

Putting Action in Climate Action Plans: How Equity-Centered Goals are Implemented in California Cities

Abstract:

As climate change accelerates, municipalities are adopting aggressive climate change policies to facilitate transitions to a more resilient future. However, addressing inequities in the treatment of politically, economically, and socially marginalized communities is necessary for transformational changes in combating climate change and advancing sustainability, as they are the most vulnerable to climate change. Although California cities are increasingly including equity-centered language and goals in their Climate Action Plans (CAPs), the actual implementation of these commitments remains largely unexamined, and it is unclear if the equity promises are merely lip service. This thesis research aims to help fill the gap by developing a policy evaluation framework to examine (1) whether California cities with equity goals in their CAPs have established effective implementation strategies, (2) what these implementation strategies entail, and (3) what factors differentiate the cities that are doing more to implement their equity goals. The study employs interviews, document analysis, qualitative comparative analysis, and statistical analysis to uncover why certain cities are more successful than others in implementing the equity actions and goals specified in CAPs. Integrating social equity-focused initiatives in climate planning actions not only enhances the implementation of climate mitigation and adaptation strategies but also boosts the likelihood of marginalized communities actively engaging in these efforts. The findings provide crucial recommendations for cities as they develop and update CAPs and allocate resources to bridge the gap between equity-oriented ambitions and the effective and equitable outcomes. Specifically, policy stakeholders should prioritize setting measurable equity targets with dedicated funding, improving administrative capacity to implement and scale up well-planned equity-centered projects. In addition, extensive community input creates the relationships and insights needed for equity-centered climate mitigation and adaptation measures.

Introduction

Climate justice is a term that acknowledges climate change not merely as an environmental problem but as a complex phenomenon intertwined with social, economic, and political inequities resulting from historical and ongoing legacies of systematic inequality (Bell, 2015). Climate justice embeds concepts from environmental justice, highlighting that marginalized communities - often designated as “Environmental Justice Communities of Concern” - are disproportionately burdened by higher exposure to pollution and environmental hazards,

resulting in a significantly lower quality of life (Welsch, 1997). Environmental justice scholarship has also developed the notion of “sacrifice zones,” or areas that are heavily impacted by environmental degradation due to higher rates of placement of industrial facilities, wastewater treatment plants, etc. (Lester et al., 2001; Lerner, 2010). Sacrifice zones often overlap with communities of low-income, color, and indigenous, exacerbating life-threatening health problems for marginalized populations, which for example, have a higher incidence of pollution-related respiratory and cardiovascular disease due to intensive air pollution (Cole and Foster, 2001; McDonald et al. 2015).

As the impacts of climate change expand and accelerate, climate change disproportionately impacts marginalized communities, exacerbating the existing socio-economic inequalities in the U.S. and globally (Schlosberg and Collins, 2014; Chapman et al., 2018; Schipper, 2020). Often termed “frontline communities,” these disadvantaged groups directly and cumulatively experience multiple overlapping climate hazards, and social inequities more acutely than populations which have more social privilege (Siddiqi et al., 2023; NAACP, n.d.). “In the context of climate change, frontline communities’ health, income, and access to resources is less than people who have social privilege” (NAACP, n.d.). They face greater health, economic, and resource access disparities, exacerbated by climate change events such as extreme heat, flooding, wildfires, storms, which disproportionately impose economic burdens, infrastructural inadequacies, and challenges in mobility and disaster recovery (Schlosberg and Collins 2014; Reames 2016; Sovacool and Dworkin 2015).

With limited financial resources and insufficient government assistance, recovery from climate-induced damages is limited for frontline communities, resulting in enlarged socio-economic inequities. The emergent pattern highlights an urgent need to integrate support for historically disadvantaged populations within climate action planning. Equitable policy development and implementation should proactively consider both procedural justice, ensuring inclusive participation of frontline communities in policymaking, and distributive justice, to ameliorate disproportionate burdens faced by climate-vulnerable populations. Such an approach necessitates robust, integrative strategies that foreground social justice alongside environmental sustainability to foster resilience within these communities (Lozano et al., 2022).

Municipal efforts to respond to climate change and climate justice

Different levels of jurisdictions in the U.S. are playing an increasingly important role in climate governance by implementing ambitious climate policy agendas to promote the shift towards a cleaner and more resilient environment. In recent decades, local climate planning has been at the forefront of the climate and sustainability movements, providing a range of essential services that are central to mitigating climate change by developing and implementing climate action plans

(CAPs), with a particular focus on greenhouse gas (GHG) emission reduction, energy efficiency improvement, renewable energy development, affordable housing development, and land-use management (Hughes, 2020; Betsill and Bulkeley, 2003; Bassett and Shandas, 2010; Greve, Boswell, and Seale, 2011; Rosenzweig et al., 2010). Cities play a crucial policymaking role in climate change governance under the current regulatory decentralization of environmental policy and the growing polarization, as well as congressional gridlocks to promote bipartisan climate regulations (Hughes 2020; Klyza and Sousa, 2008; Egan and Mullin, 2023).

Concurrently, cities are recognized for their potential to advance climate justice as local CAPs, with targeted investments, have the potential to address social and racial justice by addressing longstanding inequities (Schrock et al., 2015). As densely populated areas where economic growth, social disparities, and climate challenges converge, cities provide a unique platform for integrating climate mitigation and adaptation and social equity in climate policies. Strategies encompassing urban resilience planning, affordable housing, and clean and affordable transportation not only aim to mitigate climate impacts brought by extreme weather events but also direct benefits to vulnerable populations by investing in the most at-risk communities (Bulkeley et al., 2013). Cities are also often the hubs of activism, where grassroots community organizations facilitate community-driven policy solutions to climate change. Additionally, the transition to a green economy presents opportunities for job creation in cities. By prioritizing green jobs and ensuring that all these opportunities are accessible to all residents, cities can address both economic problems and climate change.

Existing research on U.S. municipalities' trend to incorporate equity into climate planning

The incorporation of equity considerations into municipal planning is gaining momentum. Schrock et al. (2015) reveal that cities are clearly making equity a priority theme in local CAPs. California CAPs are also increasingly incorporating language and goals that address both climate and equity concerns (Angelo et al., 2020). This shift is also evident in the prioritization of procedural and distributive justice in IPCC, with federal initiatives like Plan EJ 14 and Justice 40 reinforcing this trend. Yet, translating these priorities into action remains challenging, as equity considerations are frequently overlooked when compared to economic and environmental concerns (Schrock et al., 2015; Saha and Patterson, 2008). Even though the three E's - environment, economy, and equity - are always brought together as integral parts of sustainability, the third E - equity "is the most routinely left aside" (Schrock et al., 2015; Saha and Patterson, 2008; Opp and Saunders, 2013). Local sustainability initiatives tend to focus on improving the quality of life in cities and making them more appealing, rather than addressing social and racial inequality (Portney, 2003; Schrock et al., 2015).

To effect transformational change and achieve sustainable development, it is required to tackle the inequities that heighten the vulnerability of frontline communities to climate change (Roy

2018; Patterson 2018). Evidence suggests that a local government's commitment to sustainability resources and their success in meeting sustainability targets are positively correlated with a prioritization of equity (Hawkins et al., 2015). Thus, municipal climate policies should strive for a balanced approach, where environmental goals and economic development are pursued in concert with an unwavering commitment to social justice.

Scholarship in the field of climate governance has already extensively investigated climate change governance. Climate justice research focuses on efforts by cities to achieve GHG reduction goals, how some decarbonization pathways harm vulnerable communities, the importance of incorporating climate justice into the design of climate change interventions, and presenting key dimensions related to equity and justice to improve urban climate adaptation (Mendez 2015; Krause et al. 2019; Sovacool 2020; Bulkeley et al. 2014; Shi et al. 2016). Emerging research has begun to analyze the efficacy of CAPs, assessing their impacts on local governance structures, factors associated with the adoption of climate policies, and the CAPs' contributions to observed implementation outcomes (Wheeler, 2008; Bassett and Shandas, 2010; Boswell, Greve, and Seale, 2010; Zahran et al., 2008; Pitt, 2010; Sharp, Daley, and Lynch, 2011; Millard-Ball, 2013).

Equity considerations within municipal CAPs have recently become a focal point, with studies increasingly aiming to assess the quality of CAPs concerning their inclusivity of equity, highlighting the imperative to embed equitable planning within both development and implementation phases of CAPs. More specifically, scholars have examined the connection between equity and local climate planning efforts and investigated to what extent the cities are incorporating equity into local CAPs (Lozano et al., 2022; Schrock et al., 2015). According to a qualitative assessment of the inclusion of equity in California's CAPs, more recent CAP publications and updates tend to include more equity elements and jurisdictions whose residents have higher educational attainment are more likely to include equity themes (Lozano et al., 2022). This research also finds community engagement and advocacy are key catalysts to facilitate local jurisdictions to include equity considerations in the local CAPs (Lozano et al., 2022). Their findings advocate for systemic change across all levels of governance and industry to ensure that equitable planning is valued alongside GHG emission reduction.

Implementation of equity actions matters

Despite the growth of research on equity considerations and municipal CAPs, there are a number of key gaps in our understanding, particularly around the implementation process and ultimate impacts of these plans. While CAPs serve as a framework for establishing emissions baselines and reduction targets, there are rarely implementation requirements or penalties associated with missing these targets. There is no consistent methodology to examine equity in municipal CAPs. (Lozano et al., 2020; Lozano et al., 2022; Zimm et al., 2024). Furthermore, there is a discernible

gap in the literature regarding how the equity goals are actually implemented at the city level and the associated socio-environmental impacts, signaling a critical area for future research endeavors.

The process of translating equity goals in CAPs into actual implementation efforts and results remains understudied and is important for ensuring climate policies and regulations do more than pay lip service to equity concerns (Baker, 2021). There are historical patterns of unmet goals and a lack of implementation effort toward resolving environmental inequities in climate policy more broadly (Konisky, 2016). Similarly, broader urban planning efforts have often fallen short, with investments failing to reach target neighborhoods in ways that maximize social impacts, as economic development agendas frequently obscure equity commitments (Schrock et al., 2015).

An emerging body of literature is beginning to examine the determinants that drive the implementation of equity elements in CAPs. The establishment of measurable targets is identified as essential for the realization of equity goals and effective monitoring to track the progress (Holly et al., 2023; Chu and Cannon, 2021). Promising practices for successful implementation of environmental justice policies at the city level encompass a range of factors: procedural justice and meaningful community engagement, public trust, equitable program design and delivery, and the foresight to mitigate unintended policy outcomes (Siddiqi et al., 2023). Local capacity to bring equity issues into political debate is a key factor to include equity into sustainability transitions, but a catalytic event is required to activate the action (Schrock et al., 2015). Research on policy implementation broadly can also provide a framework for understanding the implementation of climate equity goals coupled with focused inquiry into the mechanisms through which cities actualize equity-driven climate initiatives.

Overview of the study

This research aims to address these critical gaps by investigating equity-centered commitments articulated in CAPs and the form, drivers, and outcomes of their implementation, examining the factors that enable or impede the successful translation of the goals and promises into projects and programs on the ground. It particularly looks into why certain municipalities outperform others in translating equity-centered goals and actions into tangible implementation status to point local jurisdictions clear pathways to clear the barriers to that benefit frontline communities.

The research starts with a review of all California city CAPs that cover equity topics, identifying the 20 most ambitious plans that address climate equity from multiple dimensions with details. A rigorous scoring framework, with a set of eight indicators designated to assess the strength of cities' implementation strategies for equity goals and actions in the CAPs, was developed and applied. The 20 cities were then scored on a scale from 0 to 2 across each implementation indicator, resulting in a ranking based on aggregate evaluation scores. Subsequent statistical

analyses were conducted to further analyze if demographic, socio-economic, and climate vulnerability conditions are associated with the evaluation score.

In-depth virtual interviews with municipal climate policy leaders involved in the climate or sustainability initiatives in the highest- and lowest-ranked cities provided additional insights into the implementation status, factors contributing to the differing evaluation scores, and factors contributing or hindering the implementation progress. The findings provide crucial actionable recommendations for future CAPs drafting and revisions as well as strategic resource allocation to guide the progression from equity-oriented ambitions to effective and equitable climate action outcomes.

The California Context

California's commitment to climate leadership and justice presents a compelling case study for the analysis of equity actions in city-level CAPs. The state's progressive climate policies, its varied vulnerability to climate impacts, and its ambition to incorporate equity in both state and local climate efforts make it an exceptional focus for this research.

California has emerged as a frontrunner and innovator in developing and implementing policies to combat climate change, consistently raising its goals for reducing greenhouse gas emissions in recent years (Lozano et al., 2022). Starting in 2005, Governor Schwarzenegger signed Executive Order S-3-05, setting a state goal to reduce GHG emissions to 1990 level by 2020, and 90 percent below 1990 levels by 2050 (Schwarzenegger, 2005). One of the most important pieces of legislation, Assembly Bill 32, the Global Warming Solutions Act, mandated that the local governments and state agencies help meet the GHG emission reduction goals by creating a statewide cap-and-trade program (California Assembly, 2006). More recently, Governor Brown signed executive order B-55-18 committing the state to carbon neutrality by 2045 (Brown Jr., 2018). At the local level, California Senate Bill 375, the Sustainable Communities and Climate Protection Act of 2008 encourages local municipalities to meet GHG reduction goals and requires the California Air Resources Board set regional GHG reduction targets (California Senate, 2008). Many municipal governments subsequently created CAPs to set emission reduction goals and outline how they will achieve them (Lozano et al., 2022).

California's demographic diversity and socio-economic disparities accentuate the relevance of equity in climate planning. The state's unique geography contributes to a pronounced susceptibility to climate-induced extremities such as wildfires, heatwaves, and floods, disproportionately impacting its disadvantaged communities and intensifying climate justice issues. In response, legislation like Assembly Bill 1550 has been enacted to direct climate

mitigation efforts towards these vulnerable groups (California Assembly, 2016). Some examples of state legislation relevant to climate justice can be found in Table 1.

Table 1 California Legislation on Climate Justice

Climate Justice Relevant Content	State Legislation
Specified funding to disadvantaged communities from available funds, such as Greenhouse Gas Reduction Fund	SB 535, AB 1550
Community air quality protection program, requiring statewide strategy to reduce air pollution in communities affected by a high cumulative exposure burden	AB 617
Requires environmental justice to be addressed in local government planning (e.g. General Plan) in every California city and county that contains a disadvantaged community	SB 1000

Additionally, the strong culture of environmental justice advocacy and community engagement in California is pushing for more equitable climate action and ensuring that vulnerable communities are represented in climate planning (Lozano et al., 2022). Angelo et al. (2020) revealed the increasing trend of California counties and cities to include equity language in local CAPs, with more than 100 counties and cities now having equity language in their plans. This reflects a broader, more systemic shift towards equity-centered climate action governance model in California. California's vibrant civic landscape and the state and local governments' support for climate action and social equity create an instructive environment for examining the translation of equity commitments into practice.

To facilitate an in-depth analysis, this study selectively examines city-level CAPs that have explicitly articulated commitments to equity. While some counties also have CAPs (Angelo et al., 2020), the number of county-level CAPs is limited, so focusing only on city-level plans provides opportunities for comparative analysis across the same jurisdiction level to generate more applicable insights. The study investigates whether cities that make a commitment to climate equity have indeed formulated and implemented robust strategies to fulfill such promises. The following research questions will be addressed in sequence:

- (1) For cities in California that emphasize equity in their CAPs, have they developed strong implementation strategies for these equity goals?
- (2) Why do some cities have strong implementation strategies, and others don't?
- (3) Is there a relationship between the strength of the implementation strategies in the CAP and the implementation status of the equity policies actually in place?
- (4) What are the implementation facilitators and barriers for equity-centered climate action?

Methods

The research questions are answered sequentially and logically, the methods are developed in the same manner, taking a few phases to address the questions step by step.

Study sample CAP selection and CAP review

The primary objective of this study is to assess the extent to which ambitious equity goals in municipal Climate Action Plans (CAPs) are transformed into substantive implementation strategies and tangible actions within the context of California cities. To identify the final scope of investigation, the initial step involved selecting CAPs that comprehensively address a spectrum of equity-related issues.

Given the absence of a comprehensive inventory of municipal-level CAPs in California, this research relied on an existing compilation by Angelo et al., (2020), which lists more than 100 counties and cities with equity mentioned in their municipal CAPs. An exhaustive review of 90 city CAPs from this list was conducted to identify the 20 most ambitious CAPs, in terms of addressing climate inequity. For the purpose of this study, ambitious CAPs were defined as meeting the following criteria:

- (1) Explicit designation of equity as a core goal or broad level emphasis;
- (2) Inclusion of specific equity goals within the CAP;
- (3) Identification of vulnerable groups most impacted by climate change;
- (4) Acknowledgment of income level disparities and their impact on climate vulnerability;
- (5) Emphasis on community engagement, participation, and outreach efforts;
- (6) Implementation plan and monitoring measures to track progress.

All of these criteria are crucial for assessing the level of ambition of the CAP. They not only demonstrate the city's commitment to addressing climate inequality for the most affected populations by establishing specific policy objectives with tangible targets for effective implementation and progress evaluation, but also go beyond mere goals by actively involving communities in the implementation process to ensure they will reap the benefits.

I used keyword searching to identify whether all the above six criteria are addressed. Recognizing the diverse linguistic expressions that cities might use to articulate similar concepts and considering the broad range of issues encompassed by equity, a comprehensive list of keywords was used: "Equity", "Equitable", "Equality", "Inclusive", "Low-income", "Vulnerable", "Vulnerability", "Poor", "Disadvantaged", "Disproportionate", "Community", "Engagement", and "Participate".

Additionally, to search for the implementation and monitoring strategies, additional keywords were identified: “implementation”, “monitor”, “timeline”, “performance”, “fund”, “partner”, “department”, and “indicator”. Beyond the keyword search, a careful read of each CAP document was conducted, including appendices and supplementary sections. This step was important to ensure that the keyword-search function did not miss any relevant information.

The selected 20 cities are listed in Table 2. The cities selected for this study are predominantly small-sized, with Oakland being an outlier (the only medium-sized city) in terms of population size; however, even Oakland remains below the 500,000 population thresholds commonly associated with a large city (OECD, 2022). Notably, plans from larger cities like San Francisco and Los Angeles, despite their detailed equity components, were excluded from the final sample. This decision was predicated on the recognition that the capacity and resources of these larger cities could potentially skew the comparative analysis, given their distinct scale and capabilities relative to the smaller municipalities that constitute the bulk of the sample.

Table 2 Plans Reviewed

City	Plan Name	Year	Population Size	City Size
Alameda	Alameda Climate Action and Resiliency Plan	2019	78,280	Small
Albany	City of Albany Climate Action and Adaptation Plan	2019	20,271	Small
Antioch	Antioch Climate Action and Resilience Plan	2020	115,291	Small
Colma	Town of Colma 2030 Climate Action Plan	2020	1,570	Small
Concord	Climate Action and Resilience Plan	2020	125,410	Small
Cupertino	City of Cupertino Climate Action Plan 2.0	2022	60,381	Small
Emeryville	The City of Emeryville Climate Action Plan 2.0	2016	12,905	Small
Encinitas	City of Encinitas Climate Action Plan	2018	62,007	Small
Escondido	Climate Action Plan - City of Escondido	2021	151,038	Small
Los Altos	Climate Action and Adaptation Plan	2022	31,625	Small
Madera	City of Madera Climate Action Plan	2015	66,224	Small
Morro Bay	City of Morro Bay Final Climate Action Plan	2014	10,757	Small
Oakland	Oakland 2030 Equitable Climate Action Plan	2020	440,646	Medium
Pleasanton	Climate Action Plan 2.0	2022	79,871	Small
Redwood City	Climate Action Plan	2020	84,292	Small
Richmond	City of Richmond Climate Action Plan	2016	116,448	Small
San Carlos	City of San Carlos Climate Mitigation and Adaptation Plan	2021	30,722	Small
San Leandro	San Leandro 2021 Climate Action Plan	2021	91,008	Small
San Luis Obispo	Climate Action Plan for Community Recovery	2020	47,063	Small
Santa Cruz	City of Santa Cruz 2030 Climate Action Plan	2022	62,956	Small

Development of an evaluation framework to operationalize equity inclusion

To systematically assess the strengths of CAPs' strategies for implementing equity actions and goals, this study develops and develops a novel evaluation framework. The need for such a framework arises from the observed inconsistency in evaluating equity considerations across CAPs. While Lozano et al. (2022) have assessed the integration of equity within California CAPs through a scoring framework, their analysis broadly addresses equity without delving into the nuances of specific equity issues.

Burder (2018) identifies seven key protocols universally recognized in policy implementation literature as critical to the effective realization of policy actions that can also be important to be included in implementation strategies to realize equity actions and goals: Content, Context, Capacity, Commitment, Clients and Coalitions, Communication, and Coordination.

Drawing inspiration from these protocols, the scoring framework developed for this study refines and tailors these protocols to specifically evaluate if the city CAPs articulate robust implementation strategies for the equity objectives. Each protocol is operationalized through a total of eight measurable indicators, with reflection of both procedural and distributive justice. The indicators also ensure to reflect both procedural and distributive justice. Table 3 includes an explanation of each measurable indicator.

The scoring rubrics to qualitatively assess the equity inclusion in CAPs in Lozano et al. (2022) and Schrock et al., (2015) are immediately relevant to my research, particularly providing key insights into how to distinguish between varying levels of grading. My coding scheme assigns each indicator a score ranging from 0 to 2 according to the prominence and specificity of each equity-centered element included in the CAP (Schrock et al., 2015). Table 3 also includes information about which protocol(s) each indicator meets with even more detailed grading rubric for each indicator.

The coding for CAPs was as follows: 0 was assigned if there was no mention of the equity element or if it was mentioned without commitment; 1 was assigned if there were mentions of the equity element with limited specificity; and 2 was assigned if the equity elements were both prominent and specific. Three of the indicators offer the possibility of earning an additional bonus point. The bonus point can only be awarded if the city has already been assigned a score of 2 for the indicator. The bonus point is intended to acknowledge the inclusion of strategies in certain CAPs that go beyond the expected level of implementation for achieving equity elements. The scoring framework will thus reward cities with exceptional performance that surpasses expectations. The rubric is intentionally designed with a high threshold for receiving a score of 2, indicating that a score of 2 signifies that the city has done an exceptional job with a robust implementation strategy.

The scoring framework was applied to the 20 plans in my sample. Data extracted during this review were recorded in a detailed grading spreadsheet, with explicit justifications for each assigned score. Total evaluation scores were generated by adding across all the eight indicators, and the final scores allowed the cities to be ranked from highest to lowest, with higher scores indicating the city has stronger implementation strategies for equity-centered actions and vice versa. This ranking informs the subsequent analysis, particularly addressing Question (1) concerning the variability in the effectiveness of equity-centered strategies across cities.

Table 3 Evaluation Scoring Rubric

Indicators	Applied Protocols	Score		
		0	1	2
(1) equity commitment	Content Commitment	Mentioned equity but without commitment or emphasis on the importance of addressing climate injustice	Equity is mentioned multiple times across sections in the plan but not centered as a key mission even through some importance is attached to equity	The plan is driven by centering climate equity/justice as a required step to pursue sustainability and address climate change
				* a bonus point (+1)
(2) climate vulnerability assessment	Context Clients and coalitions	No vulnerability assessment	Mentioned climate vulnerable populations in need to equitable actions with little specificity on regions or population subgroups under climate impacts	Clearly identified disparate needs and suffering of vulnerable populations, either by identifying specific populations or regions under climate impacts
				Used maps to illustrate vulnerability
(3) socio-economic vulnerability analysis	Context Clients and coalitions	No socio-economic vulnerability analysis	Mentioned socio-economic contexts that climate vulnerable populations face in the city with little depth of specificity	Analyzed socio-economic contexts and issues that climate vulnerable populations face with examples to illustrate how socio-economic issues exacerbates the climate inequity
				Used maps to illustrate vulnerability
(4) specific mitigation or adaptation actions with equity elements	Content Commitment	No mitigation or adaptation actions to address the disparate needs and challenges faced by climate vulnerable populations	Have mitigation or adaptation actions to address vulnerabilities to support vulnerable populations with little depth or specificity on how the action will enhance equity	Have concrete mitigation or adaptation actions to address the vulnerabilities faced by disadvantaged communities to enhance climate equity
				Mentioned plans to ensure equitable implementation
(5) equitable implementation plan and responsibility assignment	Capacity Client and coalitions	Have sketchy implementation plan to carry out equity actions or missing two or more of the responsibility assignments - lead department/agency, partner organizations, and funding sources	Have detailed implementation plan and/or missing one of the responsibility assignments - lead department/agency, partner organizations, and funding sources	Have detailed implementation plan and responsibility assignments of all roles - lead department/agency, partner organizations, and funding sources
				Mentioned how to explicitly monitor the implementation of equity-centered actions
(6) monitoring the implementation process and progress	Capacity Commitment	Have sketchy monitoring plans to track with little depth or specificity and lack timeline or performance metrics	Proposed monitoring plans to track and evaluate the implementation progress with mentioning of timelines or performance metrics for mitigation measures without explicitly focusing on equity actions	Have existing monitoring mechanisms to track and evaluate the implementation progress with mentioning of timelines and performance metrics without explicitly focusing on equity actions but do mention the importance of transparency
				Mentioned how to explicitly monitor the implementation of equity-centered actions
(7) equitable community engagement and participation during the planning phase to gather community input	Communication Commitment Context	No mention of the incorporation of community voices from public meetings or engagement events during the planning and drafting phases	Mentioned public meetings or engagement events during the planning and drafting phases but do not cover enough range of stakeholders or few opportunities were provided to maximize participation of underserved communities	Mentioned a wide range of public meetings and engagement events during the planning and drafting phases to integrate comprehensive community voices into the plan and include a wide range of stakeholders with efforts to prioritize the participation of underserved communities
(8) equitable community engagement and outreach during implementation phase	Communication Commitment Content	Only broadly mentioned the need to reach to community members for collaboration on implementing the plan with specificity on how	Have sketchy outreach plans to all community members to establish the collaborative relationship to implement the plan with information about how to utilize the co-benefits	Have concrete outreach plans to all community members to establish the collaborative relationship to implement the plan with information about how to utilize the co-benefits and offer convenient access to remove participation barriers to ensure equitable engagement and prioritize underserved communities

Interviews

While the analysis of CAP documents generates critical insights into the strategies stated in CAPs for achieving equity goals, it falls short of uncovering the underlying factors influencing the strength of these strategies, the status of implementation, and the dynamics that either facilitate or impede the realization of equity objectives. To address these gaps, this study incorporates interviews, a qualitative method essential for deepening our understanding of the practical aspects of policy implementation.

Given time and capacity constraints, in-depth interviews with city government officials and the city's partnering community organizations from all 20 cities was deemed impractical. Thus, a targeted approach was adopted, focusing on the three highest-ranked cities (Oakland, Alameda, and Santa Cruz) and three lowest-ranked cities (Emeryville, Colma, and Madera) based on their total evaluation scores. The interviews aimed to understand the discrepancies in evaluation scores, examining whether these cities' actual implementation efforts align with their rankings, thereby addressing Questions (2) and (3).

The interview guide comprised four thematic sections designated to facilitate semi-structured discussions with city officials and community organizations responsible for the climate and sustainability efforts:

- (1) The official's or their organization's role in planning and implementing phases of the CAP
- (2) Factors behind the observed strengths or weaknesses in the CAP's implementation strategies for equity-centered actions
- (3) Actual implementation status of the whole plan and more specifically about the equity elements
- (4) Existing and potential factors that facilitate and hinder the implementation success of equity-centered objectives.

Prior to initiating contact, this study secured approval from the University of Michigan Institutional Review Board (IRB), ensuring compliance with ethical standards governing human subject research. To identify potential interviewees, contact information for the city officials in climate, sustainability, or environmental departments or agencies and individuals who lead community organizations were collected from the CAPs, government websites, other city planning documents, and LinkedIn. Outreach efforts employed a combination of email and LinkedIn messages. Out of the 43 requests sent via email and LinkedIn messages, seven individuals who are current or former city government officials who oversee city climate and sustainability programs and have experience in either the planning or implementation stages of the CAP consented to participate in the interview. These individuals are from five of the six selected cities; attempts were made to gain an interviewee in the sixth city, but they were

unsuccessful. The seven interviews were conducted via Zoom between October 23, 2023, and January 25, 2024. Comprehensive notes were taken during each session, and where permissible, interviews were transcribed. The qualitative content analysis involved a systematic categorization and summarization of the responses, providing rich and dynamic insights into the various facets of equity implementation within municipal climate action planning.

Despite the initial intention to conduct interviews with both city officials and community organizations, the resulting interviews were solely with the officials of each city, and so may heighten the potential for bias, as the perspectives from multiple angles are not being heard. For example, information regarding the city partner's perception of the planning and implementation stages of the CAPs is absent. Among the seven interviews, three were conducted from a single city, and one was from each of the remaining four. Having only one interview for each city may skew perceptions, but all the interviewees were or continue to be prominent figures in local climate and sustainability initiatives, which implies that they possess a deep understanding of the fundamental details regarding the development and implementation of these plans. In this case, despite the limited number of interviews, the discussion still provides reliable and comprehensive information. However, due to the fact that only two cities with lower ranks were interviewed, the content analysis has limited ability to summarize findings related to cities that have less effective implementation strategies for equity actions.

Statistical Analysis

Following the approach of Schrock et al. (2015), and Lozano et al. (2022), to complement the qualitative comparative analysis generated from policy document reviews and interviews, statistical analyses were conducted. The primary aim was to explore the relationship between key demographic, socioeconomic, race and ethnicity, and climate vulnerability factors and the robustness of equity-action implementation strategies, as reflected by the evaluation scores for each city in the sample. Distinct from previous research, this study broadens the analytical scope by incorporating both linear regression and cluster analysis to examine the data.

An Ordinary Least Square Regression seeks to understand if the gradings of the strength of each city's implementation strategies for equity actions are associated with the city's demographic, socioeconomic, race and ethnicity, and climate vulnerability index (including whether the city is coastal and the extreme climate event index) to supplement the analysis of factors may influence the variability in cities' capacities to actualize their equity-centered goals. The equation for this regression model is shown below.

$$Y_{\text{evaluation score}} = \beta_0 + \beta_1 \cdot \text{Population}(\log) + \beta_2 \cdot \text{Employment rate} + \beta_3 \cdot \text{Median Household Income} + \beta_4 \cdot \text{Poverty Rate} + \beta_5 \cdot \% \text{ Without Health Insurance} + \beta_6 \cdot \% \text{ of Bachelor's degree or higher} + \beta_7 \cdot \% \text{ of White} + \beta_8 \cdot \% \text{ of Black} + \beta_9 \cdot \% \text{ of Hispanic/Latino} + \beta_{10} \cdot \% \text{ of Asian} + \beta_{11} \cdot \% \text{ of American Indian and Alaska Native} + \beta_{12} \cdot \% \text{ of Native Hawaiian and Pacific Islanders} + \beta_{13} \cdot \text{Coastal} + \beta_{14} \cdot \text{Extreme Climate Index}$$

Moreover, to identify potential patterns among the sampled cities, a K-means cluster analysis was employed, utilizing all the continuous variables collected (see Table 4 in Statistical Analysis Results). This cluster analysis aims to uncover similarities and differences among the cities and group together cities with similar social and climate vulnerability factors into distinct clusters, thereby offering a basis for the analysis of what factors are associated with cities scored higher or lower in the evaluation.

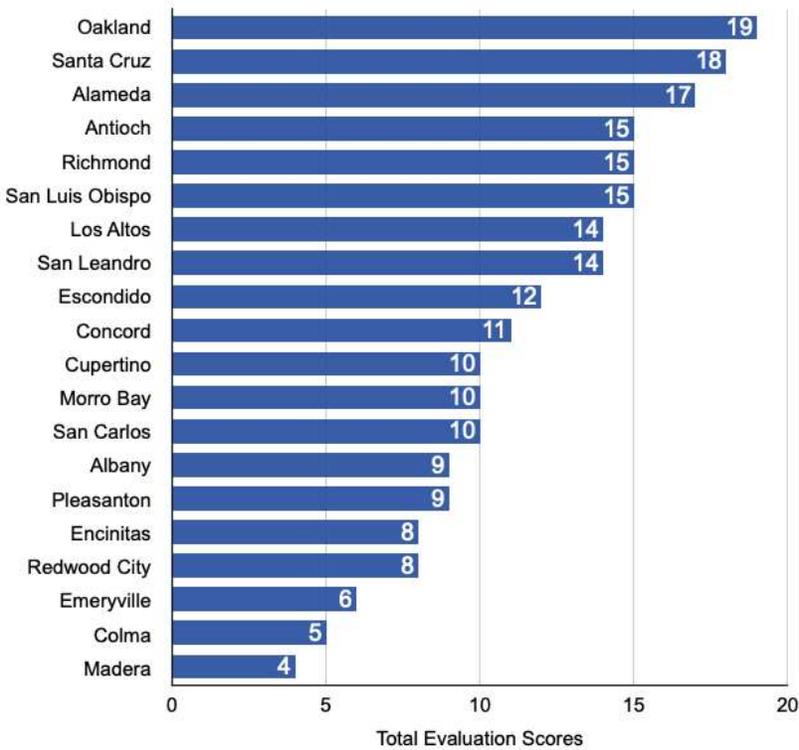
Results

Descriptive statistics of the plans

This section presents the descriptive analysis of how the 20 cities incorporate equity elements in the CAPs, after each plan was evaluated against a set of eight indicators developed to assess the integration and strength of equity-centered implementation strategies. The cumulative evaluation score and corresponding rank are presented in Figure 1. The city CAPs that were reviewed uniformly prioritize the reduction of GHG emissions as their primary objective and the main motivation behind their planning efforts.

Cities that achieve higher scores are those that have well-defined and inclusive plans for achieving equity goals and implementing corresponding actions, while the opposite is true for cities with lower scores. Oakland, Santa Cruz, and Alameda are notable among the 20 cities for their highly effective implementation strategies in achieving equity goals and actions as outlined in their CAP documents across various indicators.

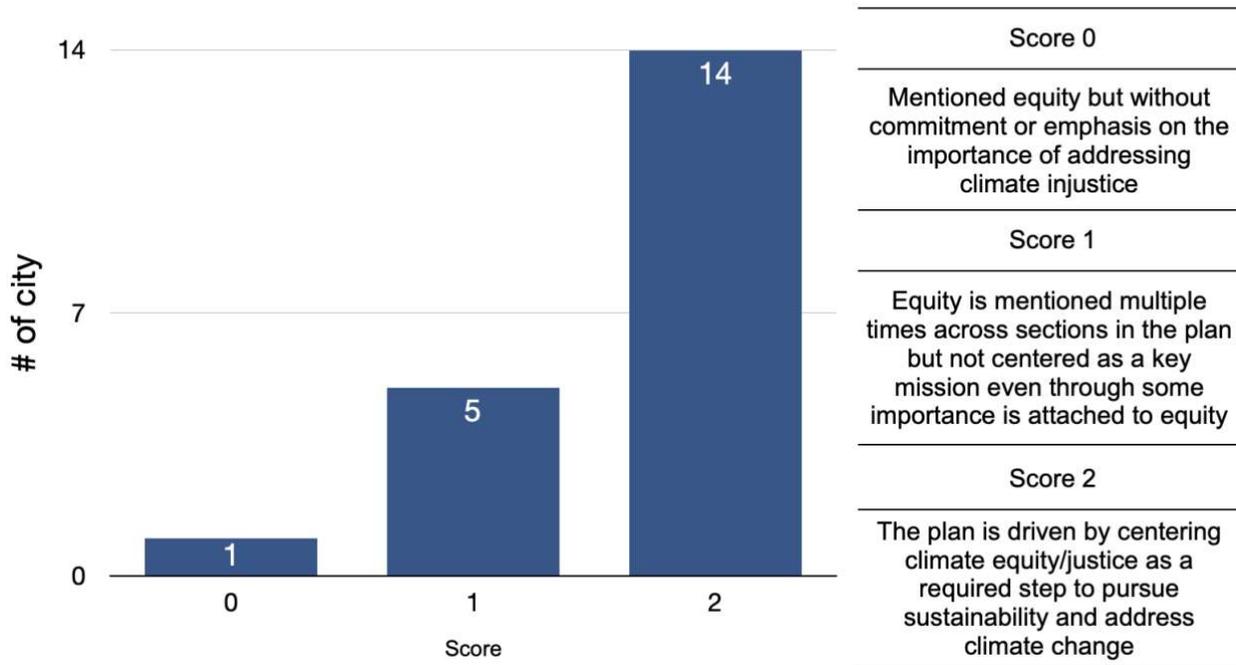
Figure 1 Total evaluation scores ranking in descending order



Indicator 1: Equity Commitment

The majority of the plans (14 out of 20) scored the highest score, score 2 (see Figure 2), explicitly placing equity as the priority element, key goal, and guiding principle in the plans, and two of them have even highlighted the theme of equity in the title of the CAP document. Only 1 plan scored a 0. Prioritizing the needs of frontline communities is repeatedly mentioned in most of the plans. Cities like Oakland and Santa Cruz have institutionalized equity through dedicated departments and equity advisors, highlighting their commitment to climate justice by ensuring that all policies and programs need to incorporate equity considerations. Some of the plans highlight certain types of equity, such as health equity, to more specifically tailor to their local contexts.

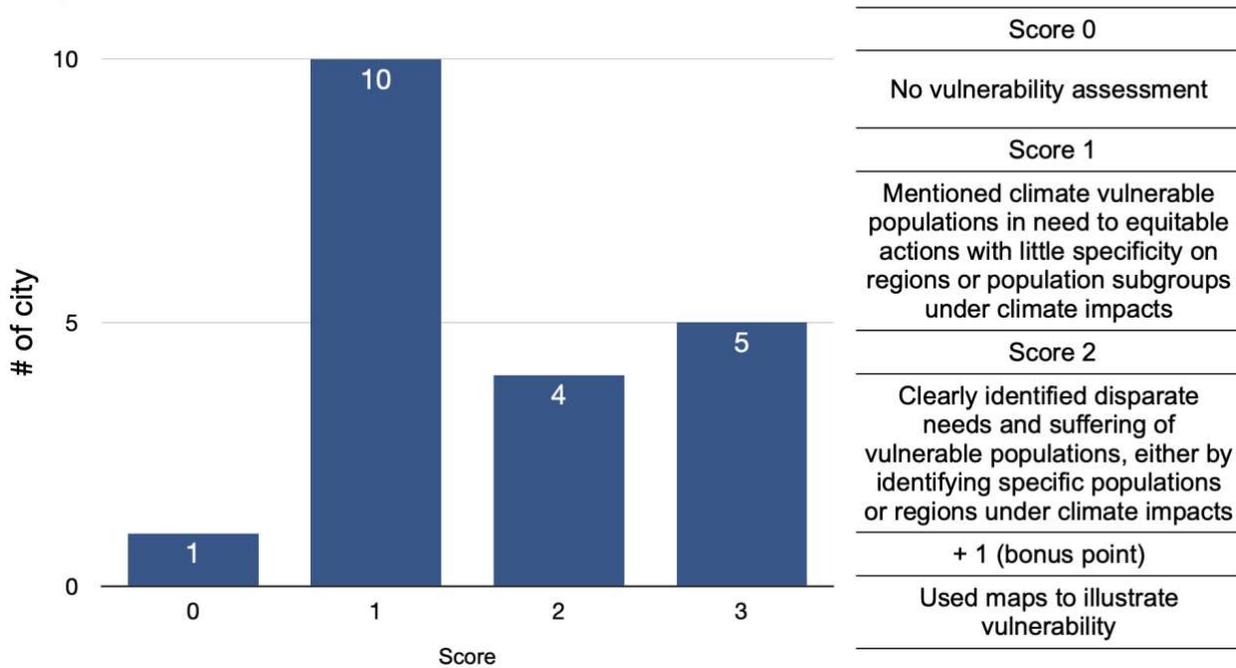
Figure 2 Score Distribution of Indicator (1) with Rubric



Indicator 2: Climate vulnerability assessment

Nearly all the plans feature climate vulnerability assessments as a key section with varying extent of specificity that 19 of the 20 plans receive scores equals or higher than 1 (see Figure 3). Some city plans include comprehensive vulnerability assessments that distinguish vulnerabilities based on various geographic regions or specific subgroups of populations, whereas other CAPs solely identify climate hazards that affect the entire city most frequently. Best practices involve detailed analyses of subgroup-specific vulnerabilities and the utilization of spatial mapping to illustrate exposure to extreme climate events; 5 of the 20 cities did this in their CAPs and scored 3 (see Figure 3).

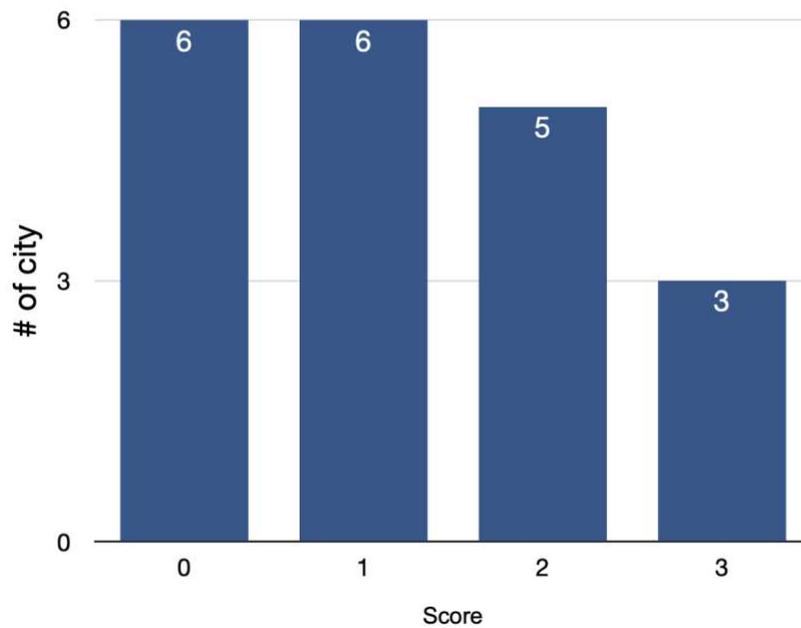
Figure 3 Score Distribution of Indicator (2) with Rubric



Indicator 3: Socio-economic vulnerability analysis

A subset of CAPs (8 out of 20) delves into how the climate crisis exacerbates socio-economic burdens on frontline communities and the systemic and root causes of the disparate climate vulnerability outcomes in-depth (see Figure 4). Alameda has a whole appendix section analyzing the importance of consideration of social vulnerability in climate planning. More specifically, for example, the analysis covers how transit dependence can make it harder for economically strained households to respond in times of climate emergency, and insufficient transit options could exacerbate the accessibility issues for transit-dependent individuals, such as children, senior, disabled, and low-income residents (City of Alameda, 2019).

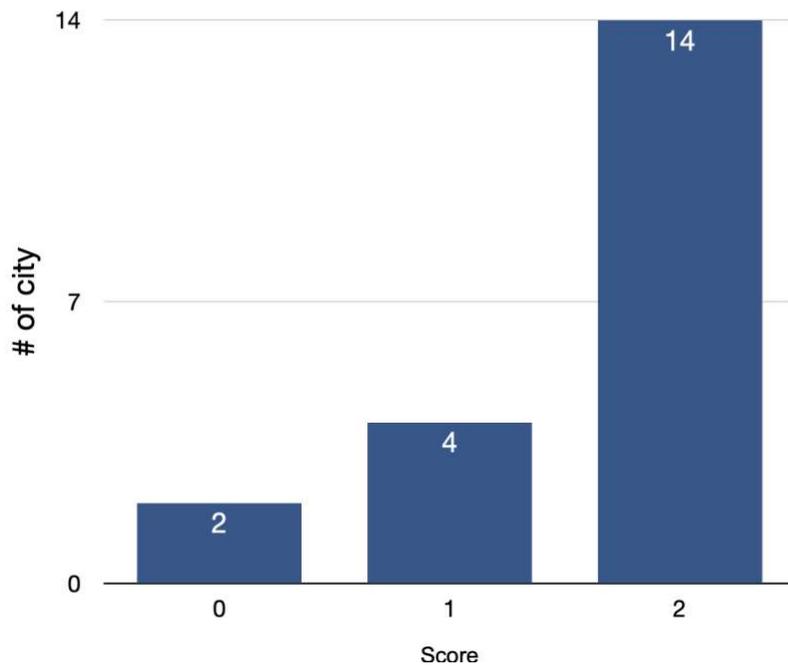
Figure 4 Score Distribution of Indicator (3) with Rubric



Score 0
No vulnerability assessment
Score 1
Mentioned socio-economic contexts that climate vulnerable populations face in the city with little depth of specificity
Score 2
Analyzed socio-economic contexts and issues that climate vulnerable populations face with examples to illustrate how socio-economic issues exacerbates the climate inequity
+ 1 (bonus point)
Used maps to illustrate vulnerability

Indicator 4: Mitigation and adaptation measures with equity elements

Figure 5 Score Distribution of Indicator (4) with Rubric

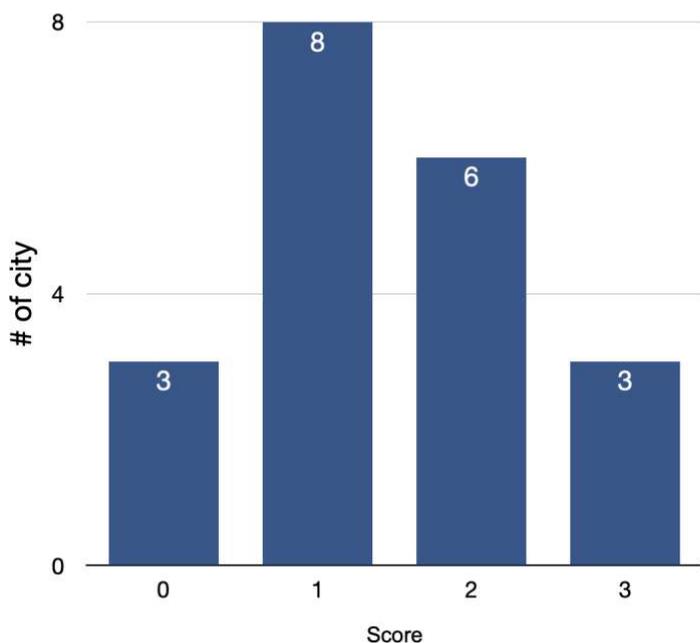


Score 0
No mitigation or adaptation actions to address the disparate needs and challenges faced by climate vulnerable populations
Score 1
Have mitigation or adaptation actions to address vulnerabilities to support vulnerable populations with little depth or specificity on how the action will enhance equity
Score 2
Have concrete mitigation or adaptation actions to address the vulnerabilities faced by disadvantaged communities to enhance climate equity

While equity is a universally mentioned concept, still, 2 of the 20 CAPs lack mitigation or adaptation measures addressing equity concerns (see Figure 5). In the measures and actions sections of the other 18 cities, city CAPs proposed mitigation or adaptation projects covering transportation, building, energy, and housing fields to address equity issues either by including equity as a co-benefit or key pillar of the action or aiming the actions to target frontline communities. Typically, energy-efficiency upgrade programs that focus on low-income housing and households are among the most common examples. It is considered a best practice to incorporate equity considerations into each action in order to achieve just outcomes, for example, as in San Luis Obispo’s plan.

Indicator 5: Implementation plan and responsibility assignment

Figure 6 Score Distribution of Indicator (5) with Rubric

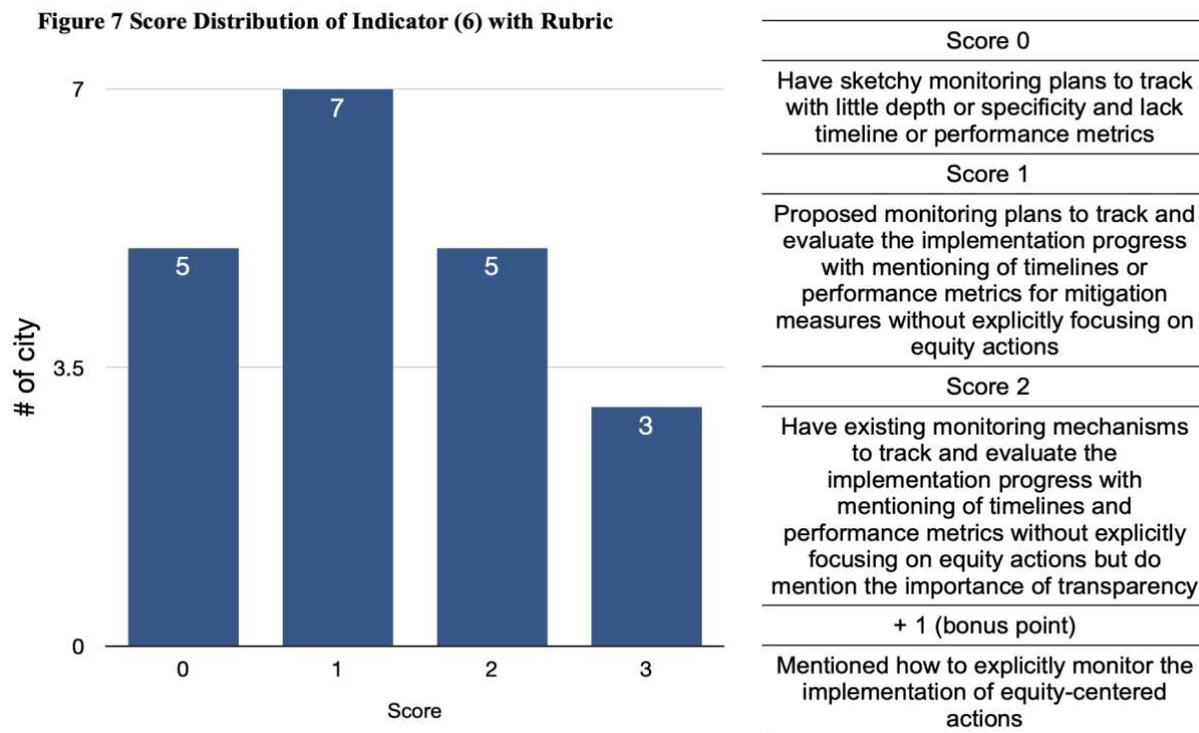


Score 0
Have sketchy implementation plan to carry out equity actions or missing two or more of the responsibility assignments - lead department/agency, partner organizations, and funding sources-economic vulnerability analysis
Score 1
Have detailed implementation plan and/or missing one of the responsibility assignments - lead department/agency, partner organizations, and funding sources
Score 2
Have detailed implementation plan and responsibility assignments of all roles - lead department/agency, partner organizations, and funding sources
+ 1 (bonus point)
Mentioned plans to ensure equitable implementation

All CAPs contain implementation plans, yet only 3 of them specifically target equity-centered projects (see Figure 6). The optimal implementation plan of each suggested mitigation or adaptation measure is typically documented in a spreadsheet that specifies the responsible department or agency, partnering organizations, and sources of funding. City CAPs typically lack specific financing mechanisms. A comprehensive roster of partners that the city will collaborate with is appended to the document in a few of the cities.

Two noteworthy exceptions are the CAPs from Oakland and Santa Cruz, as they are the only two cities that emphasize equitable implementation. The plan for Oakland includes a section that outlines important resources such as CalEnviroScreen 3.0, Oakland Equity Indicator Report, Racial Equity Impact Assessment and Implementation Guide, and Racial Equity Implementation Guide. These tools will be utilized by the city to ensure the maximum degree of fairness and equality during the implementation phase. The “equity screening tool” developed by Santa Cruz encompasses a set of procedures and standards that aim to ensure fairness in both the processes and outcomes, ultimately leading to an equitable and fair transition for all communities involved. Accessible funding and financing mechanisms must be established to prioritize and support frontline community transitions in order to implement mitigation and adaptation actions.

Indicator 6: Monitoring plan

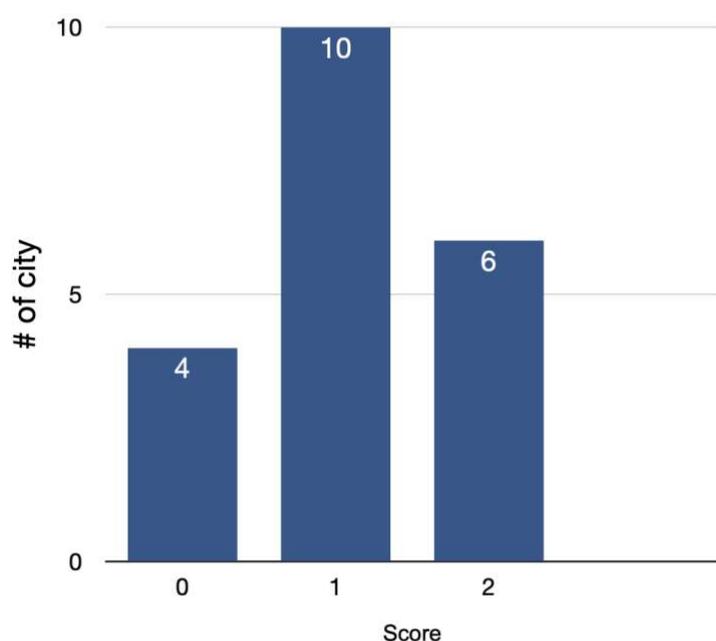


The scheduled monitoring report, which is conducted annually or every few years, primarily focuses on the progress made in reducing GHG emissions. Most of the reviewed CAPs primarily focus on performance metrics related to GHG reduction measures, as quantifying the performance indicators of equity actions is challenging. Only 3 of the plans have contents relevant to tracking the equitable implementation outcomes, whereas most of the plans lack concrete monitoring mechanisms (see Figure 7).

What sets Oakland apart is its inclusion of metrics to measure the success of equity-centered projects in each major area of mitigation or adaptation actions. These metrics include factors such as “total investment in mobility infrastructure in frontline communities,” “construction of affordable housing units near transit,” and “adoption rate of zero-emission vehicles overall and in frontline communities,” among others. The equity screening tool utilized in Santa Cruz’s plan also emphasizes the need for transparent tracking and reporting of equity actions.

Indicator 7: Equitable participation during the planning process

Figure 8 Score Distribution of Indicator (7) with Rubric



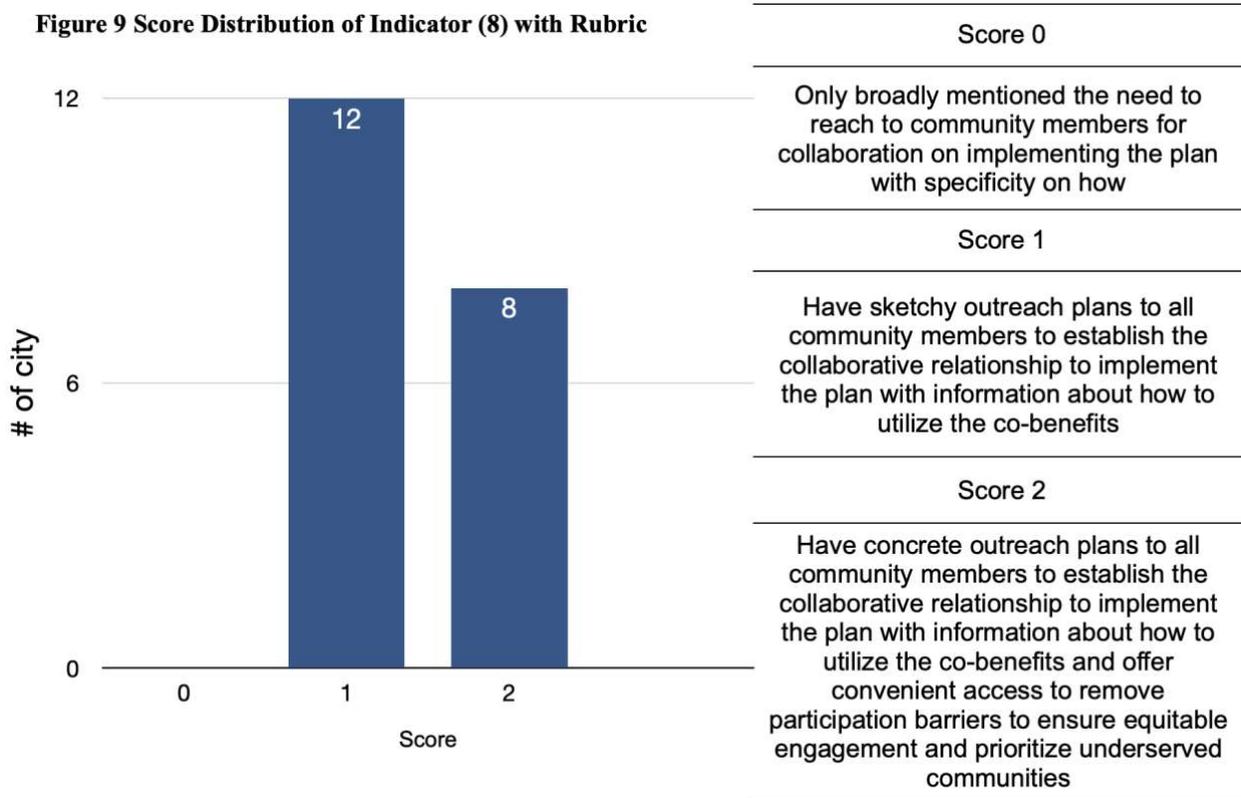
Score 0
No mention of the incorporation of community voices from public meetings or engagement events during the planning and drafting phases
Score 1
Mentioned public meetings or engagement events during the planning and drafting phases but do not cover enough range of stakeholders or few opportunities were provided to maximize participation of underserved communities
Score 2
Mentioned a wide range of public meetings and engagement events during the planning and drafting phases to integrate comprehensive community voices into the plan and include a wide range of stakeholders with efforts to prioritize the participation of underserved communities

A significant number of CAPs (15 out of 20) document public engagement activities or detail how community input was integrated into the final plans (see Figure 8). Meaningful events include city council meetings, community workshops, online education outreach, and stakeholder luncheons.

Cupertino, Oakland, Santa Cruz, San Leandro, and San Luis Obispo even prioritize the participation of individuals representing environmental justice, racial justice, and equity concerns by reducing the accessibility barriers of the events. Another encouraged strategy is to include a section in the appendices of some plans that explains how the input from the community is integrated into the final published plan.

Indicator 8: Equitable outreach and engagement activities during implementation process

Figure 9 Score Distribution of Indicator (8) with Rubric



Furthermore, alongside climate mitigation and adaptation measures that take into account equity considerations, outreach and engagement programs are also a primary form of activities that specifically address equity issues. All the 20 city CAPs highlight the importance of community outreach programs, with no city scored 0 (see Figure 9). Although there are efforts to engage the general public, there is a lack of focused outreach to frontline communities that only 8 of them addressed how to prioritize the participation of vulnerable populations. It is ideal and crucial to implement measures that eliminate barriers to participation, such as offering materials in multiple languages and organizing events in easily accessible community locations.

Insights from leading and laggard cities interviews

Factors influencing evaluation scores

Interviews with officials from cities with high evaluation scores identify several factors contributing to their success. A significant driver was the establishment of an “equity container” in two of the highest ranked cities, a racial equity framework established by ambitious political leadership focused on addressing equity across municipal departments and agencies. Such a “container” or framework in one of the top-ranked cities ensured a deep-rooted commitment to equity by assessing racial disparities, designating officials for equity work to facilitate community engagement, engaging every person in the city in decision-making through leveraging close relationships between community and equity advisors and evaluating policy impacts on communities. Their clearly defined local frontline communities also serve as a solid foundation for identifying the scope of focus. The “Equitable Screening Tool” applied by Santa Cruz ensures that each program outlined in the CAP is thoroughly evaluated for equity considerations, implying that any action with negative equity scores will be rejected.

Another crucial factor for cities to have effective implementation strategies for equity actions is the direct inclusion of community inputs during the planning process to incorporate their demands. As previously stated, many CAPs plans outline the process of gathering community input and detail how these comments were integrated into the drafting or updating of the CAP. During the interview, the Oakland official stated that their latest plan drafting involved around 5,000 residents, with approximately 2,000 of them actively participating in co-writing of the plan.

Additionally, a data-informed approach enabled a comprehensive understanding of community vulnerabilities, informing targeted resource allocation, which is also relevant to the administrative capacity of the city government. Previous experiences with climate emergencies were also cited as catalysts for integrating concrete equity-centered strategies within the CAPs. For example, Santa Cruz is confronted with a significant risk of coastal floods and erosions, which pushes the city to not only invest more in adaptation efforts but also collaborate closely with insurance companies to tackle the affordability issues.

The factors contributing to cities having a low evaluation score are more complex. The two low-scored cities interviewed in this research are among the cities with the smallest population size. In this case, the limitation on capacity is recognized as a major obstacle to the creation of concrete and effective plans for promoting equity, despite the presence of environmental justice issues. In such communities, other city priorities may divert staff time and attention away from environmental justice issues.

Another of the reasons that some communities may have less specific and effective implementation strategies for equity actions due to a lack of disadvantaged community members within their jurisdiction. For example, the official from Colma noted that their community has a relatively stable socio-economic demographic, thus reducing the need to advocate aggressively for equity or develop concrete implementation strategies for addressing climate justice. With its small population of only 1,570, the city government employs efficient methods to effectively communicate and connect with nearly every household.

Implementation Status

In general, the implementation of the city CAPs is opportunistic in all five cities, whereas interviewed city officials primarily focused on discussing the overall implementation of the plan rather than specifically addressing the implementation of equity goals and actions. GHG emission reduction progress is mentioned across all the cities, and some cities also mention the progress in energy efficiency, transportation, and housing sectors. For instance, in the town of Colma, the sustainability leaders successfully engaged all major businesses to participate in an initiative that resulted in an annual reduction of one million kilowatts of electricity. Four of the five cities interviewed have either already released or are currently in the process of preparing updates on the overall progress of their implementation efforts. Two city officials acknowledged that the COVID-19 period caused disruptions to work but felt that everything has now returned to normal. One of the cities with low scores is currently in the process of updating their current CAP due to the recognition of issues with the existing performance metrics. They are currently working on developing new metrics that are more practical and focused on equity and can be quantified more effectively.

Regarding the implementation of equity actions, four out of the five cities have made advancements in the efforts to build trust with the community, but equity action progress is only reported by Oakland. A city official stated that while SB 1000 now mandates the inclusion of environmental justice components in general plans, its implementation poses significant challenges. Cities have implemented programs by collaborating with non-profit organizations, with a particular emphasis on initiatives related to electrification and affordable housing. In Oakland, centers dedicated to resilience, libraries, and parks are prepared to function as hubs of resources during emergencies. City climate and sustainability leaders actively engage in in-person participation in community meetings. Attempts are undertaken to broaden the range of information disseminated at events and ensure that events are inclusive for all members of the community. Aside from in-person engagements, social media platforms like NextDoor, Facebook, and Live Wire serve as crucial communication channels for cities to promptly convey information to all residents. The one city that has fallen behind in implementing equity action has identified a predominant issue: the insufficient efforts in engaging with the community.

In August 2023, Oakland published its “Climate Equity Progress in Oakland” report to track and monitor the development of equity-centered actions in the format of story maps. The report highlights the city’s commitment to equity-driven strategies and provides updates on the current progress in areas such as community outreach, affordable housing, and affordable transportation. Oakland’s Department of Transportation created the Geographic Equity Toolbox as an interactive map to explore priority neighborhoods with severe demographic and socioeconomic conditions and neighborhoods with higher percentages of pollution burden. The progress report also includes maps to show the geographic distribution of green infrastructure, distribution of affordable housing units, etc.

Facilitators and barriers to implementation

Integration of climate justice with other social justice issues emerged from the interviews as a crucial facilitator for implementing equity actions since climate justice also intertwined with other social justice issues. For example, effective strategies include addressing health hazards and housing insecurity in conjunction with climate actions. Interviewees also noted that stable political environments that won’t affect the long-term implementation of CAPs will lead to success in delivering long-standing requests of frontline communities. The diverse representation in decision-making bodies, and a third-party organization or committee to bridge the city staff and elected officials were also highlighted as essential for advancing equity. It is also highlighted that having the goals in line with surrounding jurisdictions is also important to foster regional coherence, creating a united force in the pursuit of climate justice, closely linked to broader political and social objectives.

However, limited capacity, insufficient funding, and a lack of coordinated efforts present significant barriers. The most frequently cited implementation barrier by interviewees is a lack of capacity. The main challenge faced by four out of the five cities being interviewed is the insufficiency of financial resources and staff despite the existence of well-defined and ambitious strategies. The absence of sufficient capability not only hinders the implementation process, but also the future expansion of carefully planned projects. Especially in cities with a small population and limited resources, the absence of community groups further exacerbates the problem. The cities’ climate programs lack the necessary capacity to carry out outreach initiatives, thus relying on community organizations to fill this gap. Furthermore, due to limited financial resources, the climate departments are only able to prioritize grant-based projects with restricted discretionary spending. Consequently, equity projects often receive minimal targeted grants. Lack of effective collaboration among various departments and agencies hinders the sharing of information necessary to collectively achieve common objectives, such as addressing public health concerns, resolving landlord issues, and tackling affordable housing problems.

Furthermore, a progressive leadership that prioritizes achieving goals through mandates rather than emphasizing outreach or addressing environmental justice is another important barrier. Within one of the low-score cities, the interviewee noted that city leadership does not prioritize the equity component as a primary objective even though they do address equity concerns in their CAP. Moreover, effectively involving frontline and historically marginalized communities is difficult because of competing obligations and the pre-existing lack of trust between these communities and governments.

Statistical analysis results

Linear Regression

Table 4 shows the variables included in the regression, and Table 5 shows the OLS regression model results. The high R-squared value at 95% indicates that the overall model explains a substantial portion of the variation in the cumulative evaluation score among the 20 cities. The difference between the R-Squared value and the adjusted R-squared value may indicate some

Table 4 Social and climate vulnerability

City	Demographics and Socioeconomic ¹						Race & Ethnicity ²						Climate Vulnerability ^{3,4}	
	Population	Employment Rate (%)	Median Household Income (\$)	Poverty Rate (%)	Percent of No Health Insurance (%)	Percent of Bachelor's degree or higher (%)	Percent of White Alone (%)	Percent of Black (%)	Percent of Hispanic or Latino (%)	Percent of Asian (%)	Percent of Native Indian and Alaska Native (%)	Percent of Native Hawaiian and Pacific Islanders (%)	Coastal or Not	Extreme Climate Event Index
Alameda	78,280	61.5	131,116	9.3	1.7	57.6	42.1	6.1	12.4	31.3	0.5	0.5	1	51
Albany	20,271	65.9	124,469	9.1	3.5	75.2	44.3	4.1	12.9	29	0.4	0.3	1	47
Antioch	115,291	63.3	100,178	10.3	4.4	24.2	25.5	20.1	35.0	12.8	1.0	1.4	1	56
Colma	1,570	62.2	123,864	7.7	6.0	32.6	20	3.8	39.6	29.3	1.3	0.38	0	33
Concord	125,410	63.3	104,523	8.8	6.7	38.7	46.2	3.6	30.2	13.5	0.8	0.1	0	37
Cupertino	60,381	59.6	223,667	5.3	1.8	82.8	22.5	1.1	3	69.4	0.2	0.4	1	50
Emeryville	12,905	73.3	114,345	12.2	3.8	72.6	37	19.2	9.5	29.2	0.4	0.2	1	20
Encinitas	62,007	61.2	142,506	7.1	3.7	64.7	74.9	0.5	16.6	4.0	0.3	0	1	83
Escondido	151,038	64.8	87,664	11.8	10.9	28.5	35.4	2.1	52	6.4	1.3	0.4	0	91
Los Altos	31,625	55.8	250,000	3.1	1.3	86.4	52.6	0.59	4.9	35.3	0.1	0.14	0	23
Madera	66,224	54.8	67,454	30.9	6.9	13.8	13.2	3.9	79.3	2	1.2	0.1	0	53
Morro Bay	10,757	51.9	88,547	9.8	2.4	43.2	74.5	0.2	15	5.3	0.1	0	1	35
Oakland	440,646	65.3	93,146	13.9	5.2	50.7	28.6	21.8	26.6	15.9	1.2	0.5	1	37
Pleasanton	79,871	64.2	183,969	5.7	1.3	74.6	43.5	1.9	10.8	39.1	0.6	0.5	0	47
Redwood City	84,292	64.8	137,512	6.2	5.6	57.5	41.1	2.2	35.3	16.3	1.3	0.9	1	72
Richmond	116,448	59.3	88,594	16.2	7.7	31.7	18.2	18.4	43.8	14.5	1.1	0.4	1	63
San Carlos	30,722	68	219,413	3.0	1.2	66.9	63.2	0.7	9.5	18.4	0.2	0.5	1	30
San Leandro	91,008	60.2	92,561	7.4	4.3	34.4	21.5	10.3	27.6	34.4	0.9	1.7	1	66
San Luis Obispo	47,063	58.2	65,000	31.5	5.0	50.7	70.7	1.6	18.5	5.3	0.4	0.2	0	17
Santa Cruz	62,956	57.8	105,491	18.7	3.8	57.1	60.8	2.2	21.1	10.7	0.9	0.1	1	87

N = 20

¹: Demographics and socioeconomic data collected from 2020 Decennial Census and 2022 American Community Survey 1-Year Estimates for each city

²: Race & Ethnicity data collected from 2020 Decennial Census and 2022 American Community Survey 1-Year Estimates for each city

³: The geographic location of each city

⁴: Extreme Climate Event Index is collected from the U.S. Climate Vulnerability Index, published by Environmental Defense Fund, Texas A&M University, and Darkhouse Analytics. The U.S. Climate Vulnerability Index map only provides county-level or track-level (each city has multiple tracks) data. Only the highest extreme event index in each city was selected to be included in the data analysis as an indicator of the extent of the city's highest climate risks. https://map.climatevulnerabilityindex.org/map/cc_extreme_events/usa?mapBoundaries=Tract&mapFilter=0&reportBoundaries=Tract&geoContext=State

variables may not be useful, but the 85% adjusted R-squared value still suggests a strong fit.

Table 5 shows a statistically significant positive coefficient for the log of the population variable with the model including all 20 cities in the sample, indicating that larger cities are more likely to develop more robust equity-action implementation strategies, affirming what is heard in interviews that administrative capacity is an important facilitator. An additional regression omitting Oakland from the city list was run (Table 6) to test if the extraordinary larger population size of Oakland contributes to the significance of the logged population variable. The new coefficient of logged population variable in Table 6 is still significant but only at 0.1 level, compared to the 0.05 level in the original regression shown in Table 5. The magnitude of the coefficient reduces slightly from 1.58 to 1.53, indicating that excluding Oakland from the analysis leads to a slight decrease in the impact of population on the total evaluation score. Since Oakland is the best performed city, it also worth looking at how the overall model changes with Oakland omitted. The new R-squared and adjusted R-squared values in Table 6 are only slightly lower than those in the original regression, suggesting that the overall fit of the model is slightly better when Oakland is included, but excluding Oakland doesn't change the relationships or the model fit substantially. Most of the important variables significant in the original model are still significant in Table 6 but also with slight decrease in magnitude or increase in the level of significance.

Back to the original full regression model shown in Table 5, a negative correlation between the employment rate and evaluation scores may imply that cities with higher economic stability see less urgency in prioritizing equity-focused actions, matching the interview result with the official from Colma. A higher poverty rate is associated with higher evaluation scores, which suggests that cities with more disadvantaged populations may tend to focus on addressing climate equity with concrete policies and plans.

The full model also reveals that cities with higher percentages of various racial and ethnic populations (White, Black, Hispanic, Latino, and Asian) tend to have lower evaluation scores, and all the relationships are statistically significant.

Table 5 Regression Results

Variable	Model
Intercept	124.90 * (31.45)
Population (log)	1.58 * (0.47)
Employment Rate	- 0.43 * (0.13)
Median Household Income	0.00 · (0.00)
Poverty Rate	0.40 * (0.17)
% of No Health Insurance	0.61 (0.41)
% of Bachelor's degree of higher	- 0.14 (0.07)
% of White	- 1.13 * (0.33)
% of Black	- 0.94 * (0.34)
% of Hispanic or Latino	- 1.52 ** (0.32)
% of Asian	- 1.17 * (0.32)
% of American Indian and Alaska Native	4.74 (2.42)
% of Native Hawaiian and Pacific Islanders	0.07 (1.59)
Coastal or Not	- 0.70 (1.53)
Extreme Climate Event Index	0.06 (0.04)
Model Summary	
R ² = 0.9541	
Adjusted R ² = 0.8258	
P-value = 0.018	
0 **** 0.001 *** 0.01 ** 0.05 ' ' 0.1 ' ' 1	

Table 6 Regression Results Without Oakland

Variable	Model
Intercept	124.90 * (35.09)
Population (log)	1.53 · (0.66)
Employment Rate	- 0.43 * (0.15)
Median Household Income	0.00 (0.00)
Poverty Rate	0.40 * (0.13)
% of No Health Insurance	0.62 (0.46)
% of Bachelor's degree of higher	- 0.14 (0.08)
% of White	- 1.13 * (0.37)
% of Black	- 0.94 · (0.37)
% of Hispanic or Latino	- 1.52 * (0.36)
% of Asian	- 1.17 * (0.36)
% of American Indian and Alaska Native	4.49 (3.30)
% of Native Hawaiian and Pacific Islanders	0.16 (1.92)
Coastal or Not	- 0.76 (1.77)
Extreme Climate Event Index	0.06 (0.05)
Model Summary	
R ² = 0.9449	
Adjusted R ² = 0.7521	
P-value = 0.068	
0 **** 0.001 *** 0.01 ** 0.05 ' ' 0.1 ' ' 1	

Cluster analysis

The K-means cluster analysis identified three distinct groups among the cities, with the principal component analysis employed for dimensionality reduction prior to clustering. Although the coastal location of cities (“Coast”) was not directly included in the cluster analysis, it was annotated in Figure 10 to provide contextual insights.

Since the clustering is based on scaled data, the detailed clustering results show the mean values of the variables of each of the clusters in Table 7 to facilitate the comparison of the characteristics among the 20 cities. A positive mean value in the summary table indicates that the cluster members have higher average scores for that variable than the overall sample mean and vice versa.

The primary comparison will center around Cluster 2 and 3, as Cluster 2 comprises cities with the highest cumulative evaluation scores, while cities in Cluster 3 exhibit the lowest cumulative evaluation scores overall. Cluster 2 cities, characterized by the highest evaluation scores, exhibit lower employment rates and median household incomes, suggesting a potential linkage between economic instability and the adoption of stronger equity-action strategies. Despite not having the highest climate event index, Cluster 2's mean value closely approaches the maximum observed, indicating a relatively higher-level of emphasis on climate equity. In contrast, Cluster 3 is marked by lower evaluation scores, higher employment rates, and median household incomes, alongside the lowest extreme climate event index, pointing to a divergence in priorities or capacities for equity-focused action. Cluster 1 cities display, on average, lower evaluation scores and median household incomes, coupled with a higher percentage of uninsured residents, highlighting disparities that might influence the focus and efficacy of equity-action strategies.

Figure 10 Cluster Analysis Visualization

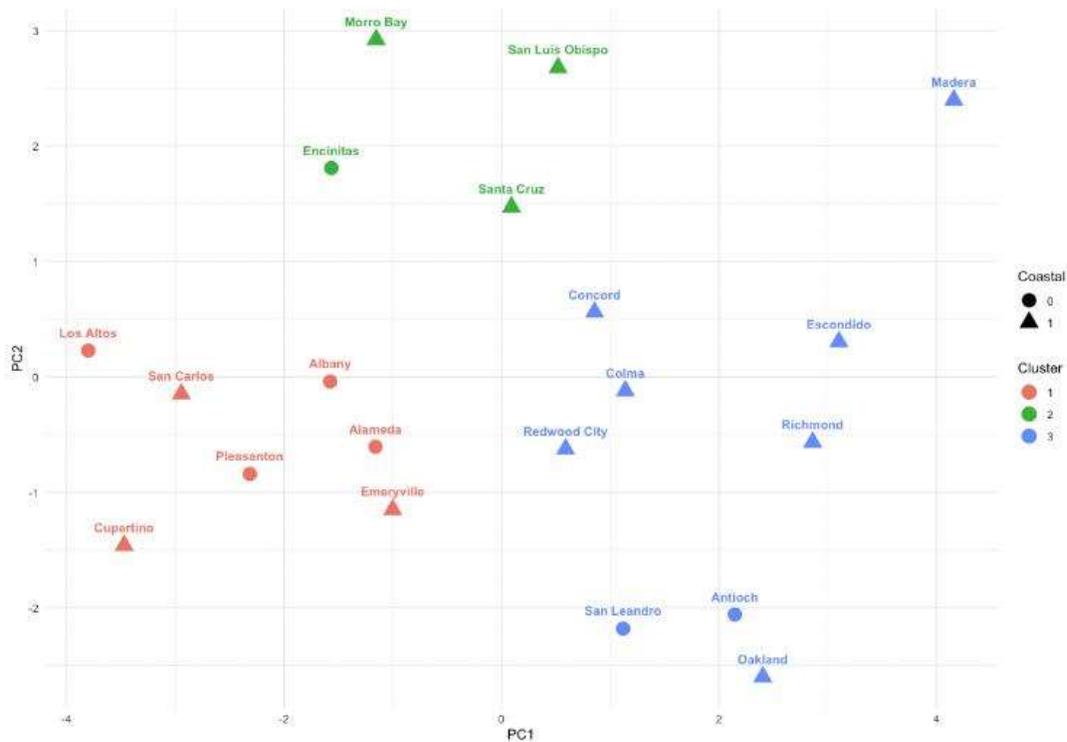


Table 7 Clusters mean values

Variables	Mean Value of Variables in Each Cluster		
	1	2	3
Evaluation Score	-0.001	0.302	-0.171
Log(Population)	0.333	-0.266	-0.276
Employment Rate	0.047	-0.919	0.465
Median Household Income	-0.526	-0.509	0.967
Poverty Rate	0.150	0.684	-0.584
% of No Health Insurance	0.819	-0.253	-0.908
% of Bachelor's degree or higher	-0.842	0.083	1.036
% of White Alone	-0.726	1.471	0.094
% of Black	0.454	-0.689	-0.190
% of Hispanic or Latino	0.852	-0.396	-0.869
% of Asian	-0.306	-0.907	0.912
% of American Indian and Alaska Native	0.945	-0.653	-0.841
% of Native Hawaiian and Pacific Islanders	0.492	-0.818	-0.166
Extreme Climate Event Index	0.299	0.256	-0.531

Discussion

Recap of key results

For cities in California that emphasize equity in their CAPs, have they developed “strong implementation strategies” for these goals?

The simple answer is that some of them have, and some haven't. The diversity in total evaluation scores among the city CAPs, ranging from 4 to 19, underscores a significant variation in the development of strategies to realize equity commitments even through the 20 CAPs in the sample are already the most ambitious plans addressing climate justice in California. Cities exhibiting comprehensive equity strategies were characterized by their holistic approach, integrating equity across various planning and implementation facets, from vulnerability assessments to community engagement. In contrast, cities that only briefly mention equity in the plan tend to lack concrete implementation strategies for equity-centered actions.

Why do some cities have strong implementation strategies, and others don't?

Based on interviews, it appears that it is important for the political leaders to make a commitment to social equity in order to address the structural harm, ensuring a citywide prioritization of equity. While it is mentioned that extreme weather events may prompt cities to implement strong strategies to address equity issues in the interview, this study finds no statistically significant correlation between the score and either the city being coastal or

experiencing extreme climate events. Larger cities also usually have better evaluation ratings, along with greater potential funding and administrative capability to potentially establish specialized departments to tackle equity concerns, similar to what Oakland and Santa Cruz have done. Furthermore, they may have a higher level of capacity to conduct comprehensive vulnerability assessments and outreach initiatives.

Economic stability indicated by the negative relationship between employment rate and the evaluation scores as well as the positive correlation between poverty rate and the score and cluster analysis result, does not guarantee the existence of more effective implementation strategies for equity actions. This outcome necessitates further research but may indicate that economic opportunities for employment aren't necessarily leading to a prioritization of equitable actions. Cities with elevated employment rates may place greater emphasis on economic growth, potentially overshadowing the objectives of climate justice. Cities experiencing higher unemployment rates may demonstrate increased motivation and stronger political determination to promote equity initiatives. This suggests that these cities may prioritize equity in climate governance as a strategy to tackle wider social justice issues. Alternatively, the stable economic environment may be attributed to the overall affluence of the city, which reduces the value of specifically addressing equity actions since there might be fewer marginalized communities in need of equitable measures, as observed in the case of Colma during the interview.

There are strong negative correlations between the percentages of White, Black, Hispanic/Latino, and Asian populations and the total evaluation scores. The significant negative correlations between minority races and the evaluation scores suggest that cities with higher percentages of racial minority populations tend to have lower evaluation scores for equity action strategies. This may indicate that city with larger minority populations might also be those face economic challenges and fewer resources to allocate to develop robust implementation strategies. This is inconsistent with the regression results that high poverty rate and low employment rates are associated with higher evaluation scores.

However, the negative coefficient of the % of White variable supports the findings of the employment and poverty rates, suggesting that a lower proportion of people of color may indicate better socio-economic conditions in the city. This, in turn, weakens the effectiveness of equity action implementation strategies due to a lack of demand to address inequity. Such internal inconsistent findings suggest that racial and ethnic composition plays a crucial and complicated role in shaping the effectiveness of equity-action implementation strategies, likely reflecting underlying social and economic disparities. This necessitates more in-depth investigation into the social vulnerability factors to understand the underlying reasons of the contrary regression results.

But overall, the major predictors of an emphasis on climate justice are measures of existing inequality and minority status such as poverty rates, unemployment rates, and race. The presence of historical and structural inequity and the resulting harm may serve as a significant motivating factor for cities to put efforts to address climate equity first.

Is there a relationship between the strength of the implementation strategies in the CAP and the implementation status of the equity policies actually in place?

This study found that for four out of the five cities being more deeply investigated, the implementation status matches the strength of the implementation strategies for equity actions. The cities with high implementation scores have indeed implemented a diverse array of community engagement and educational outreach, but the reported implementation status and progress lacks details on quantifiable measures or metrics in specific mitigation or adaptation programs. All the top-ranked cities are actively working to rebuild trust in the government-resident relationship, confirming the effectiveness of their strong implementation strategies to translate the goals in the CAPs into concrete actions. In one of the cities with lower evaluation scores, there is a deficiency not only in prioritizing projects that promote equity but also in engaging with the community and organizing events, which aligns with the low evaluation score. The Town of Colma stands out as an exception among cities with lower scores. This is because the city has made significant advancements in ensuring that outreach efforts reach nearly all members of the community, thanks to its distinctive characteristics even though it has weak implementation strategies as reflected by the low evaluation score.

What are the implementation facilitators and barriers for equity-centered actions?

Integrating climate justice with other social justice issues is critical for the effective implementation of equity actions. A holistic approach across city departments and stable political leadership to commit to climate and equity are also identified as vital to sustain long-term equity goals.

Moreover, the successful implementation of equity-centered programs also hinges on the active participation of frontline communities, who are often preoccupied with immediate livelihood concerns and may not have the interest or ability to prioritize climate issues. Historical mistrust and inadequate outreach further impede engagement, highlighting the need for deliberate efforts to repair damaged relationships and address structural harm.

Common barriers such as limited funding, capacity, and personnel were reported by most of the cities, hindering the implementation and scale-up of ambitious climate projects, especially in smaller-sized cities. The absence of community organizations in small cities exacerbates the challenges, as does reliance on city staff to carry out outreach programs to frontline

communities. Another common implementation barrier is the challenge of implementing and tracking equity elements persists across cities, emphasizing the need for practical and quantifiable equity-focused metrics to enhance the accountability of those equity-centered actions.

Another barrier to the implementation of equity-centered actions is leadership focusing more on other priorities that could bring them more quantifiable achievements instead of hard-to-quantify climate justice outcomes. Related back to the existing literature revealing why equity is left out of the implementation, the political leadership's focus on other priorities, such as making the city more attractive for businesses will shift the focus away from climate and social justice (Portney, 2003; Schrock et al., 2015)

Implications: Why do the results matter?

This study's exploration into why certain cities are more successful in translating equity goals into actionable strategies offers valuable insights for overcoming barriers to implementing equity-centered actions. By identifying the differential success among cities committed to climate equity, this research contributes significantly to the understanding of how local governance can navigate and dismantle the barriers to equitable climate action.

The translation of ambitious climate equity goals into tangible implementation marks a critical contribution to the discourse on incorporating equity into local climate governance and planning. Through the development of a qualitative scoring framework, this study not only assesses the robustness of cities' implementation strategies across planning and implementation phases but also illuminates the challenges hindering the actualization of environmental justice promises. The scoring framework developed for evaluating equity elements within CAPs offers a novel tool for assessing the degree to which cities are actualizing their commitments to climate justice, enriching the scholarship on the implementation gap examination in the realm of climate governance and the complexities underlying unmet environmental justice goals.

Systemic change integrating social equity into climate actions emerges as a fundamental requirement for achieving climate justice. This study aligns with existing research in asserting that climate justice is inseparable from social justice (Baker, 2021; Patterson et al., 2018). An integrated approach—acknowledging the interplay between climate vulnerability and social disparities, and addressing issues such as housing insecurity alongside climate actions—is deemed to be effective. The findings, particularly through statistical analysis, reveal that cities facing greater socio-economic challenges are proactively advancing the translation of equity goals into practice. This underscores the urgency of adopting strategies that not only mitigate

GHG emissions but also tackle the social and economic inequalities exacerbating climate vulnerability at the same time.

The examination of California cities' progress in fulfilling equity promises, and the variation in this progress, directs the path forward. The findings offer recommendations to close the implementation gap, ensuring that equity promises are not just articulated but realized. By addressing the long-standing issue of lip service in realizing climate justice goals (Baker, 2021), this research sheds light on the determinants of a successful transition to sustainable and equitable urban futures.

Conclusion

This study aimed to investigate the reasons behind the varying levels of success in implementing equity goals outlined in CAPs in different cities in California. In general, city leadership motivated by the structural inequity issues and socio-economic vulnerability leads to successful establishment of a comprehensive equity-centered framework that is dedicated to address climate equity and restoring trust through mitigation and adaptation measures as well as equitable implementation and monitoring processes.

First, cities that engage in extensive communication with communities and actively incorporate community voices are more successful in translating equity promises into tangible actions.

Second, there is a positive relationship between population sizes and the strength of equity action implementation strategies. This suggests that larger cities have a higher level of administrative capacity to efficiently allocate resources and prioritize different aspects of climate policymaking, such as conducting detailed vulnerability assessment. When socio-economic conditions worsen, such as for cities with increased poverty rates and decreased employment rates, evaluation scores tend to be higher. This indicates that the local government acknowledges the significance of addressing climate and social injustice in an integrated manner.

Third, while there is a relationship between stronger strategies and better implementation status, it remains uncertain whether there is a statistical association between them or if other variables also play a significant role in facilitating implementation.

Political leadership that prioritizes equity and engages the community extensively is crucial for municipal climate and sustainability planning. This approach provides an ideal “container” or framework for cities to implement mitigation and adaptation measures with a focus on justice and equity. Several high-level and political factors have been identified as either facilitating or hindering the translation of goals into implementation. These factors are not easily changeable by

city planners or climate and sustainability leaders. Therefore, efforts to address this issue necessitate radical and systemic changes in municipal climate governance, which aligns with the in the research conducted by Lozano et al. (2022).

Given the difficulty of influencing high-level political agendas and decisions, policy stakeholders should concentrate on identifying and addressing areas that can be changed within their limited capacity. The scoring framework results provide valuable insights into best practices for the development and planning of equity-centered projects in municipal climate action plans. These insights are crucial for ensuring both procedural and distributive justice. While centering equity is advantageous, a crucial next step is conducting a thorough assessment of climate and social vulnerability, taking into account the variations across different geographic regions and population groups. This information is crucial for allocating resources to communities that require the greatest support in implementing targeted mitigation and adaptation measures. Integrating diverse community perspectives through a variety of inclusive community gatherings and activities is an essential component to ensure that the planning process accurately reflects the needs of the communities. Applying an equity lens to every action is crucial to prioritize the specific needs of frontline communities, rather than disregarding or potentially harming them during sustainable transitions.

City climate and sustainability planners should give priority to establishing quantifiable equity objectives and performance metrics and mandating regular monitoring of progress towards equity goals and actions. This will enhance the accountability to effectively implement and oversee well-designed projects. Local jurisdictions should establish holistic policy and planning initiatives to address climate equity alongside other social vulnerability issues, ensuring efficient coordination and collaboration among different departments and agencies within the jurisdiction. An integrated approach could enhance the awareness of frontline communities regarding the co-benefits of mitigation and adaptation actions, thereby increasing their willingness to participate in equity-centered programs. City planner should also strive for securing dedicated funding for equity-centered programs to further reduce implementation barriers.

Cities should persistently strive to mend their broken ties with local communities, particularly in cities characterized by historical and structural social and racial inequalities. One way to show the city's dedication is by prioritizing the involvement of residents from frontline communities and providing them with accessible opportunities for engagement. Rebuilding relationships takes time, and residents must witness tangible benefits in order for them to trust that the city will deliver on its promises.

Through the interview process, this research gained insights into the dynamic atmosphere of California municipal governments. City officials actively seek solutions and expect research to better inform their decision-making. To ensure that important policy recommendations are

effectively integrated into planning processes, it is crucial to encourage productive discussions between policy researchers and policymakers. These dialogues not only help city officials gain a better understanding of feasible future paths, but also provide valuable insights for policy scholars, such as identifying areas for future research that can assist local policy entrepreneurs in resolving policy dilemmas.

Limitations and suggestions for future research

This study offers detailed insights from a thorough examination of ambitious CAPs in addressing equity, which result in significant limitations due to the narrowed focus. The research lacks, however, generalizability due to its focus on ambitious goals, strategies, and implementation in a state that is a progressive leader in the U.S. and global development of aggressive and innovative climate policies (Lozano, Kendall, and Harvey, 2020). Consequently, the results may not be applicable to cities that do not prioritize such policies that there might be even more complicated factors compounding the development of strategies to implement equity actions and the actual implementation progress.

Second, since the sample size is only the 20 most ambitious cities, the relatively small sample size used in evaluation and statistical analysis may lead to overfitting issues and reduce generalizability. Additionally, interviews were exclusively conducted with city officials, thereby missing input from community organizations or community members who are directly affected by the implementation of the CAP. The impartiality of the implementation progress reported by the city officials is uncertain. Additionally, because of limitations in time and resources, the sample size of interviews is small, also leading to reduced external validity.

Furthermore, the review of the CAPs solely focuses on the information presented in the CAPs, neglecting to assess any other climate planning documents that the cities might have. In so doing, it might overlook the efforts that the cities have already undertaken or have intentions to pursue. Also, the scoring rubric was created to standardize the measurement of qualitative variables, but the scoring process remains subjective. The scores were allocated by just one researcher, and it is possible that an alternate researcher might assign different scores utilizing a different rubric. It is important to interpret the correlations between the scores generated and social and climate vulnerability data within this specific context with a cautious approach.

As previously stated, this research does not examine the actual results of implementation. Instead, it concentrates on the process by which cities transition from implementing strategies for equity actions outlined in the CAPs to achieving their equity goals. Future research should prioritize evaluating the implementation results and outcomes of equity actions as longitudinal studies to track the implementation outcomes from short- to long-term, despite the challenges involved. Measuring equity outcomes is tricky as it also takes time for these outcomes to take shape. Furthermore, it is necessary to create assessment frameworks that can be easily

customized to evaluate the climate efforts of various municipalities, instead of using a one-fits-all framework. This is because each CAP has its own set of performance indicators, and determining whether a jurisdiction is making significant progress depends on how they establish their own objectives.

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