

Measuring Local Climate Action in Alameda County District 1 Cities

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Abstract This research paper analyzes how District 1 cities, including Pleasanton, Dublin, Livermore, and Fremont, respond to climate change and which of these cities are leading and lagging in climate action. Although climate change is a topic that is widely explored at the state and national levels, there is little information on how climate action compares between District 1 cities. To answer this, data for five metrics—greenhouse gas emissions (GHG emissions), climate action plan (CAP) score, heat pump adoption, EV infrastructure progress, and tree canopy coverage—across three categories—policy strength, implementation progress, and outcomes—were pulled from various datasets ([California Climate Action Portal - Climate Action Planning Data for California Communities](#); [Tree Equity Score National Explorer](#); [Climate Action Plan 2030 and Beyond](#); [Climate Ready Fremont](#); [Livermore Climate Action Plan 2022](#); [Climate Action Plan 2.0](#)). Based on these data, a climate action index is formulated to compare the rankings of the cities in the various metrics. The results reveal that Pleasanton leads overall, while Fremont lags in climate action metrics. In addition, recommendations are suggested to help reduce GHG emissions in areas where cities are lacking, and a website is designed to display results for residents, policymakers, and others to see how their District 1 city is doing in climate action. While this study only uses some of the few climate action metrics available, they can be used for future research and guide future climate action planning.

1. Introduction

In 1938, steam engineer George Callendar discovered that global temperatures had increased by 0.3 degrees Celsius over the past 50 years ([A Brief History of Climate Change Discoveries](#)). He advocated that carbon dioxide caused an increase in temperatures, but many scientists didn't believe that humans could have such a large impact on the environment ([A Brief History of Climate Change Discoveries](#)). Many people at this time believed that the Earth warming was a good thing, as it could decrease dangerous glaciers and cold weather. However, as research continued to expand, it was found that the climate getting warmer wasn't a good thing and that greenhouse gases, gases that trap heat in the atmosphere produced by us humans, were contributing to the warming ([History of Climate Science Research](#)). Climate change, the long shift of temperature and weather patterns, has degraded the environment by increasing droughts, increasing natural disasters, and decreasing biodiversity, the variety of life in an area ([What Is Climate Change?](#)).

Now more than ever, local governments play a pivotal role in addressing climate change through policy decisions, infrastructure investment, and emissions reduction strategies ([Bedsworth and Hanak](#)). However, climate action, implementation progress, environmental outcomes, and much more can vary widely within cities in the same area. Specifically, this research paper looks at Alameda County's District 1, four incorporated cities, which are Livermore, Pleasanton, Dublin, and Fremont. This project aims to understand which cities are advancing in climate action and which are falling behind by developing a comparative Climate Action Index to decide where change is most needed. For future services, a public website comparing the 4 cities under climate action metrics will be produced.

2. Methodology

This project creates a Climate Action Index by comparing Dublin, Fremont, Livermore, and Pleasanton across five metrics under three categories. They are independently ranked and then classified as leading, moderate, and lagging based on their average ranking.

2.1 Policy Strength

CAP quality and implementation were evaluated by reviewing each city's CAP and supporting evidence such as implementation dashboards and progress reports to create a CAP score. They were evaluated against a 1-5 rubric where a 1 means no plan exists, 2 means a basic plan with no specific targets or implementation tracking, 3 means a plan with specific targets but no published implementation tracking, 4 means a plan with specific targets and a published implementation progress table, and 5 means a plan with specific targets, detailed implementation tracking, and evidence of completed actions.

2.2 Implementation Progress

Three metrics were used to evaluate how much a city was investing in climate action: heat pump adoption per 10,000 residents (data only comes from those that participate in the Tech Clean California Program) ([California Climate Action Portal - Climate Action Planning Data for California Communities](#)), which measures how much a city is investing in heat pumps; EV infrastructure progress, which measures each city's current EV infrastructure per 10,000 residents against suggested 2030 goals from ClimatePlans; and tree canopy coverage, which measures how much of the city is covered by tree canopy ([Tree Equity Score National Explorer](#)).

2.3 Outcomes

GHG emissions measures how much climate action is affecting a city's GHG emissions. GHG emissions reduction progress is calculated by measuring a city's current GHG reduction from its baseline. Cities are then compared to their predicted linear progress from their own 2030 goal stated in their CAP plan. GHG per capita is also then compared to California's statewide 6.0 MT CO₂e per capita benchmark ([Climate Action Resource Guide](#)).

2.4 Normalization and Ranking

Two of the metrics, GHG emissions and EV infrastructure progress, are measured as the percentage of each city's targeted goal that has been met. CAP scoring is normalized using the formula $(\text{score} - 1)/4$. The rest of the metrics, tree canopy coverage and heat pump adoption per 10,000 residents, use relative normalization, meaning that they are compared against each other. They also use goals and averages as context. All the normalized scores are then ranked independently across the cities and then averaged to create one score.

3. Results and Analysis

3.1 Category 1: Policy Strength

3.1.1 Climate Action Plan (CAP) Score

Table 1 summarizes the Climate Action Plan (CAP) quality scores for each city. All cities scored above a 3 since they all have CAPs with specific targets in mind. Dublin scores a 4 with a live

Table 1: Climate Action Plan Quality Scores

City	Score	Implementation Tracking	Progress Report
Dublin	4.0	Live Rincon Dashboard	No
Fremont	3.5	Power BI Dashboard	No
Livermore	4.5	Live Rincon Dashboard	Yes
Pleasanton	3.5	Private Rincon Dashboard	No

Rincon dashboard. As of its most recent update, it shows that only 1 action, switching all municipal electricity accounts to EBCE’s Renewable 100 power portfolio, has been completed, and the other 105 actions it supports are ongoing ([CAP Implementation Dashboard - Dublin](#)). Based on the dashboard, they are making good progress in developing an existing building electrification plan, developing an electric vehicle infrastructure plan, and adopting an electric vehicle charging station ordinance. However, they do fall short of a 5 due to no progress report and limited actions completed.

Fremont and Pleasanton both score a 3.5 but for different reasons. While Fremont does have its own Power BI dashboard on its website that focuses on climate action efforts such as trees planted, EVs registered, and GHG trends, it lacks specific CAP action tracking ([Climate Action Dashboard](#)). Pleasanton scored a 3.5 because an internal implementation tracking table exists and its strategic plan report provides partial evidence of completed CAP-related actions, but it falls short of a 4 because the tracking table is not publicly accessible and the strategic plan covers broader cities beyond climate, specifically making it difficult to directly assess CAP implementation progress.

Lastly, Livermore scores the highest with a score of 4.5 because it has a live Rincon table and an annual progress report. However, the half point comes from the dashboard showing that 88 out of the 89 actions have no action, with 1 action, which is adopting an electric reach code for new construction by 2023, being completed ([CAP Implementation Dashboard - Livermore](#)). In contrast, the progress report shows meaningful action such as the expansion of EV charging infrastructure through a \$1.6 million California Energy Commission grant funding 100 charging ports at five city facilities, approval of 333 EV chargers across 60 permits, 4.83 MW total of rooftop solar approved, 167 heat pump permits, 253 all-electric housing units under construction, 1.42 miles of new bike lanes, 123 new trees planted, and compost distribution to over 2,200 residents ([Climate Action Plan Progress Report 2025](#)). This suggests that the dashboard hasn’t been updated recently and there are tracking inconsistencies.

3.2 Category 2: Implementation Progress

3.2.1 Heat Pump Adoption

Figure 1 shows heat pump adoption per 10,000 residents for each city. Livermore leads significantly at 2.12 installations per 10,000 residents. Dublin and Pleasanton follow with 0.68 installations and 1.18 installations per 10,000 residents. While Fremont, with 0.52 installations per 10,000 residents, is the only city that falls below the state average of 0.6 installations per 10,000 residents ([California Climate Action Portal - Climate Action Planning Data for California Communities](#)). Compared to other metrics, this is a positive finding since most cities do have installations above the state average. However, it should be noted that this only contains data from installations that received incentives through the TECH California program and may not reflect the total adoption rate.

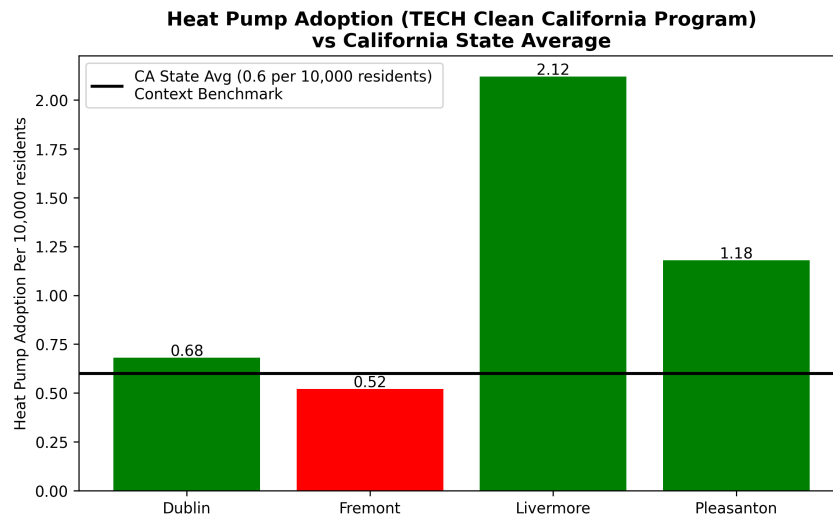


Figure 1: Heat pump adoption per 10,000 residents across the four Alameda County cities. Data is from ClimatePlans.

3.2.2 EV Infrastructure Progress

Table 2: Electric Vehicle Charging Infrastructure Progress

City	Current EV Chargers (per 10,000 residents)	2030 Suggested Target (per 10,000 residents)
Dublin	35.90	269.21
Fremont	25.00	260.36
Livermore	26.66	263.18
Pleasanton	37.51	263.62

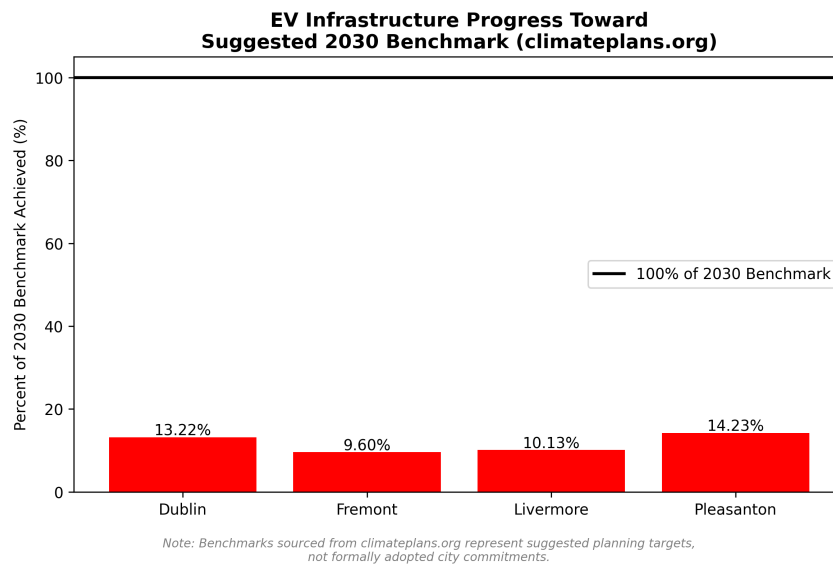


Figure 2: EV infrastructure progress across the four District 1 cities. Data is from ClimatePlans.

Table 2 and Figure 2 compare each city's current electric vehicle (EV) charging infrastructure with the suggested 2030 benchmark developed by ClimatePlan. From the data, all four District 1 cities

are shown to be severely behind the suggested 2030 benchmark, which shows the most consistent underperformance out of all metrics. These 2030 benchmarks were calculated based on California’s goal to hit 1 million charging stations statewide ([California Climate Action Portal - Climate Action Planning Data for California Communities](#)). Pleasanton leads with the most progress at 14.23%, Dublin following closely behind at 13.22%, Livermore with 10.13%, and Fremont with the least progress at 9.60%. Because all cities are severely behind on all targets, it raises the question of whether these benchmarks were aspirational at the time or whether investment in EV infrastructure has become insufficient.

3.2.3 Tree Canopy Coverage

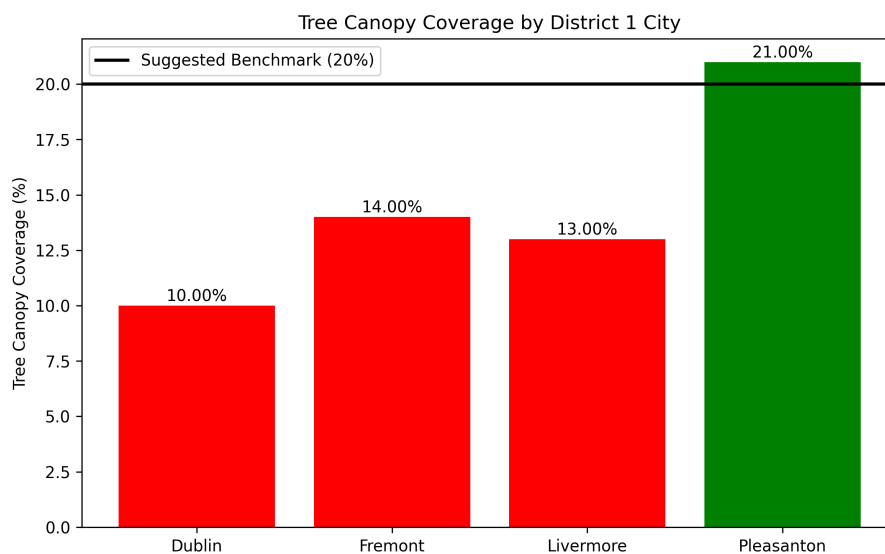


Figure 3: Tree canopy coverage across the four District 1 cities. Data is from Tree Equity Score.

Figure 3 shows the tree canopy coverage for each city. A coverage level of 20% is set as the context benchmark for grassland cities and is a realistic target ([Leahy](#)); however, higher percentages could be achieved through greater investment. Pleasanton leads as the only city above the suggested grassland benchmark. The other three cities fall behind the benchmark, with Dublin falling severely behind at 10% tree canopy coverage. However, it should be noted that tree canopy coverage can also be influenced by other factors such as geography, land use patterns, and development densities.

3.3 Category 3: Outcomes

3.3.1 Greenhouse Gas (GHG) Emissions

Table 3: Greenhouse Gas (GHG) Emissions Progress by City

City	Actual Progress (%)	Expected Progress (%)	GHG Per Capita (MT CO ₂ e)	2030 Goal (MT CO ₂ e)
Dublin	81.32	82.50	4.50	2.80
Fremont	41.71	72.00	4.54	2.65
Livermore	59.94	82.50	5.70	3.08
Pleasanton	74.65	82.50	6.54	4.11

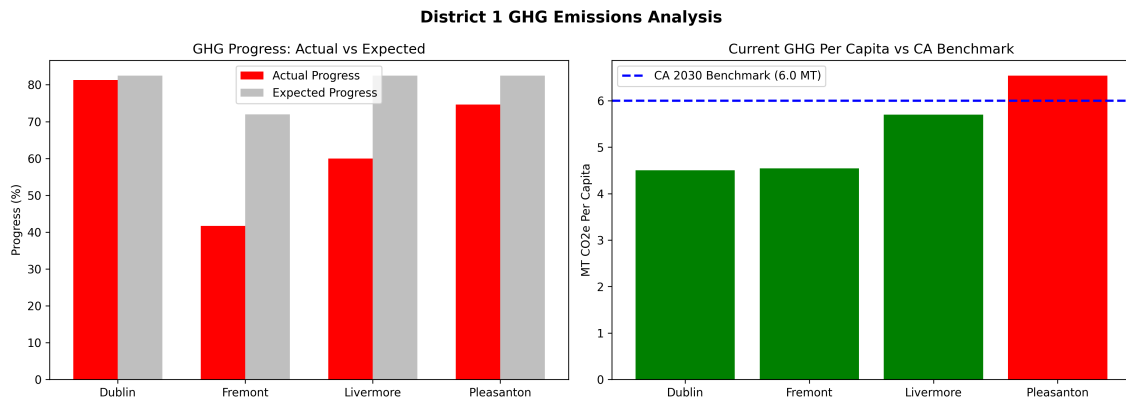


Figure 4: GHG emissions across the four District 1 cities.

Figure 4 and Table 3 show the GHG analysis for each city. All cities are currently not on track to meet their own 2030 goals when compared to the linear progression. Dublin leads in progression, having achieved 81.32% of its goal already, while the expectation is 82.5%, making it very likely the city will meet its goal soon. Pleasanton ranks second at 74.65%, Livermore follows at 59.94%, and Fremont ranks last at 41.71%. Regarding the California statewide benchmark of 6.0 MT CO₂e per capita, three of four cities currently fall below this threshold. Pleasanton is the only city that falls above it with 6.54 MT CO₂e, which means that despite ranking first overall in the metrics given, there could be other confounding variables that affect Pleasanton's high emissions, such as vehicle use or low solar panel usage.

3.4 Overall Climate Action Index Rankings

Table 4: Final Climate Action Index Rankings

City	Average Rank	Tier
Dublin	2.4	Moderate
Fremont	3.5	Lagging
Livermore	2.2	Moderate
Pleasanton	1.9	Leading

Table 4 presents the final Climate Action Index rankings after averaging each city's ranking across the five evaluation metrics. Pleasanton ranks as leading, driven by its strong performance in tree canopy coverage and heat pump adoption. Livermore and Dublin both rank as moderate, with Livermore performing stronger on CAP quality and heat pump adoption while Dublin performs stronger on GHG progress. Fremont ranks lagging, with consistently low performance across all five metrics.

Figure 5 reveals some interesting findings about District 1 cities. First, while Pleasanton leads overall, it is also the only city above the 6.0 MT CO₂e per capita GHG benchmark, meaning that it could be lagging in other metrics not mentioned in this paper or its implementation has not been translated into emission reduction. Livermore has the highest CAP score and quality but ranks second to last on GHG reduction progress. Lastly, all four cities rank below their suggested EV infrastructure benchmarks and expected progress in GHG emission reduction.

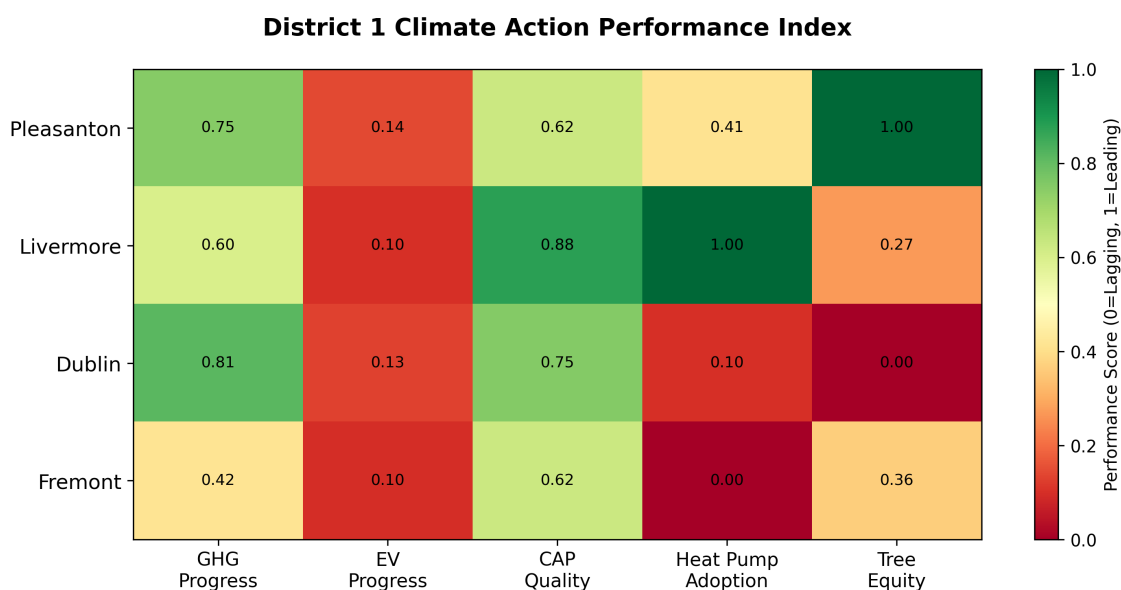


Figure 5: Heatmap of normalized Climate Action Index metrics for District 1 Cities

4. Priority Recommendations

4.1 Increase Electric Vehicle Infrastructure Investment

Transportation is the largest sector of GHG emissions, and more specifically for the four cities. It will not only help them meet the suggested 2030 goal but also help these cities reduce GHG emissions significantly. District 1 should advocate for coordinated regional EV infrastructure investment across all four cities and actively support cities in pursuing available grant funding.

4.2 Address Greenhouse Gas Reduction Gaps

Both Livermore and Fremont are at the bottom two for their reduction progress from the 2030 target. Fremont is at only 41.71% and Livermore at 59.94%. District 1 should work with both cities to conduct reviews identifying specific barriers to GHG reduction progress, whether that is funding, technology constraints, or something else, and prioritize decreasing those barriers.

4.3 Strengthen Climate Action Plan Implementation Tracking

The four cities need to strengthen implementation tracking by making it publicly accessible and regularly updated. District 1 should encourage all four cities to do so, as this will help residents and policymakers identify what actions are being executed correctly and what needs more implementation.

5. Conclusion

This project's main goal is to find out which cities in District 1 are leading and lagging in climate action and what possible gaps could be filled. While this analysis is limited to five metrics and can be influenced by many confounding factors, this research demonstrates the value of public climate transparency and how the climate action index can aid residents, policymakers, and other staff as a resource to see how each District 1 city is performing.

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