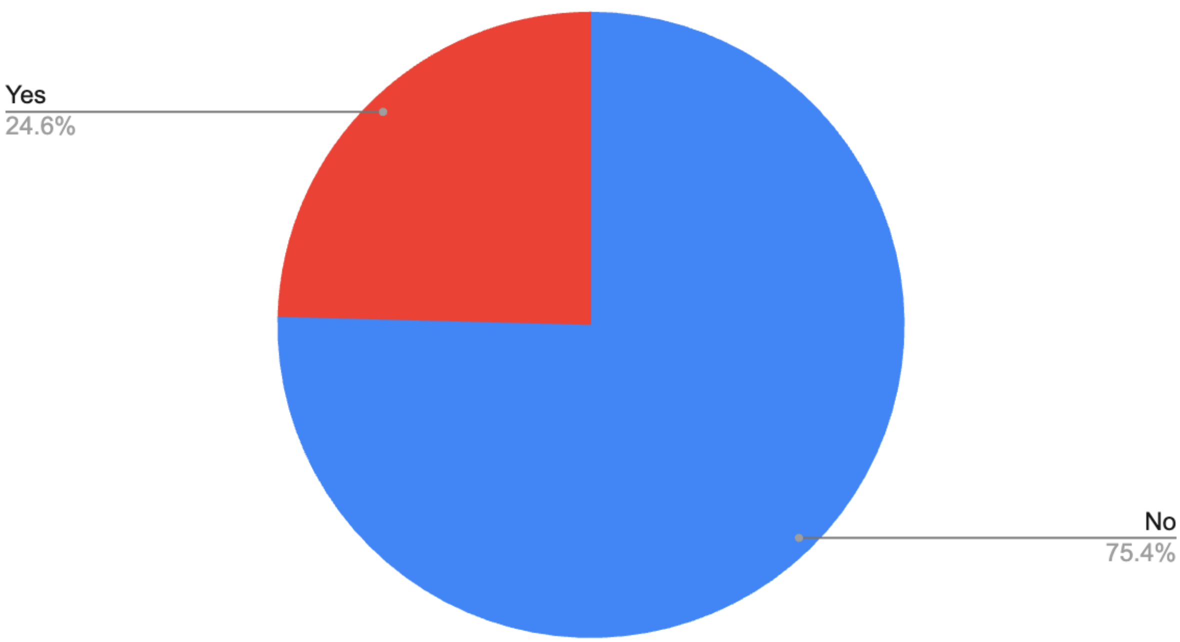
Count of Do you rent or own?

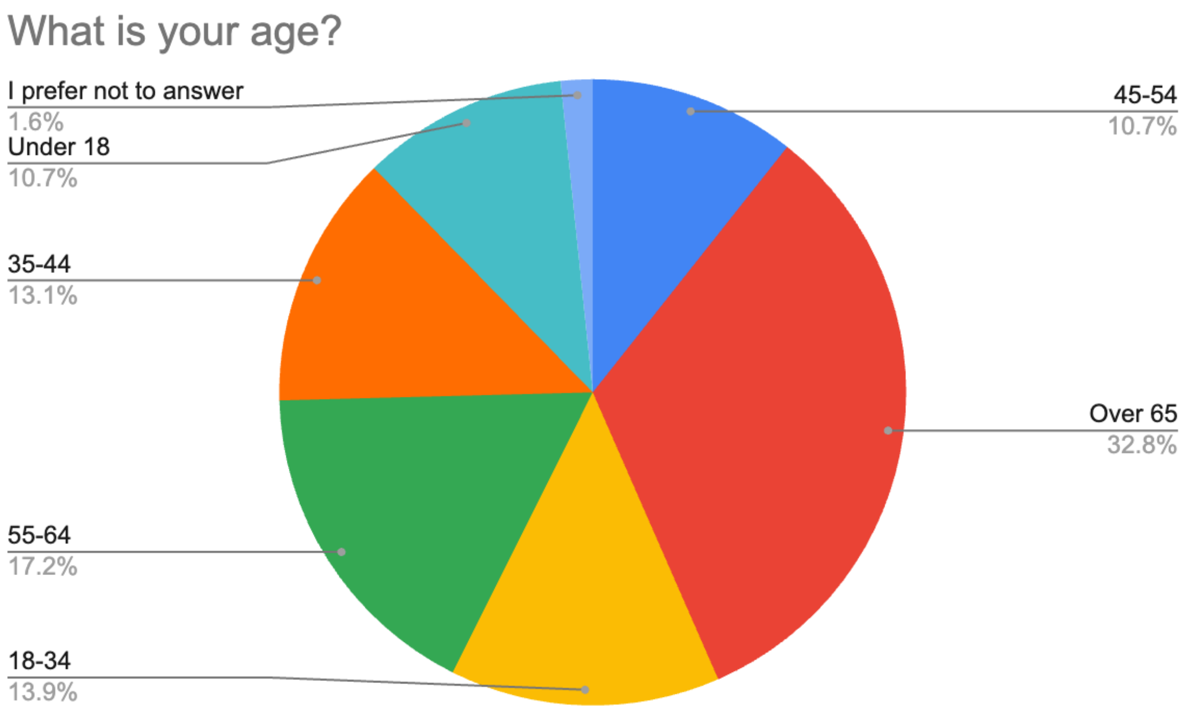


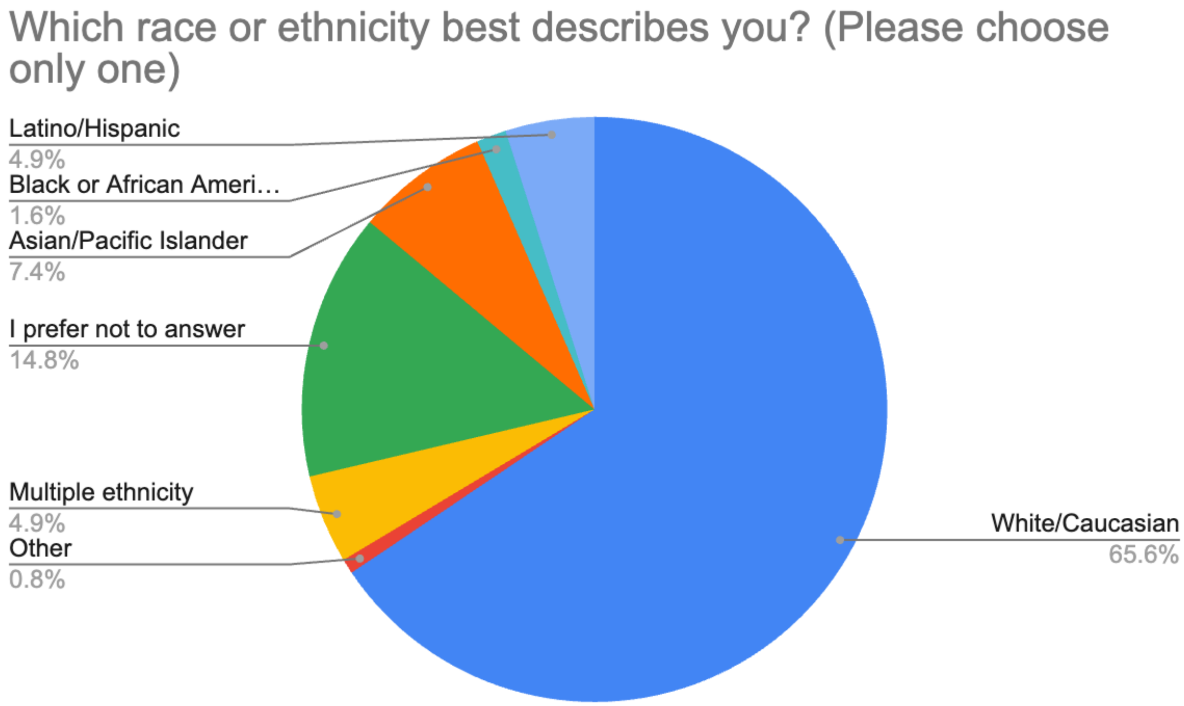
How long have you lived in La Cañada Flintridge?

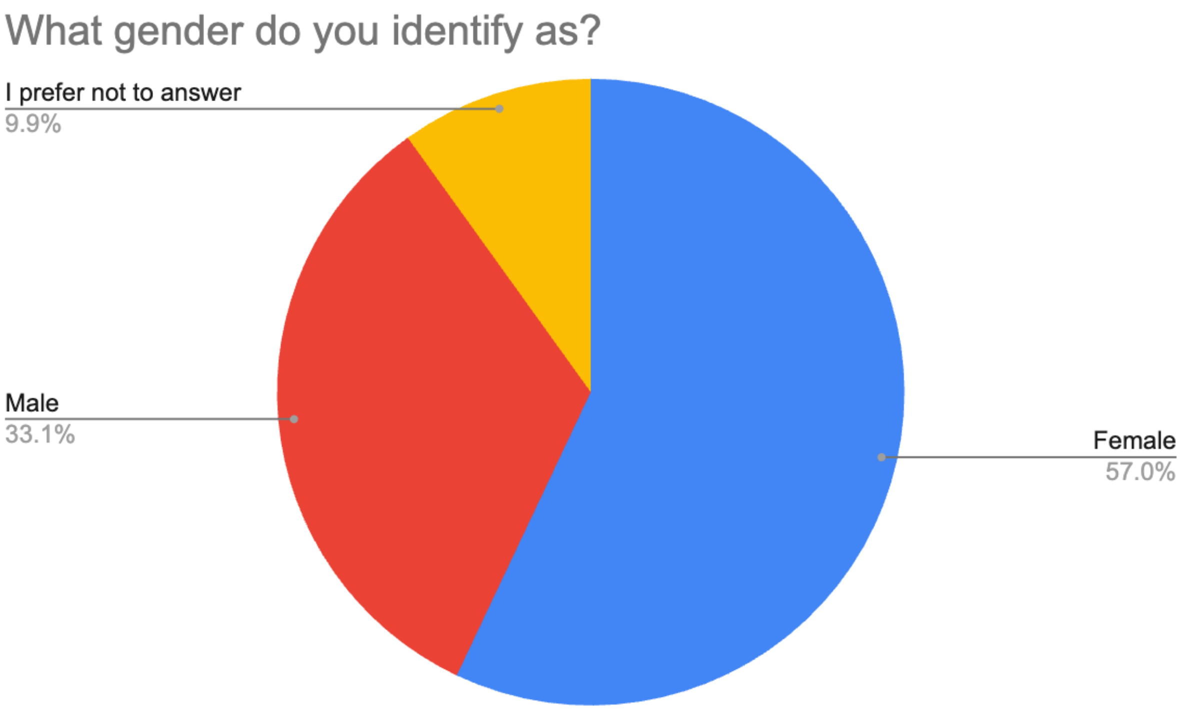


Do you work or own a business in La Cañada Flintridge?




What is your age?
I prefer not to answer
1.6%
Under 18
10.7%
35-44
13.1%
55-64
17.2%
18-34
13.9%
45-54
10.7%
Over 65
32.8%


Which race or ethnicity best describes you? (Please choose only one)
Latino/Hispanic
4.9%
Black or African Ameri…
1.6%
Asian/Pacific Islander
7.4%
I prefer not to answer
14.8%
Multiple ethnicity
4.9%
Other
0.8%
White/Caucasian
65.6%


What gender do you identify as?
I prefer not to answer
9.9%
Male
33.1%
Female
57.0%

APPENDIX C: What Can I Do Now?

While governments and corporations can make significant mitigation impacts in the way they operate, individuals can make a difference in the way we live our daily lives. Our decisions give us the power to set a course for change by taking small actions that cause rippling effects across communities and can build dialogues that lead to broad behavior change. Join La Cañada Flintridge as it sets a course for community-wide climate change.

ENERGY

Pledge to:

- Turn off the lights when you leave if your home or office does not have occupancy sensors.
- Skip the elevator and take the stairs for exercise and energy savings.
- Unplug or use a power strip
- Obtain an energy audit for your home
- Take advantage of your energy provider's incentives for reducing your energy consumption

WATER

Pledge to:

- Bring a reusable water bottle to work each day
- Reduce meat consumption (biggest water user)
- Reduce water use at home and work
- Plant native plants that require less water than non natives

FOOD

Pledge to:

- Say no to plastic by bringing a reusable to go container to work and for restaurant leftovers
- Not ask for a straw
- Only take what you can eat.
- Eat a more plant- based diet

GREEN SPACES

Pledge to:

- Be a good steward to the earth by planting a tree
- Convert some or all of your lawn space to native plants
- Use an electric mower or battery operated mower

PURCHASING

Pledge to:

- Prioritize local and minority owned farms and businesses and support those with a climate mission.
- Purchase products with reduced packaging
- Make your next purchase an electric one instead of gas

TRANSPORTATION

Pledge to:

- Ride your bike or carpool to work
- Take public transportation as often as possible
- Telecommute when possible

WASTE

Pledge to:

- Reduce/eliminate use of single use plastic bags
- Reduce food waste
- Start composting
- Purchase second-hand clothing whenever possible
- Reduce paper copies and print double sided
- Fix first before buying new

ENGAGE

Pledge to:

- Talk and share ideas with others about climate change
- Volunteer for a community climate action project
- Stay informed and involved with what the City and region are doing to tackle climate change
- Participate in community engagement efforts around climate change

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APPENDIX D:
2019 GHG Inventory Report

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CONTENTS

Executive Summary

Introduction

The goal of this report is to provide an inventory of greenhouse gas (GHG) emissions that are attributable to human activities in La Cañada Flintridge, California. This report acts as a foundational document for the 2023 climate action plan, which provides a roadmap for reducing carbon emissions while preserving the living standards of City residents. A GHG inventory describes the primary sources of emissions within the city, including those originating from residents, commercial enterprises, and governmental operations. The emissions studied can be either direct or indirect. Direct emissions are those emitted at the location of use such as natural gas combustion in heating buildings, whereas indirect emissions are purchased and used at one location but generated elsewhere, such as those originating from the electrical grid.[1] A GHG inventory is crucial for creating strategies and programs that reduce future emissions and providing insight into the environmental condition of the City during the study year.

This GHG inventory analyzes two different tracks, which are presented separately. The community track encompasses all La Cañada Flintridge residents, including businesses and individuals. Community emissions were divided into sectors: residential and commercial; transportation and mobile services; solid waste; and water and wastewater. The city government operations track includes the emissions related to La Cañada Flintridge government activities, including government facilities, vehicle fleets, and employee commuting. The municipal operations inventory is a subset of the community inventory, and has specific usage portioned out from the community inventory. This report relies on the best available data to date. If certain data could not be collected, best estimates were used. Emission factors were compiled for each sector from reliable sources, such as the Environmental Protection Agency (EPA) and the US Community Protocol, which update information regularly. This GHG inventory offers a reliable reflection of real-world emissions in La Cañada Flintridge. All calculations were made using the US Community Protocols for Greenhouse Gas Accounting studies, as published by ICLEI.[2] Two appendices are included in this report. Appendix A lists raw usage data collected from utilities and other sources, while Appendix B provides a detailed methodology of all calculations used in determining emission totals.

Community Inventory Results

In 2019, the La Cañada Flintridge community produced a total of 164,353 metric tons of carbon dioxide equivalent emissions (MT CO2e). As illustrated in the figure below, the greatest percentage of emissions was from transportation and mobile service at 57%, or 92,720 MT CO2e. Energy use (which includes electricity and natural gas) in residential buildings represents the next largest source at 29%, and energy from commercial use followed, contributing 7%. In terms of total amounts, residential energy produced 47,691 MT CO2e, commercial energy resulted in 12,065 MT CO2e. The remainder of the community inventory includes solid waste with 3% or 5,578 MT CO2e, water and wastewater with 4% or 6,182 MT CO2e, and fugitive emissions with 118 MT CO2e.

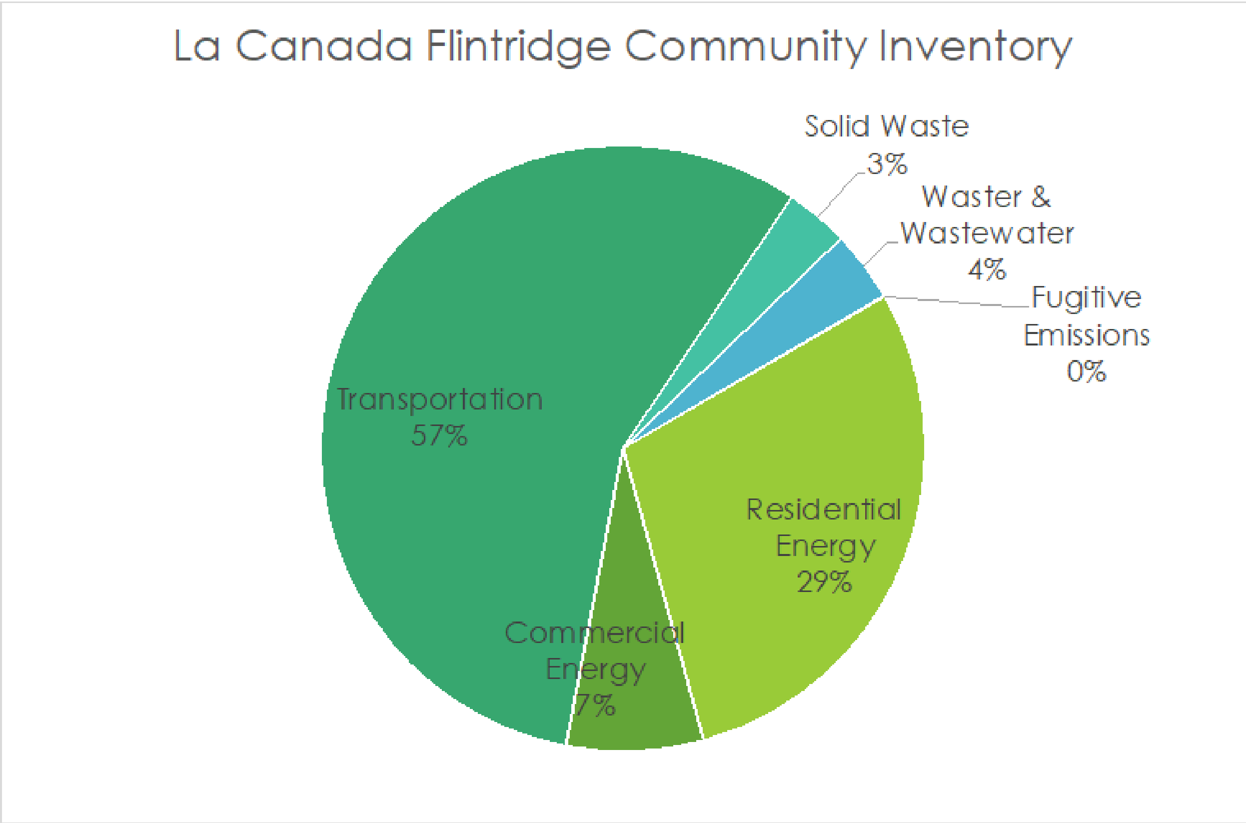

Fig. 1: La Cañada Flintridge 2019 community inventory by sector

City Operations Inventory Results

City operations GHG emissions were also analyzed. La Cañada Flintridge government operations were responsible for 226 MT CO2e. The largest emission sources were employee commuting at 36% (80 MT CO2e) and City Facilities at 28% (64 MT CO2e). The Public Lighting sector contributed 22%, with 64 MT CO2e. Finally, city operational water supply contributed 14% of emissions, or 32 MT CO2e.

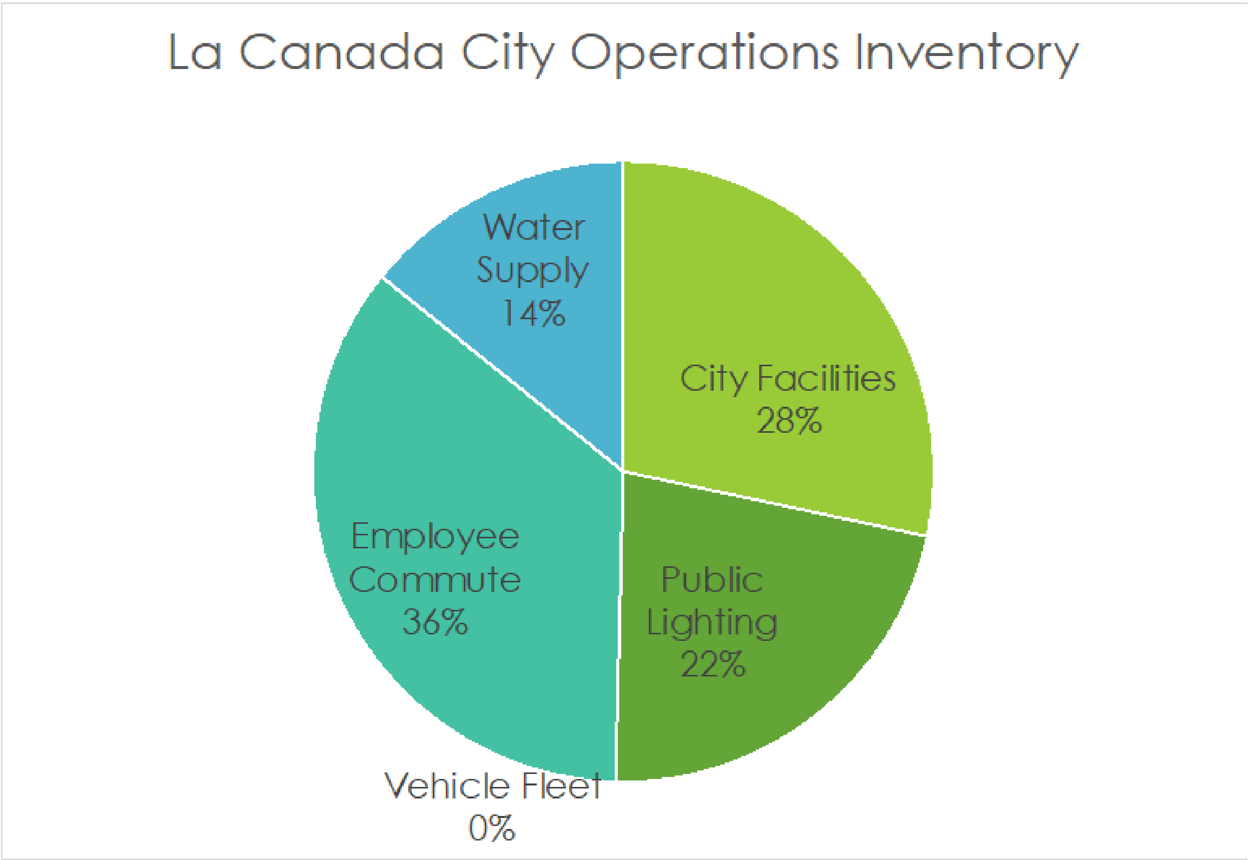

Fig 2: La Cañada Flintridge 2019 municipal emissions by sector

Introductory Summary

This inventory was performed using the U.S. Community Protocol Version 1.2, as developed by ICLEI and updated for this specific GHG accounting exercise in July 2019. Inventory emissions were calculated using best practices and were based on 2019 data gathered from the city. These "usage" data were assigned an appropriate emission factor to arrive at a figure for emissions emitted. The calculations took place within Excel but used all formulas from the U.S Community protocol. The U.S. Community Protocol assists in GHG accounting and management at the community and municipal levels. Emission factors were compiled from 2019 data and information from the federal Environmental Protection Agency GHG Emission Factors Hub.[3]

As a result, this report compiles data from the city and models GHGs to provide an accurate depiction of the City's real-world emissions. It also identifies key areas to focus on for strategy development and program creation to reduce emissions in the city. Finally, it serves as an update to the City's existing GHG inventories completed in 2007 and 2014.[4]

Previous Inventories and Climate Resolutions

La Cañada Flintridge has been actively striving to reduce carbon emissions. The City's first GHG inventory was conducted in 2007 and the second in 2014. This inventory builds upon previous inventories and provides valuable data on how the City is progressing towards reducing carbon emissions.

Not all sectors were consistently measured across the 2007, 2014, and the current 2019 inventory; however, comparisons can be made in several sectors such as residential, commercial, transportation, wastewater, water, and solid waste. As shown in figure 3, these sectors have experienced significant emission reductions since 2007. In 2007, La Cañada Flintridge was responsible for emissions amounting to 292,181 tons of carbon dioxide equivalent. In 2014 emissions in La Cañada Flintridge were 203,776 tons of CO2e. By 2019, these emission sectors had fallen to 164,235 tons of CO2e, a decrease of 43.7% between 2007 and 2019.

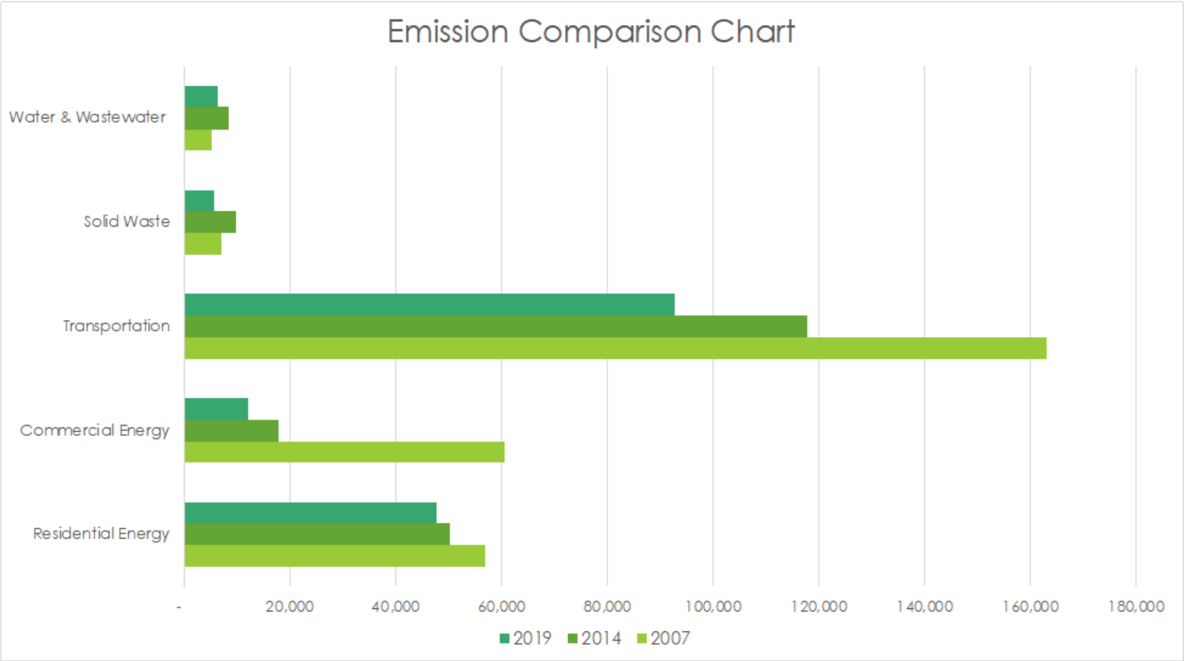

Fig 3: GHG Inventory Comparison by Year

Methodology

The methodology for this inventory was based upon best practices from the US Community Protocol provided by ICLEI, coupled with the United States Environmental Protection Agency GHG Emission Factors, which serve as the benchmark for greenhouse gas inventory analysis nationwide. Emissions estimates incorporate real-world usage data (listed in Appendix A), which were subsequently processed through an Excel based tool.

Inventory year

The year 2019 was selected for this inventory because it offers a more typical representation of GHG emissions for the year 2023 since the COVID-19 pandemic significantly reduced travel emissions and markedly impacted other sectors as well. Notably, the years 2020, 2021, and 2022 recorded significantly lower emissions compared to current levels. Additionally, the Science Based Targets Initiative recommends using 2019 as a baseline year for future emission reduction targets.[5]

Community and City Operations inventories

The inventory considers two distinct greenhouse gas accounting tracks: community and City operations sectors. The community inventory includes emissions from residents within La Cañada Flintridge's jurisdiction, accounting for both emissions from residents within the City's limits and from people who recreate and work in La Cañada Flintridge; the inventory is inclusive of all towns within the city. Required sectors for community GHG inventories are: 1) community building energy use from kilowatt hours and natural gas therms usage, and other significant energy sources 2) transportation emissions from vehicle miles traveled in the city, 3) solid waste disposed, 4) wastewater and water electricity used and gallons consumed. In contrast, the City Operations inventory encompasses emissions resulting from La Cañada Flintridge operations and facilities. Although City emissions represent a small fraction of the emissions inventory, they are significant, given the government's ability to influence and lead by example to combat climate change. The city operations inventory includes emissions from City buildings, City vehicle fleets, employee commutes, and water consumption[6].

Calculating emissions

Greenhouse Gasses

Local governments are expected to evaluate emissions of the six internationally recognized greenhouse gasses (GHG) under the Kyoto Protocol[7], namely Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur hexafluoride (SF6). Each of these greenhouse gasses is reported and converted into metric tons (MT), differentiated by their respective Global Warming Potential (GWP). The GWP of each is benchmarked on Carbon dioxide's potential, which is set at 1, as it serves as the reference point for the other gasses. Methane, with a GWP of 28, is largely emitted from landfills, wastewater, and natural gas leakage. Nitrous Oxide, with a higher GWP of 265, is primarily associated with energy production and wastewater treatment. Hydrofluorocarbons, having a wide GWP range of 12-11,700, are mainly tied to refrigerant usage. Perfluorocarbons, with a GWP between 6,500-9,200, typically result from manufacturing and production processes. Sulfur Hexafluoride, possessing the highest GWP of 23,900, is principally connected with power transmission and distribution. This inventory primarily uses Carbon, Methane, and Nitrous Oxide[8] to establish the carbon dioxide emission equivalents (CO2e) for all sectors analyzed[9].

Sector Activity Data and Emissions Factors

The process of calculating Carbon dioxide equivalents (CO2e) utilizes both activity data and emission factors. When activity data is multiplied by corresponding emission factors, the result is an amount of carbon dioxide-equivalent emissions. By converting each sector's activity data into carbon dioxide equivalents, a comparative ratio for each sector can be established, enabling further analysis and facilitating decision-making about potential reduction strategies.

Emissions Reporting

Emissions are quantified using the measure of Carbon dioxide equivalent (CO2e) and compared across sectors. Each sector is individually reported and assessed in relation to others, offering a comprehensive picture of emissions across the city. The community inventory covers building energy use, transportation, solid waste, wastewater, and water. Building energy is further divided into residential and commercial energy and consists of both electricity and natural gas consumption. The municipal inventory includes building energy use, employee commute, vehicle fleet, water, and wastewater.

Results

The following sections detail the findings from the community and City government operations greenhouse gas inventories, with results organized by sectors. The community and City operations inventory are separate endeavors, but the information is combined within this report. There will be overlap in emissions data for the two inventories, and each inventory should be considered as a benchmark for future emission reductions. Calculation methodologies for all results are provided in Appendix B.

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Community Inventory

In La Cañada Flintridge, total community emissions were 164,235 MT CO2e. This result includes emissions originating from the combustion of fuel for transportation and mobile services, onsite burning of natural gas in residential and commercial sectors[10], emissions linked to electricity procurement for residential and commercial edifices, emissions connected to water and wastewater services within the city, as well as solid waste emissions emanating from the city.

Table 1: La Cañada Flintridge Community Inventory by sector

Sector	**MT CO2e**	**Percentage (%)**
Transportation & Mobile Sources	92,720	57%
Solid Waste	5,578	3%
Water & Wastewater	6,182	4%
Commercial Energy	12,065	7%
Residential Energy	47,691	29%
Process & Fugitive Emissions	117	0.07%
Total	164,353	

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Residential Energy

Residential energy consumption incorporates emissions from natural gas combustion and electricity production from all specific to residential communities within La Cañada Flintridge. Data regarding La Cañada Flintridge's residential electricity usage were supplied by Southern California Edison, while Southern California Gas Company provided data for natural gas usage. Electricity data for 2019 from Southern California Edison Electricity were extrapolated from 2017 usage statistics.

Overall residential energy use contributed 47,691 MT CO2e. Of that total, emissions attributed to electricity were 17,207 MT CO2e, natural gas contributed 30,484 MT CO2e. Residential energy constituted 29% of total community emissions.

Commercial Energy

Commercial energy produced 12,065 MT CO2e. Data on commercial electricity energy consumption were provided by Southern California Edison. Data for natural gas usage were sourced from Southern California Gas Company.

Of the commercial total, electricity accounted for 7,349.68 MT CO2e and natural gas contributed 4,715 MT CO2e. Thus, commercial energy constitutes 7% of total community emissions in La Cañada Flintridge.

Transportation and Mobile Service

Transportation and Mobile services are the primary contributor of emissions in La Cañada Flintridge, generating 92,720 MT CO2e and accounting for 57% of the City's total emissions. La Cañada Flintridge is characterized by its location within Los Angeles County, where reliance on cars is significant, leading to a considerable amount of Vehicle Miles Traveled (VMT) within the City. The emissions produced by gasoline fuel vehicles is 91,254 MT CO2e, while the emissions produced from diesel vehicles equaled 1,465 MT CO2e.

Solid Waste

Emissions resulting from the waste sector are derived from methane production due to decomposition of solid waste generated in the city. This information was provided by CalRecycle for solid waste destined for Southeastern Resource Recovery Facility. These calculations incorporate data gathered from the landfill and consider factors such as methane capture processes. Solid waste disposal contributes to 3% of the total emissions in La Cañada Flintridge, accounting for 5,578 MT CO2e.

Water and Wastewater

There are four water and wastewater suppliers that manage the City's potable water supply and wastewater disposal, and data were provided or were gathered from estimations of historical usage. Total emissions from water and wastewater amount to 6,182 MT CO2e, accounting for 4% of total emissions across the city. Emissions from potable water processes in La Cañada Flintridge are 4,782 MT CO2e. Wastewater emissions equal 1,400 MT CO2e. Specific data regarding water and wastewater calculations can be found in Appendix B. Some of the suppliers were unable to provide data in time for this report to be completed, so emissions were estimated from applying population growth for La Cañada Flintridge from data from the 2017 inventory.

Processes and Fugitive Emissions

Fugitive emissions, which are defined as unintended leaks or releases of gasses during the transportation or handling of substances like natural gas, contribute less than one percent to the total emissions of the city, amounting to an equivalent of 117 MT CO2e. These inadvertent emissions can occur at various stages of production, processing, storage, transmission, and distribution.

City Operations Inventory

The following sections provide detailed insights into the municipal GHG emissions within La Cañada Flintridge. The City's emitting sectors include buildings and facilities, vehicle fleets, transit fleets, and employee commuting. In 2019, the City's municipal activities generated a total of 19,359 MT CO2e, making up roughly 1% of the City's total emissions.

Table 2: La Cañada Flintridge's City Operations Inventory by sector

Sector	**MT CO2e**	**Percentage (%)**
City Facilities	64	28%
Public Lighting	50	22%
Vehicle Fleet	0	0
Employee Commute	80	35%
Water and Wastewater	32	14%
Total	226	

City Facilities

La Cañada Flintridge's government-owned and operated buildings and facilities contribute to 28% of the total emissions in the Municipal Inventory, and total 64 MT CO2e. The generation and consumption of electricity are the primary sources of these emissions, with only one building consuming natural gas. Electricity usage for the government consumed 59.5 MT CO2e, where the natural gas combustion consumed 4.7 MT CO2e.

Public Lighting

Public lighting consists of electrically powered streetlights and streetlamps, traffic signals, and other public forms of lighting within the city. These lights consumed 49.9 MT CO2 in 2019.

Vehicle and Transit Fleet

The city has a minimal vehicle fleet which only had 2 vehicles, which both are already electrically powered. These vehicles consume a small amount of electricity, which is considered negligible for this emission study.

Employee Commute

A survey of commuting habits was disseminated among all La Cañada Flintridge employees to gauge the carbon impact of the daily commute by the City's workforce. Based on the surveys, employee commuting is estimated at around 35% of the total emissions generated by local government operations, producing 80 MT CO2e.

Water and Wastewater

Emissions associated with water and wastewater contribute to 14% of municipal emissions. These are emissions associated with specifically the municipal government operations. In 2019 the city produced 32 MT CO2e relating to water and wastewater processes.

Conclusion

In 2019, La Cañada Flintridge, California, the community generated a total of 164,353 MT CO2e and City government operations produced 226 MT CO2e. The most significant contributors were transportation and mobile sources, accounting for 56% of community emissions. Residential energy sources, including electricity and natural gas, were the second highest contributor, constituting 29% of the emissions. Commercial energy was the third highest contributor; other sources contributed relatively minor amounts in comparison. As for the emissions attributable to La Cañada Flintridge's government operations, four primary areas were prominent: employee commute, city facilities, public lighting, and water and wastewater are responsible for 35%, 28%, 22%, and 14 of the total emissions, respectively. Moving forward, La Cañada Flintridge is committed to maintaining its leadership role in California's efforts to reduce greenhouse gas emissions.

Appendix C.1: Attached Use Data

Community Inventory

Activity	Unit	Data	Source
Residential Electricity	kWh	81,550,294	Southern California Edison Energy 2019
Residential Natural Gas	MMBtu	5,740,926	Southern California Gas Company 2019
Commercial Natural Gas	MMBtu	887,933	Southern California Gas Company 2019
Commercial Electricity	kWh	34,832,605	Southern California Edison Energy 2019
Diesel Transportation	VMT	4,384,706	Fehr and Peers 2023
Gasoline Transportation	VMT	214,850,588	Fehr and Peers 2023
Solid Waste	Tons	19,675	2019 CalRecycle and Southeastern Resource Recovery Facility
Potable Water	Cubic Meters	2,601,250	2019 Crescentia Valley Water District
Potable Water	Cubic Meters	643,750	2019 Liberty Utilities
Potable Water	Cubic Meters	4,693,750	2017 La Cañada Flintridge Inventory

Community Inventory *CONT.*

Extraction	kWh	1,139,417	2017 La Cañada Flintridge Inventory
Supply/conveyance	kWh	18,779,287	2017 La Cañada Flintridge Inventory
Treatment	kWh	211,003	2017 La Cañada Flintridge Inventory
Distribution	kWh	2,532,038	2017 La Cañada Flintridge Inventory
Wastewater Electricity Usage	kWh	889,515	2019 La Cañada Flintridge
Wastewater Biogas Combustion	Population based	9,974	2019 La Cañada Flintridge
Wastewater Nitrification/denitrification processes	Population based	9,974	2019 La Cañada Flintridge
Wastewater effluent discharge	Kg/N	556,435	2019 La Cañada Flintridge
Wastewater septic systems	Population based	9,974	2019 La Cañada Flintridge

City Operations Inventory Data

Activity	Unit	Data	Source
Building and Facilities	kWh	282,216	2019 La Cañada Flintridge Usage
	Therms	882	2019 La Cañada Flintridge Usage
Public Lighting	kWh	236,674	2019 La Cañada Flintridge Usage
Employee Commute	Miles	135,730	2019 La Cañada Flintridge Commute Survey
Municipal Water Usage	Cubic Meters	53,797	2019 La Cañada Flintridge Usage

Appendix C.2: Detailed Methodology

Community Inventory

Electricity

Residential, commercial, and industrial electricity usage data for 2019 were furnished by Southern California Edison Energy and Southern California Gas Company. The process of determining emissions involved multiplying electricity usage by the emissions factor relevant to the jurisdiction where the electricity was generated. Southern California Edison Energy has a publicly available grid mix with which was calculated to produce emission factors for the local jurisdictions. The specific emission factor is 0.211 kilograms of equivalent carbon dioxide.

Natural Gas

Data on residential and commercial natural gas was provided by Southern California Gas Company. The calculation of natural gas emissions involves multiplying the usage data by an emission factor provided by the US Community Protocol BE.1.1.[11] The respective emission factors are 53.02 kg/MMBtu CO2, 0.005 kg/MMBtu for CH4, and 1 xE-4 for N2O. The full methodology is detailed in the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix C: Built Environment Emission Activities and Sources

Transportation and Mobile Service

Transportation emissions in La Cañada Flintridge were computed using a subcontractor Fehr and Peers. Their specific memorandum on methodology of calculating vehicle miles traveled will be in a further appendix. The emissions factors are sourced from the US Community Protocol,[12] which are as follows:

CO2 Emissions Factor	0.07024
CO2 Emissions Factor Units	MT/MMBtu
CH4 Emissions Factor	1.9493×10^{-8}
CH4 Emissions Factor Units	MT/mile
N2O Emissions Factor	1.0608×10^{-8}
N2O Emissions Factor Units	MT/mile

Solid Waste

Solid Waste information was provided by CalRecycle and Southeastern Resource Recovery Facility. The following are the specific emission factors: Mixed MSW Emission Factor (MT CH4/wet short ton) 0.0648, Newspaper Emission Factor (MT CH4/wet short ton) 0.042, Office Paper Emission Factor (MT CH4/wet short ton) 0.1556, Corrugated Cardboard Emission Factor (MT CH4/wet short ton) 0.1048, Magazines/Third Class Mail Emission Factor (MT CH4/wet short ton) 0.0476, Food Scraps Emission Factor (MT CH4/wet short ton) 0.0648, Grass Emission Factor (MT CH4/wet short ton) 0.0228, Leaves Emission Factor (MT CH4/wet short ton) 0.026, Branches Emission Factor (MT CH4/wet short ton) 0.058. The calculation methodology was adopted from the US Community Protocol.[13]

Water and Wastewater

Both potable water and wastewater systems consume electricity, and the emissions from this are calculated as previously outlined. Additionally, wastewater treatment processes utilize natural gas, the emissions from which are calculated using the aforementioned methods. The process of digester gas combustion is estimated using site-specific data obtained from OWASA. This information is converted into emissions data by applying emission factors from the US Community Protocols. Specifically, the Biogenic CO2 Emissions Factor is 52.07 kg/MMBtu, the CH4 Emissions Factor is 0.0032 kg/MMBtu, and the N2O Emissions Factor is 6.3 x 10-4 kg/MMBtu. Further details on digester combustion calculations can be found in US Community Protocols WW.1.A, WW2.A, and WW.3. Emissions resulting from the flaring of digester gas are also considered in this inventory. This is determined using site-specific data sourced from OWASA and adhering to the best calculation practices provided by the US Community Protocol. The CH4 Emissions Factor in this case is 1.2177 x10-7 MT CH4/scf. Daily nitrogen discharge is another factor incorporated in this inventory. Using the daily nitrogen load provided by OWASA, emissions data is calculated in line with the US Community Protocol. Here, the N2O Emissions Factor stands at 0.005 kg N2O/kg N in effluent. Additional details concerning effluent discharge can be referenced in the US Community Protocol, specifically WW.12. The final aspect of the water and wastewater analysis pertains to emissions from septic systems. While OWASA services the majority of households in La Cañada Flintridge, approximately 65,000 are not covered by the local wastewater agency. This results in widespread use of septic systems for wastewater disposal. Emissions from these systems can be calculated using a population-based method, which incorporates a CH4 Emissions Factor of 0.048213 MT CH4 per daily kg BOD5. An alternative calculation approach is documented in the US Community Protocol under reference WW.11 (alt).[14]

Fugitive Emissions

Fugitive emissions were calculated by usage data summed from natural gas. This was multiplied by a leakage factor of an industry standard recommended by the U.S. Community Protocol.[15] The leakage emissions are multiplied by an emissions factor of 6.1939×10^{-5} MT CH4/MMBtu natural gas used, and CO2 emission factor of 6.6316×10^{-5} MT CO2/MMBtu natural gas used.

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City Operations Inventory

Building and Facilities

La Cañada Flintridge’s buildings and facilities emissions were calculated using usage data obtained from the government's tracking software. This software monitors both electricity and natural gas usage data. The calculations were carried out in the same manner as those for the community inventory of natural gas and electricity.

Vehicle Fleet

Fuel usage for La Cañada Flintridge’s vehicle fleet was supplied by the City and calculated using the US Community Protocol.[16] The annual miles traveled, and annual fuel usage are tracked and multiplied by emission factors from ICLEI. These include a CO_2 Emissions Factor of 0.070268 MT/MMBtu, a Biogenic CO_2 Emissions Factor of 0 MT/MMBtu, a CH_4 Emissions Factor of 2.153 x10-8 MT/vehicle mile, a Biofuel CH_4 Emissions Factor of 0 MT/vehicle mile, a N_2O Emissions Factor of 1.248 x10-8 MT/vehicle mile, and a Biofuel N_2O Emissions Factor of 0 MT/vehicle mile.

Transit Fleet

Data on La Cañada Flintridge’s transit fleet usage was also provided by the City. This data was broken down by vehicle types, with transit fleet vehicles identified as buses within the data sheet. Emission factors for transit fleet buses include a CO_2 Emissions Factor of 0.07024 MT/MMBtu, a CH_4 Emissions Factor of 1.93 x 10-8 MT/vehicle mile, and a N_2O Emissions Factor of 1.48 x10-8 MT/vehicle mile.[17]

Employee Commute

Data on employee commutes was provided by the 2019 commuting survey of La Cañada Flintridge employees. This survey asked employees about their commuting habits, and total annual Vehicle Miles Traveled (VMT) was extrapolated from the responses. While the survey results did not include total mileage, it was possible to calculate this by multiplying the average miles per commute by the average workdays per week and then calculating the yearly VMT using the average number of working weeks in a year, which is 49.[18] This yields the total annual commuting VMT for La Cañada Flintridge. The emissions were then calculated using the US Community Protocol emission factors of CO_2 Emissions Factor 0.07024 MT/MMBtu, CH_4 Emissions Factor 1.8300 x10-8 MT/Mile, and a N_2O Emissions Factor 8.3 x10-9 MT/Mile.

Water and Wastewater

The emissions from water and wastewater operations for La Cañada Flintridge's municipal activities were calculated in the same manner as in the community inventory.[19] The usage data was provided by the city, and calculated for emissions in the same way as the community inventory.

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[1] https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance

[2] U.S. Community Protocol for Accounting And Reporting of GHG Emissions Version 1.2 July 2019 ICLEI–Local Governments for Sustainability USA

[3] https://www.epa.gov/climateleadership/ghg-emission-factors-hub

[4] https://cityoflcf.org/wp-content/uploads/2020/01/ClimateActionPlan.pdf

[5] https://sciencebasedtargets.org/faqs

[6] Data were not available for solid waste from City Operations to be differentiated from community waste, therefore all solid waste emissions are included only in the community inventory.

[7] https://unfccc.int/resource/docs/convkp/kpeng.pdf

[8] As referenced in the US Community Protocol the high GWP GHG's perfluorocarbons and sulfur hexafluoride are not required to complete an accurate inventory. The city reported no refrigerant loss, and therefore no hydrofluorocarbons do not appear in the inventory. All other GHGs are measured and reported.

[9] https://icleiusa.org/ghg-protocols/

[10] La Cañada Flintridge has no emissions generating from industrial sources, so only residential and commercial energy were accounted for.

[11] U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix C: Built Environment Emission Activities and Sources

[12] U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix D: Transportation and Other Mobile Emission Activities and Sources

[13] U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix E: Solid Waste Emission Activities and Sources

[14] U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix F: Wastewater and Water Emission Activities and Sources

[15] https://www.edf.org/sites/default/files/US-Natural-Gas-Leakage-Model-User-Guide.pdf

[16] U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix D: Transportation and Other Mobile Emission Activities and Sources

[17] U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix D: Transportation and Other Mobile Emission Activities and Sources

[18] https://www.bls.gov/news.release/pdf/atus.pdf

[19] U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Appendix F: Wastewater and Water Emission Activities and Sources

APPENDIX E:
VMT & GHG Reduction Strategy Memo

FEHR & PEERS

Memorandum

Date: September 29, 2023

To: Kristin Cushman and Sol Shepherd, Blue Strike Environmental

From: Netai Basu, AICP, CTP and Griffin Kantz, Fehr & Peers

Subject: VMT & GHG Reduction Strategy Analysis in Support of the La Cañada Flintridge CAAP

LA22-3415

1. Introduction

Fehr & Peers is assisting Blue Strike Environmental with transportation modeling efforts in support of the development of the La Cañada Flintridge Climate Action and Adaptation Plan (CAAP) for the City of La Cañada Flintridge, California. This memorandum documents the methodologies Fehr & Peers employed to estimate the potential for long-term reduction of citywide vehicle-miles-traveled (VMT) and the related greenhouse gas (GHG) emissions through strategies outlined in the draft CAAP, particularly in Goal T1.

These quantification methodologies made use of the California Air Pollution Control Officers Association (CAPCOA) *GHG Reduction Handbook*[1] to the greatest extent possible. The *2021 CAPCOA GHG Reduction Handbook* is the industry standard for quantifying GHG reductions from common transportation-oriented measures based on defensible, peer-reviewed research. In cases when the *CAPCOA GHG Reduction Handbook* does not offer an exact quantification methodology for a given transportation-based GHG reduction strategy proposed in the draft CAAP, Fehr & Peers referred to the closest quantifiable analog. Fehr & Peers also consulted research by the Southern California Association of Governments (SCAG) on post-pandemic "telework" / work-from-home (WFH) trends.

Please refer to our previous memorandum which documented the methodologies used to estimate the vehicle-miles traveled (VMT) associated with the City for the 2019 Baseline and 2045 future "Business as Usual" scenarios ("VMT Analysis in Support of the La Cañada Flintridge CAAP,"

[1] California Air Pollution Control Officers Association (2021). *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity* (Final Draft). <http://www.airquality.org/air-quality-health/climate-change/ghg-handbook-caleemod>.

600 Wilshire Boulevard | Suite 1050 | Los Angeles, CA 90017 | (213) 261-3050 | Fax (310) 394-7663
www.fehrandpeers.com

Fehr & Peers, July 6, 2023). Those estimates were based on the SCAG Activity-Based Model (ABM) from the agency's 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS).

2. VMT & GHG Reductions Approach

Overview of *CAPCOA GHG Reduction Handbook*

Travel demand management (TDM) strategies have proved to be among the most effective for reducing VMT and the associated GHG emissions at the municipal level. The *CAPCOA GHG Reduction Handbook* provides general formulas and parameters for quantifying these TDM reductions given input variables on local conditions including built environment context and existing local travel patterns. The Handbook provides a percentage range (from zero up to the maximum feasible) on the expected VMT and GHG reductions for each individual TDM strategy. Many strategies covered in the *CAPCOA GHG Reduction Handbook* have associated benefits for equity and quality-of-life goals. Some strategies overlap others in scope, so the Handbook provides guidelines on how to avoid double-counting likely VMT reductions from multiple strategies in combination.

Data Sources

To estimate VMT and GHG reductions from each of the strategies proposed in the draft CAAP based on the formulas in the *CAPCOA GHG Reduction Handbook*, the Fehr & Peers team consulted the data sources listed below in **Table 1**.

Table 1: Data Sources for VMT/GHG Reduction Estimation

Source	Metric
SCAG 2020 RTP activity-based model	• Baseline VMT trends (*refer to memo dated 7/6/2023*) • Local travel behavior (*e.g., mode split*)
City staff and Jet Propulsion Laboratory (JPL) facilities operation staff	• WFH trends at JPL
Local media	• LCF Shuttle annual ridership

Source: Fehr & Peers, 2023.

Additionally, the GHG reduction formulas in the *CAPCOA GHG Reduction Handbook* cite peer-reviewed sources for default parameters such as elasticity multipliers. We cite each of these sources where they are used in the analysis presented later in this memo.

Baseline VMT

The formulas provided in the *CAPCOA GHG Reduction Handbook* compute VMT reductions in the form of percentages, which are then multiplied by baseline VMT specific to the study area as calculated by the analyst. In the case of this CAAP, the baseline year for analysis is 2019, and the percentage reductions shown here for any given horizon year should be interpreted in relation to 2019 Baseline VMT.

Refer to the previous memo dated 7/6/2023 for documentation of the process of interpolating between the SCAG 2020 RTP model's 2016 base year scenario and 2045 full-build scenario. This linear interpolation method is used for some of the methods used to estimate VMT reduction, described below.

Relating VMT to GHG

The great majority of transportation strategies quantified in the *CAPCOA GHG Reduction Handbook* accomplish GHG reductions by reducing VMT, and for these strategies there is a 1:1 correspondence between percentage VMT reduction and percentage GHG reduction. Other strategies accomplish GHG reductions through a transition from fossil-fuel-powered vehicles to hybrid or zero-emissions vehicles. For this latter type of strategies, GHG reductions are not necessarily associated with any change in VMT, except for possible effects from production and recharging of such vehicles. It is important to note that trip mileage from zero-emissions vehicles is still counted towards total VMT.

Non-Quantifiable VMT & GHG Reductions

The *CAPCOA GHG Reduction Handbook* documents quantification methodologies for VMT and GHG reduction strategies when robust literature is available, but not all common strategies are yet quantifiable. Per the *CAPCOA GHG Reduction Handbook*, non-quantifiable GHG reduction strategies "may achieve emissions reductions and co-benefits on their own or may enhance the ability of quantified measures to attain expanded reduction and co-benefits."

3. VMT & GHG Reductions Estimation for Goal T1

This memo estimates the GHG reductions possible through reduction of citywide VMT, but does not attempt to estimate GHG reductions possible through other transportation-related strategies that do not reduce VMT.

The following pages summarize the final list of quantifiable VMT and GHG reduction strategies including their closest CAPCOA equivalent, the CAPCOA formulae and parameters used, the sources referenced, assumptions made where necessary, and the total citywide VMT reduction percentage as a proportion of baseline VMT.

The estimated VMT reductions from strategy are presented in table format. In each table, there are forecasts for multiple years: the 2016 base year of the SCAG 2020 RTP model, the 2045 full-build scenario of the model, and the interpolated years 2019 and 2040.

Strategy T1.1: Work with La Canada Flintridge School Districts and Jet Propulsion Laboratory to develop and implement TDM programs for students and employees.

- **Action T1.1.1:** "Encourage partnerships with private schools to develop and implement school bus programs that reduce school-related single occupancy vehicle commutes".
- **Action T1.1.2:** "Work with School Districts to encourage EV shuttle service for students living >1 mile from their neighborhood schools."

The closest GHG reduction strategies in CAPCOA for these actions are *T-40 Implement School Bus Program* and *T-41 Implement a School Pool Program*, however, these strategies are not quantified. The closest quantified strategy in CAPCOA is *T-6 Implement Commute Trip Reduction Program (Mandatory Implementation and Monitoring)*, but the description of this strategy is more applicable to workplace commute trips rather than K-12 school trips. The City is likely to have more policy levers for reducing vehicular trips to/from local schools than with workplace commute trips, as well as more flexibility to adapt those approaches to a local context.

Thus, Fehr & Peers sought to estimate an upper limit on the proportion of citywide VMT that could potentially be reduced from school-purpose VMT alone. **Table 2** estimates the potential effect of eliminating 100% of school-purpose VMT through a combination of unspecified strategies. The VMT totals presented in the table are based on the SCAG 2020 RTP model's 2016 base year scenario and 2045 full-build scenario.

Note that the school trip length assumptions in the SCAG 2020 RTP model may underestimate school trip lengths in La Cañada Flintridge, due to a higher-than-average proportion of private schools in the City, which draw attendance from further distances. Therefore, this estimate may underrepresent the amount of VMT that could be reduced through this strategy, since the total school-related VMT for La Cañada Flintridge may be higher than what is estimated by the model.

Table 2: Estimate of Maximum VMT Reduction from Strategy T1.1

Strategy T1.1					
Scenario Year		**2016**	**2019***	**2040***	**2045**
Assume up to 100% of K-12 School VMT affected	(A)	100%	100%	100%	100%
K-12 School VMT Attracted, Citywide (model)	(B)	3,673.3	3,601.1	3,095.1	2,974.7
Total OD VMT, Citywide (model)	(C)	1,273,767	1,269,411	1,238,924	1,231,665
Total % VMT Reduction	(A * B / C)	**0.29%**	**0.28%**	**0.25%**	**0.24%**

The maximum citywide VMT and GHG reduction from implementing the actions in Strategy T1.1 by 2040 is **0.25%,** which is a slight reduction from earlier years.
*Interpolated from 2016 and 2045.
Source: SCAG 2020 RTP ABM and Fehr & Peers, 2023.

Strategy T1.2: Improve connectivity of transportation network to encourage more high-occupancy trips.

- **Action T1.2.1:** Expand the frequency and hours of service of the LCF Shuttle.

The LCF Shuttle is a fare-free transit service operated by Glendale Beeline which operates along Foothill Boulevard and Ocean Boulevard between JPL and Montrose 18 times per weekday in each direction.

The closest GHG reduction strategy in CAPCOA for this action is *T-26 Increase Transit Service Frequency*. **Table 3** uses an adapted version of the formula from CAPCOA Strategy T-26 to estimate the potential effect of doubling the average frequency of the LCF Shuttle route.

Table 3: Estimate of Maximum VMT Reduction from Action T1.2.1

Strategy T1.2 – Action T1.2.1					
Scenario Year		**2016**	**2019***	**2040***	**2045**
2016 LCF Shuttle annual ridership[1]	(A)	33,449	33,449	33,449	33,449
Annualization factor for transit trips[2]	(B)	250	250	250	250
Estimated 2016 LCF Shuttle weekday ridership	(A / B)	134	134	134	134
2016 transit OD trips, Citywide	(C)	453	453	453	453
Assume 100% increase in frequency	(D)	100%	100%	100%	100%
Elasticity of transit ridership with respect to frequency of service[3]	(E)	0.5	0.5	0.5	0.5
Transit mode share, Citywide[4]	(F)	0.54%	0.62%	1.21%	1.36%
Passenger vehicle mode share, Citywide	(G)	93.48%	93.40%	92.86%	92.73%
Average vehicle occupancy, Citywide	(H)	1.61	1.61	1.60	1.60
Total % VMT Reduction	(A * D * E * F / (B * C * G * H))	**0.05%**	**0.06%**	**0.12%**	**0.13%**

The maximum citywide VMT and GHG reduction from implementing Action T1.2.1 by 2040 is **0.12%,** which would increase in later years.
*Interpolated from 2016 and 2045.
Source: SCAG 2020 RTP ABM and Fehr & Peers, 2023.

[1] *Crescenta Valley Weekly* (2016). "LCF Shuttle Ridership Increases Dramatically" (2016). <https://www.crescentavalleyweekly.com/news/02/25/2016/lcf-shuttle-ridership-increases-dramatically/>.
[2] 250:1 was used to annualize this metric of weekday travel patterns.
[3] Handy, S., K. Lovejoy, M. Boarnet, and S. Spears (2013). "Impacts of Transit Service Strategies on Passenger Vehicle Use and GHG Emissions". <https://ww2.arb.ca.gov/sites/default/files/2020-06/Impacts_of_Transit_Service_Strategies_on_Passenger_Vehicle_Use_and_Greenhouse_Gas_Emissions_Policy_Brief.pdf>.
[4] This includes ridership on all public transit services within the City.

- **Action T1.2.2:** Consider rideshare options to LAX airport, similar to the beach bus.

The closest GHG reduction strategy in CAPCOA for this action is *T-26 Extend Transit Network Coverage or Hours*, however, this strategy's VMT reduction is quantified by scaling transit mode share in a community with existing transit service. In this case, quantifying the VMT reduction effect from this CAAP action requires estimating passenger use of a direct transit service not yet offered along a defined OD pattern.

Fehr & Peers sought to estimate an upper limit on the proportion of citywide VMT that could potentially be reduced from vehicular travel to/from LAX alone. **Table 4** estimates the potential effect of shifting half of vehicular trips between the City and LAX to a new transit or rideshare service, not counting the VMT contribution of any transit or rideshare vehicles themselves. The trip totals presented in the table are based on the SCAG 2020 RTP model's 2016 base year scenario and 2045 full-build scenario.

Table 4: Estimate of Maximum VMT Reduction from Action T1.2.2

Strategy T1.2 – Action T1.2.2					
Scenario Year		**2016**	**2019***	**2040***	**2045**
Daily OD vehicle trips between City and LAX	(A)	52	52	51	51
Average trip distance between City and LAX (miles)	(B)	32.0	32.0	32.0	32.0
Assume at most 50% mode share of trips between City and LAX	(C)	50%	50%	50%	50%
Average vehicle occupancy, Citywide	(D)	1.61	1.61	1.60	1.60
Reduced daily OD vehicle trips between City and LAX	(A * C / D)	16	16	16	16
Total OD VMT, Citywide	(E)	1,273,767	1,269,411	1,238,924	1,231,665
Total % VMT Reduction	(A * B * C / (D * E))	**0.04%**	**0.04%**	**0.04%**	**0.04%**

The maximum citywide VMT and GHG reduction from implementing Action T1.2.2 by 2040 is **0.04%**.
*Interpolated from 2016 and 2045.
Source: SCAG 2020 RTP ABM and Fehr & Peers, 2023.

- **Action T1.2.3:** Assess and promote Park-&-Ride options for commuters outside of the city.

The closest GHG reduction strategies in CAPCOA for this action is *T-51 Install Park-and-Ride Lots*, however, this strategy is not quantified. The effectiveness of park-&-ride facilities is dependent on their location within the regional transit network and the orientation of regional commute patterns. The VMT reduction effect of this CAAP action cannot be quantified without new modeling analysis. The greatest potential for new transit ridership from park-&-ride may be along the Metro A Line, which is outside the City bounds and already offers parking at the Sierra Madre Villa, Lake, Del Mar, Fillmore, and South Pasadena stations.[1]

Action T1.2.3 is **supportive** of other VMT and GHG reduction efforts.

Strategy T1.3: Require new non-residential developments greater than 10,000 sq. ft. or anticipated to include businesses with more than 50 employees to reduce VMT through TDM programs.

- **Action T1.3.1:** Offer an annual bus pass to all new employees who express interest.

The closest GHG reduction strategy in CAPCOA for this action is *T-9 Implement Subsidized or Discounted Transit*. This action would only apply to new employment growth in the City that occurs in buildings of over 10,000 square feet or that have more than 50 employees, and not to employees at existing workplaces. Thus, the calculations below represent the highest reduction that can be expected from this action.

The SCAG 2020 RTP ABM forecasts citywide employment growth between the 2016 base year scenario and 2045 full-build scenario. Fehr & Peers linearly interpolated this growth between 2016 and 2045 to estimate the employment growth as a percentage of service population (population + employees) growth starting in 2019, the base year of the CAAP. **Table 5** uses the formula from CAPCOA Strategy T-9 to estimate the potential effect of offering subsidized transit passes to new employees citywide.

[1] Los Angeles County Metropolitan Transportation Authority (2023). "Metro Parking Lots by Line". <https://www.metro.net/riding/parking/lotsbyline/>.

Table 5: Estimate of Maximum VMT Reduction from Action T1.3.1 (New Emp. Only)

Strategy T1.3 – Action T1.3.1					
Scenario Year		**2016**	**2019***	**2040***	**2045**
Population, Citywide	(A)	20,761	20,893	21,816	22,036
Employees, Citywide	(B)	12,996	13,107	13,887	14,073
Service population, Citywide	(A + B)	33,757	34,000	35,703	36,109
Growth in employees since 2019	(ΔB)	0	0	780	966
Percent VMT attributable to employee growth since 2019	(ΔB / (A + B))	0.0%	0.0%	2.2%	2.7%
Assume 100% transit fare subsidy	(C)	100%	100%	100%	100%
Assume 80% of employees eligible[1]	(D)	80%	80%	80%	80%
Transit mode share, Citywide	(E)	0.54%	0.62%	1.21%	1.36%
Elasticity of transit boardings with respect to price[2]	(F)	-0.43	-0.43	-0.43	-0.43
Percent of transit trips that would otherwise be made in a vehicle[3]	(G)	50%	50%	50%	50%
Conversion factor of vehicle trips to VMT	(H)	1.0	1.0	1.0	1.0
Total % VMT Reduction	(-ΔB * C * D * E * F * G * H / (A + B))	**0.00%**	**0.00%**	**0.01%**	**0.01%**

The maximum citywide VMT and GHG reduction from implementing Action T1.3.1 for new employees only by 2040 is **0.01%**.
*Interpolated from 2016 and 2045.
Source: SCAG 2020 RTP ABM and Fehr & Peers, 2023.

[1] Night-shift employees and independent contractors/"gig workers" are not eligible.
[2] Taylor, B., D. Miller, H. Iseki, and C. Fink (2008). "Nature and/or Nurture? Analyzing the Determinants of Transit Ridership Across US Urbanized Areas". *Transportation Research Part A: Policy and Practice*, 43(1), 60-77. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.367.5311&rep=rep1&type=pdf>.
[3] Handy, S. and Boarnet, M.G. (2013). "Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions". <http://www.arb.ca.gov/cc/sb375/policies/transitservice/transit_brief.pdf>.

For demonstration purposes, **Table 6** uses the same formula from CAPCOA Strategy T-9 to estimate the potential effect of offering subsidized transit passes to all employees citywide, as opposed to *new* employees only. This reduction amount includes the 0.01% possible from offering subsidized transit passes to new employees only, and should not be double-counted when totaling their cumulative effect.

Table 6: Estimate of Maximum VMT Reduction from Action T1.3.1 (All Emp.)

Strategy T1.3 – Action T1.3.1					
Scenario Year		**2016**	**2019***	**2040***	**2045**
Population, Citywide	(A)	20,761	20,893	21,816	22,036
Employees, Citywide	(B)	12,996	13,107	13,887	14,073
Service population, Citywide	(A + B)	33,757	34,000	35,703	36,109
Percent VMT attributable to employees	B / (A + B)	38.5%	38.6%	38.9%	39.0%
Assume 100% transit fare subsidy	(C)	100%	100%	100%	100%
Assume 80% of employees eligible[1]	(D)	80%	80%	80%	80%
Transit mode share, Citywide	(E)	0.54%	0.62%	1.21%	1.36%
Elasticity of transit boardings with respect to price[2]	(F)	-0.43	-0.43	-0.43	-0.43
Percent of transit trips that would otherwise be made in a vehicle[3]	(G)	50%	50%	50%	50%
Conversion factor of vehicle trips to VMT	(H)	1.0	1.0	1.0	1.0
Total % VMT Reduction	(-B * C * D * E * F * G * H / (A + B))	**0.04%**	**0.04%**	**0.08%**	**0.09%**

The maximum citywide VMT and GHG reduction from implementing Action T1.3.1 for all employees citywide by 2040 is **0.08%**, which would increase in later years.
*Interpolated from 2016 and 2045.
Source: SCAG 2020 RTP ABM and Fehr & Peers, 2023.

[1] Handy, S. and Boarnet, M.G. (2013).
[2] Taylor, B., D. Miller, H. Iseki, and C. Fink (2008).
[3] Handy, S. and Boarnet,, M.G. (2013).

- **Action T1.3.2:** Encourage employers to provide opportunities for flex hours, compressed work week and telecommuting schedules to reduce VMT and reintroduce transportation reduction programs.

The closest GHG reduction strategy in CAPCOA for this action is *T-42 Implement Telecommute and/or Alternative Work Schedule Program*, however, this strategy is not quantified. The closest quantified strategies in CAPCOA are *T-5 Implement Commute Trip Reduction Program (Voluntary)* and *T-6 Implement Commute Trip Reduction Program (Mandatory Implementation and Monitoring)*, but the descriptions of these strategies are more applicable to travel demand management (TDM) practices that shift work commute trips to transit and non-motorized modes, not "telework"/WFH practices which eliminate work commute trips altogether.

Fehr & Peers sought to estimate the effect of requiring WFH practices for employees added between 2019 and 2045, drawing from the analysis of WFH rates at JPL as described in the previous VMT memo dated 7/6/2023. **Table 7** estimates the potential effect of requiring WFH at the projected JPL rate for all new employees citywide.

Table 7: Estimate of Maximum VMT Reduction from Action T1.3.2

Strategy T1.3 – Action T1.3.2					
Scenario Year		**2016**	**2019***	**2040***	**2045**
Population, Citywide	(A)	20,761	20,893	21,816	22,036
Employees, Citywide	(B)	12,996	13,107	13,887	14,073
Service population, Citywide	(A + B)	33,757	34,000	35,703	36,109
Growth in employees since 2019	(ΔB)	0	0	780	966
Percent VMT attributable to employee growth since 2019	(ΔB / (A +B))	0.0%	0.0%	2.2%	2.7%
% JPL VMT reduced by telework (2023)[1]	(C)	19.7%	19.7%	19.7%	19.7%
Assumed % WFH for new employees	(D)	0.0%	0.0%	19.7%	19.7%
Total % VMT Reduction	(ΔB * ΔD / (A + B))	**0.00%**	**0.00%**	**0.43%**	**0.53%**

The maximum citywide VMT and GHG reduction from implementing Action T1.3.2 by 2040 is **0.43%,** which would increase in later years.
*Interpolated from 2016 and 2045.
Source: SCAG 2020 RTP ABM and Fehr & Peers, 2023.

[1] City staff and JPL facilities operation staff.

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Strategy T1.4: Reduce other sources of citywide vehicle miles traveled (VMT).

- **Action T1.4.1:** Support Transit-Oriented Development.

The closest GHG reduction strategy in CAPCOA for this action is *T-3 Provide Transit-Oriented Development*. This action would only apply to new development within the City. The effectiveness of this strategy is dependent upon the level of implementation of Action T1.2.1 and the future frequency of the Glendale Beeline Route 3.

Table 8 uses the formula from CAPCOA Strategy T-3 to estimate the potential effect of TOD land use policies for new development citywide. The quantification below estimates the theoretical maximum effectiveness of this policy based on a value of 4.9 from CAPCOA for variable D. For a more conservative estimate, use the value 1.0 for variable D.

Table 8: Estimate of Maximum VMT Reduction from Action T1.4.1

Strategy T1.4 – Action T1.4.1					
Scenario Year		**2016**	**2019***	**2040***	**2045**
Population, Citywide	(A)	20,761	20,893	21,816	22,036
Employees, Citywide	(B)	12,996	13,107	13,887	14,073
Service population, Citywide	(A + B)	33,757	34,000	35,703	36,109
Growth in service population since 2019	(ΔA + ΔB)	0	0	780	2,109
Percent VMT attributable to all growth since 2019	((ΔA + ΔB) / (A + B))	0.0%	0.0%	4.8%	5.8%
Transit mode share, Citywide	(C)	0.54%	0.62%	1.21%	1.36%
Ratio of transit mode share for TOD area with measure compared to existing transit mode share in surrounding city[1]	(D)	4.9	4.9	4.9	4.9
Passenger vehicle mode share, Citywide	(E)	93.48%	93.40%	92.86%	92.73%
Total % VMT Reduction	((ΔA + ΔB) * C * D / (A + B) * E)	**0.00%**	**0.00%**	**0.31%**	**0.42%**

The maximum citywide VMT and GHG reduction from implementing Action T1.4.1 by 2040 is **0.31%**, which would increase in later years.
*Interpolated from 2016 and 2045.
Source: SCAG 2020 RTP ABM and Fehr & Peers, 2023.

[1] Lund, H., R. Cervero, and R. Wilson (2004). "Travel Characteristics of Transit-Oriented Development in California". <https://trid.trb.org/view/696824>.

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- **Action T1.4.2:** Promote Work-From-Home policies and infrastructure.

This action concerns WFH on the residential side, rather than the workplace side. Policy tools for encouraging WFH among local residents are even more limited than the tools for encouraging WFH among local employers.

The closest GHG reduction strategy in CAPCOA for this action is *T-42 Implement Telecommute and/or Alternative Work Schedule Program*, however, this strategy is not quantified. The VMT reduction effect of this CAAP action cannot be quantified without new modeling analysis.

Action T1.4.2 is **supportive** of other VMT and GHG reduction efforts.

4. Summary of Cumulative VMT & GHG Reductions

Estimating the cumulative VMT and GHG reductions from the CAAP strategies and actions in Goal T1 requires accounting for the compounding effects of the multiple strategies in combination through a multiplicative approach. This approach provides a mathematical way to reflect the diminishing returns that each additional strategy offers towards cumulative VMT reduction, recognizing that multiple strategies may target the same types of trips, and any individual trip cannot logically be reduced more than once even if it is targeted by multiple strategies. The method for quantifying the cumulative total percent VMT reduction from *n* strategies is described by the formula below:

$$Cumulative\ \%\ VMT\ Reduction = 1 - \left((100\% - x_1) * (100\% - x_2) * (\ldots) * (100\% - x_n)\right)$$

The estimates provided in **Tables 2 through 8** are shown in the calculation below to derive the maximum cumulative percent VMT reduction possible by 2040. This calculation uses the VMT reduction estimate from **Table 6** (subsidized transit passes for all citywide employees) in place of the estimate from **Table 5** (subsidized transit for employees from new growth only).

$$\begin{aligned} &Maximum\ Cumulative\ \%\ VMT\ Reduction \\ &= 1 - \big((100\% - 0.25\%) * (100\% - 0.12\%) * (100\% - 0.04\%) * (100\% - 0.08\%) \\ &\qquad * (100\% - 0.43\%) * (100\% - 0.31\%)\big) \\ &= 1.22\% \end{aligned}$$

Using the VMT reduction estimate from **Table 5** (subsidized transit for employees from new growth only) in place of the estimate from **Table 6** (subsidized transit passes for all citywide employees) yields a more conservative estimate:

$$\begin{aligned} &Maximum\ Cumulative\ \%\ VMT\ Reduction \\ &= 1 - \big((100\% - 0.25\%) * (100\% - 0.12\%) * (100\% - 0.04\%) * (100\% - 0.01\%) \\ &\qquad * (100\% - 0.43\%) * (100\% - 0.31\%)\big) \\ &= 1.15\% \end{aligned}$$

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The maximum citywide VMT and GHG reduction from implementing Goal T1 by 2040 is **1.22%**. This amount is relative to 2019 Baseline VMT, and on top of expected VMT decline in a "Business as Usual" scenario due to policies and programs already reflected in the SCAG 2020 RTP/SCS.

If you have any questions or comments about the analysis contained in this memo, feel free to contact Fehr & Peers for clarification.

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APPENDIX F:
VMT Analysis in Support of the La Cañada Flintridge CAAP

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Memorandum

Date: June 20, 2023

To: Kristin Cushman and Sol Shepherd, Blue Strike Environmental

From: Netai Basu, AICP, CTP and Griffin Kantz, Fehr & Peers

Subject: VMT Analysis in Support of the La Cañada Flintridge CAAP

LA22-3415.

Introduction

Fehr & Peers is assisting Blue Strike Environmental with transportation modeling efforts in support of the development of the La Cañada Flintridge Climate Action and Adaptation Plan (CAAP) in La Cañada Flintridge, California. The purpose of this memorandum is to document the methodologies used to estimate the baseline and future scenario vehicle-miles traveled (VMT) associated with the City in support of quantifying GHG emissions.

VMT Analysis Overview

Origin-destination-based VMT was estimated using the Southern California Association of Governments' (SCAG) Activity-Based Model from the agency's 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). Such models are developed and periodically updated, calibrated, and validated for use in long range infrastructure planning, environmental impact assessments, and air quality conformity analyses by local and regional agencies. Trip-based travel forecasting models generate daily vehicle trips for each traffic analysis zone (TAZ) across various trip purposes based on inputs such as the transportation network and socioeconomic data (population, household, and employment). SCAG's 2020 model is validated to the base year 2016, and it forecasts conditions out to 2045 for different scenarios of future regional travel patterns.

Post-processing the model's outputs yields City-level VMT totals disaggregated by:

- Trip configuration: internal-internal (I/I), internal-external (I/X), external-internal (X/I)
- Heavy-duty truck weight

600 Wilshire Boulevard | Suite 1050 | Los Angeles, CA 90017 | (213) 261-3050 | Fax (310) 394-7663
www.fehrandpeers.com

VMT forecasts have been provided for the years 2016 and 2045, which are the base year and horizon year of the adopted model, respectively. The VMT forecast for the year 2023 documented in this memorandum is based on linear interpolation between those two years.

Model Adjustments

Before producing the following vehicle trip and VMT forecasts for each scenario year, Fehr & Peers reviewed the off-the-shelf SCAG model and determined it was necessary to make two adjustments so that it would be suitable for this use:

- The structure of the transportation anlaysis zones in the model do not precisely align with the city's municipal boundaries. In order to produce data representative of the entire city, the model's socio-economic data (SED) inputs were shifted. Some population, households, and employees for two TAZs spanning the southwestern city boundary were reallocated to TAZs fully within the city boundary. The reallocation of households and population was based on a count of residential parcels in the overlap area and the reallocation of employees was based on a count of commercial parcels by type in the same area.
- In the 2016 base year scenario, 5,477 employees were added to the TAZ in the northeast of the city, since Fehr & Peers determined that the off-the-shelf SCAG model does not account for JPL's employees in La Cañada Flintridge. JPL had 6,085 employees in 2016 and 90% of them worked on-site, therefore 5,477 on-site JPL employees were added to the model.[1] JPL had 6,167 emlployees in 2022 and 90% of them worked on-site, thus yielding 5,550 on-site JPL employees in 2022. Fehr & Peers used this number of JPL on-site employees in modeling the horizon year 2045. For travel behavior modeling purposes, Fehr & Peers treated two-thirds of JPL employees as professional services/information technology employees and one-third as manufacturing employees.

Forecast Year Interpolation

A linear interpolation between the SCAG 2020 RTP model's 2016 base year scenario and 2045 full-build scenario was used to estimate past and future VMT for the City of La Cañada Flintridge in 2023. The full-build 2045 scenario assumes implementation of all transportation projects and programs adopted in the 2020 RTP/SCS.

Regional Fair-Share VMT

The forecasts shown here calculate the City's "fair share" of regional VMT by adding 50% of VMT for I/X trips and 50% of VMT for X/I trips between the City and the surrounding region to the total I/I VMT entirely within the City. We omit external-external (i.e., pass-through) trip VMT. This

[1] 2016 and 2022 employee totals provided by City staff.

method is standard for Climate Action Plans and other related analyses; it may differ from VMT calculation methods used in other contexts (for example, transportation impact analysis of a land use project).

Figure 1 shows the linear trendline interpolating between the 2016 base year and 2045 horizon year scenario forecasts from the SCAG model.

Figure 1: Vehicle-Miles Traveled Interpolation

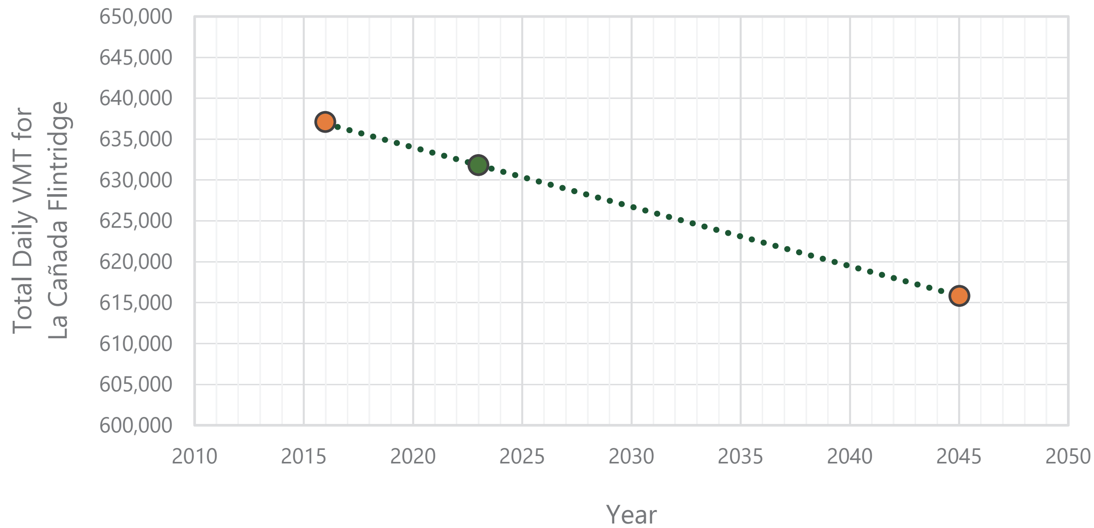

Table 1 presents the "fair-share" regional VMT for the City of La Cañada Flintridge in the forecast years. The City's VMT declines by approximately 3.34% between the baseline year 2016 and the horizon year 2045, or by roughly 21,000 vehicle-miles. The substantial majority of VMT will continue to be between the City and the surrounding region for the forecast year, with I/X and X/I VMT comprising more than 97% of the City's total VMT share. I/I VMT is forecasted to increase over time while total VMT is forecasted to decrease, due to a larger proportion of short-distance, locally-captured trips in the future.

Table 1: Vehicle-Miles Traveled Forecast Summary

City of La Cañada Flintridge Fair-Share Vehicle Miles Travelled (VMT) Forecast Summary			
Configuration	**2016**	**2023**	**2045**
Internal-Internal (I/I)	14,356	14,749	15,983
Internal-External (I/X)	303,902	300,760	290,885
External-Internal (X/I)	318,625	316,293	308,965
Total VMT	**636,883**	**631,802**	**615,833**

Source: Fehr & Peers, 2023.

Table 2 presents the forecasted vehicle-trips (VT) for the City of La Cañada Flintridge in the same years. I/X and X/I trips comprise 83-84% of the City's total VT share in each year, which is less than the I/X and X/I proportion of VMT, since external trips are longer than internal trips, on average. Total VT are forecasted to increase over time while total VMT is forecasted to decrease, again due to a larger proportion of short-distance, locally-captured trips in the future.

Table 2: Vehicle Trips Forecast Summary

City of La Cañada Flintridge Fair-Share Vehicle Trips (VT) Forecast Summary			
Configuration	**2016**	**2023**	**2045**
Internal-Internal (I/I)	9,140	9,350	10,008
Internal-External (I/X)	24,058	24,019	23,896
External-Internal (X/I)	24,073	24,035	23,913
Total VT	**57,271**	**57,404**	**57,818**

VMT by Vehicle Type

Table 3 on the following page disaggregates VMT for the City by vehicle type according to this framework:

- Light motor vehicles (LMV) are comprised of
  - Drive Alone (DA)
  - 2 Person Shared Ride (SR2)
  - 3+ Person Shared Ride (SR3)
- Heavy-duty trucks (HDT) are comprised of
  - Light heavy-duty trucks (8.5K-14K lbs. gross vehicle weight) (LHDT)
  - Medium heavy-duty trucks (14K-33K lbs. gross vehicle weight) (MHDT)
  - Heavy heavy-duty trucks (>33K lbs. gross vehicle weight) (HHDT)

LMV VMT comprises over 95% of the City's total VMT in each forecast year. DA VMT is consistently 74-76% of total LMV VMT and 71-73% of Total VMT.

Table 3: Vehicle-Miles Traveled Forecast Disaggregation by Vehicle Type

City of La Cañada Flintridge VMT Forecast by Vehicle Type										
		LMV				HDT				
Year	**Configuration**	**DA**	**SR2**	**SR3**	**Total**	**LHDT**	**MHDT**	**HHDT**	**Total**	**Total**
2016	Internal-Internal (I/I)	8,187	3,358	2,696	14,240	51	45	20	116	14,356
	Internal-External (I/X)	221,450	49,309	20,914	291,673	2,906	2,502	6,821	12,229	303,902
	External-Internal (X/I)	232,771	51,682	21,915	306,367	2,916	2,510	6,831	12,258	318,625
	Total VMT	**462,407**	**104,349**	**45,525**	**612,280**	**5,874**	**5,057**	**13,672**	**24,603**	**636,883**
2023	Internal-Internal (I/I)	8,396	3,481	2,754	14,631	52	46	20	118	14,749
	Internal-External (I/X)	218,208	49,287	20,852	288,347	2,924	2,504	6,984	12,413	300,760
	External-Internal (X/I)	229,985	51,895	21,968	303,848	2,934	2,513	6,999	12,446	316,293
	Total VMT	**456,588**	**104,663**	**45,575**	**606,825**	**5,911**	**5,063**	**14,003**	**24,977**	**631,802**
2045	Internal-Internal (I/I)	9,052	3,868	2,937	15,857	57	49	21	126	15,983
	Internal-External (I/X)	208,019	49,219	20,658	277,896	2,982	2,513	7,494	12,989	290,885
	External-Internal (X/I)	221,228	52,563	22,137	295,928	2,990	2,519	7,527	13,036	308,965
	Total VMT	**438,300**	**105,650**	**45,731**	**589,681**	**6,028**	**5,082**	**15,041**	**26,151**	**615,832**

APPENDIX G:

COMING OCT. 26

Environmental Review:
Initial Study/Mitigated Negative Declaration