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Assessing the Three Es—Environment, Economy, and Equity— in Climate Action Plans

February
2022

A Research Report from the National Center
for Sustainable Transportation

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16. Abstract The range of efforts to address climate change can span from international collaboration to personal action. This study looks at environmental efforts at the local jurisdictional level. Over the last decade, cities and counties have released climate action plans (CAPs) to set emissions reduction targets and outline actions that will help meet those goals. However, the range of information included in CAPs varies dramatically across jurisdictions. This study examines CAPs released by jurisdictions in California, focusing on the quantity and quality of information presented on the expected GHG emissions reduction, cost, and equity impacts of proposed climate actions. This research develops a framework to assess their inclusion, which could also be used to guide future CAP development, and develops a set of guiding questions to promote the inclusion of equity themes in climate action planning and implementation. To gauge the current state of climate action by local jurisdictions, a survey was implemented to better understand the (i) relative consideration of factors in climate action planning and implementation, (ii) factors which affect the inclusion of equity in climate action, (iii) the primary sources of funding for CAP implementation, and (iv) which factors affect the likelihood that an action is implemented. The survey found that, of the considered factors, expected emissions reduction is considered most during planning and implementation, while external impacts are considered the least. When comparing factors between planning and implementation, cost is significantly more important during implementation. For both phases, equity impacts received average levels of consideration. Free responses revealed that recent pushes by community members has encouraged local jurisdictions to include more equity themes in their climate planning. However, lifecycle equity, which considers local impacts across the lifecycle of an action, and thus beyond jurisdictional borders, is considered infeasible due to resource limitations and beyond the scope of local planning. Better equity planning would require systemic change at the jurisdiction, industry, state, and federal levels.			
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Assessing the Three Es— Environment, Economy, and Equity— in Climate Action Plans

A National Center for Sustainable Transportation Research Report

February 2022

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
1. Introduction	3
2. Materials and Methods.....	6
2.1 Evaluating the State-of-Practice in California CAPs.....	6
2.2 Survey to Examine the Current State of CAP Planning and Implementation	9
3. Results	14
3.1 Emissions, Cost, and Equity Scores	14
3.2 Survey to Examine the Current State of CAP Planning and Implementation	18
4. Discussion.....	27
4.1 Evaluating the Data in CAPs to Make Suggestions	27
4.2 Survey to Examine the Current State of CAP Planning and Implementation	29
References	32
Data Summary.....	35
Appendix	37
A.1 CalEnviroScreen Indicators	37
A.2 Linear Regressions Testing	38
A.3 Survey questions.....	42

List of Tables

Table 1. A scoring rubric to quantify the extent to which various themes are included in CAPs ..	8
Table 2. The questions asked in the survey	11
Table 3. Summary of Scores and Demographic Data for each Reviewed CAP	15
Table 4. Results from the linear regressions conducted on the three response variables: equity, emissions, and cost scores.....	18
Table 5. Results of a one-sample t-test for the reported importance of various factors during the planning and implementation phases of local climate action.	20
Table 6. Ways that jurisdictions fund (1) climate actions included in their CAPs, and (2) updates to their CAP.	25
Table 7. A summary of how many jurisdictions mentioned that the listed factor affected an action’s likelihood of implementation.	26
Table A.1. The list of indicators considered in CalEnviroScreen3.0 to identify disadvantaged communities in California (OEHHA 2018).....	37

List of Figures

Figure 1. (a) Trend of average emissions scores plotted over time. (b) Trend of average cost scores plotted over time. (c) Trend of average equity scores plotted over time.....	17
Figure 2. This box and whiskers plot shows the range of original consideration scores received by all factors for both the planning and implementation phases.	19
Figure 3. This box and whiskers plot shows the range of normalized consideration scores received by all factors for both the planning and implementation phases.	19
Figure 4. A comparison of the mean reported relative consideration for planning (grey) and implementation (white).	21
Figure 5. The difference in mean reported consideration of various factors during implementation compared to planning.....	22
Figure A.1. Linear regressions testing correlations between responding to the survey and demographic data.	38
Figure A.2. Linear regressions testing correlations between cap equity scores and demographic data.	38
Figure A.3. Linear regressions testing correlations between cap emissions scores and demographic data.	39
Figure A.4. Linear regressions testing correlations between cap cost scores and demographic data.	40
Figure A.5. Linear regressions testing correlations between cap equity scores and the other assigned scores.	40
Figure A.6. Linear regressions testing correlations between cap emissions scores and the other assigned scores.	41
Figure A.7. Linear regressions testing correlations between cap cost scores and the other assigned scores.	41
Figure A.8. The number of lines connecting two variables represents the extent to which they are statistically correlated, such that their p-value is significant at the denoted alpha value.....	42

Assessing the Three Es—Environment, Economy, and Equity—in Climate Action Plans

EXECUTIVE SUMMARY

The range of efforts to address climate change can span from international collaboration to personal action. This study looks at environmental efforts at the local jurisdictional level. Over the last decade, cities and counties have released climate action plans (CAPs) to set emissions reduction targets and outline actions that will help meet those goals. However, the range of information included in CAPs varies dramatically across jurisdictions. This study examines CAPs released by jurisdictions in California, focusing on the quantity and quality of information presented on the expected greenhouse gas (GHG) emissions reduction, cost, and equity impacts of proposed climate actions. To better understand the CAP development and implementation process, and how, if at all, GHG emissions reduction, cost, and equity impacts are considered, a survey was also developed and distributed to individuals identified as contributing to CAP development.

The research process involved the following steps:

1. Develop a scoring framework to assess the inclusion of quantitative GHG emissions reduction expectations, cost, and equity impacts.
2. Apply the scoring framework to approximately 30 published CAPs from jurisdictions in California to evaluate the current state of practice.
3. Collect demographic data for the evaluated jurisdictions, and conduct regression analysis to examine whether correlation between demographic characteristics and the quality of CAPs, as determined by the scoring framework, exists.
4. Develop a survey to better understand (i) the relative consideration of factors in climate action planning and implementation, (ii) the factors which affect the inclusion of equity in climate action, (iii) the primary sources of funding for CAP implementation, and (iv) the determination of factors that affect the likelihood that an action is implemented. The survey is comprised of two parts, one where respondents answer using a 5 point Likert scale, and another which is a free response section.
5. Develop a set of guiding questions to promote the inclusion of equity themes in future climate action planning and implementation.

The scoring framework had possible values from 0-3 for the manner and extent of inclusion of Equity, Emissions, and Cost in CAPs. Where quantitative values are possible, namely for emissions and cost, inclusion of quantitative information is valued higher, with life cycle-based emissions and cost accounting valued highest. Equity was evaluated based on qualitative measures only. The application of the scoring framework showed that GHG emissions were represented more frequently in CAPs than costs or equity.

When linear regression was used to examine correlations between publication year, demographics and scoring, some demographic data correlated with the inclusion of emissions, cost, or equity data. Higher emissions scores were positively correlated with the year of CAP publication, suggesting that CAPs have been trending towards more quantitative emissions data over time. A higher emissions score was negatively correlated with both the jurisdiction's poverty rate as well as its non-Hispanic population. In other words, wealthier jurisdictions and those with a higher proportion of Hispanic residents tended to have CAPs that did a better job of quantifying emissions in their CAPs. There was a weak relationship between cost scores and the year of CAP release, and no other significant relationships were identified.

Equity scores were positively correlated with both the year of CAP publication as well as the proportion of the jurisdiction's population who earned at least a Bachelor's degree, suggesting that CAPs include more equity themes over time, and that jurisdictions with residents with higher education levels may be motivated to include more equity themes in their CAPs. One interesting trend is that the average Equity score stagnated below 1 for many years, in large part because many CAPs failed to mention equity at all. However, 2020 saw a spike in Equity scores. Though the timeline for when these considerations were added is not clear, the uptick coincides with the broader social movement for racial justice that ignited after the killing of George Floyd in May 2020.

While the CAP scoring examined the state of the practice in previously published CAPs, the survey that was developed and distributed to practitioners provided an opportunity to understand both past experience and priorities for the future. The survey found that GHG emissions reduction is considered most during planning and implementation of CAPs, while external impacts (i.e., those imposed on people outside the jurisdiction or as co-benefits or disbenefits) are considered the least. When comparing factors between planning and implementation, cost is significantly more important during implementation.

For both phases, equity impacts received average levels of consideration, even though scoring showed equity considerations were rarely evident in published CAPs. Free responses may explain this, since they revealed that recent pushes by community members have encouraged local jurisdictions to include more equity themes in their climate planning. However, lifecycle equity, which considers local impacts across the lifecycle of an action, and thus beyond jurisdictional borders, is considered beyond the scope of local planning and infeasible to implement. Some revelations that emerge as themes from survey responses (especially free responses) are the lack of resources directed at CAPs, the importance of political will in determining implementation, and the limitations faced by local jurisdictional boundaries with respect to lifecycle thinking. Finally, embedding equity planning in CAP development and implementation will likely require systemic change at the jurisdiction, industry, state, and federal levels if it is to be prioritized along with GHG mitigation.

1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) releases consensus reports that documenting the causes and effects of global climate change caused by anthropogenic emissions of greenhouse gases (GHGs), increasingly focused on the tipping points we cannot surpass if we hope to avoid irreversible and existential damages from global warming (IPCC 2019). In fact, the United Nations (2019) declared human-made climate change the “defining” issue of our time. California has been a leader in climate change mitigation policy and has steadily increased its GHG mitigation goals in recent years. The first major policy was enacted in 2005 when Governor Schwarzenegger signed Executive Order S-3-05, which set a state goal to reduce GHG emissions to 1990 level by 2020, and to 80 percent below 1990 levels by 2050 (Schwarzenegger 2005). A year later, the Global Warming Solutions Act (Assembly Bill 32) made this a mandate and required that local governments and state agencies help in meeting those goals, notably by creating a statewide cap-and-trade program (California Assembly 2006). In 2015, Governor Brown’s Executive Order B-30-15 set a new reduction goal of 40 percent below 1990 levels by 2030 (Brown Jr. 2015). This was then signed into law by Senate Bill 32 in 2016 (California Senate 2016). Most recently, Governor Brown signed executive order B-55-18 committing the state to reaching carbon neutrality by 2045 (Brown Jr. 2018).

Particularly relevant to California counties and cities, California passed the Sustainable Communities and Climate Protection Act of 2008, or Senate Bill 375, to promote local efforts to meet statewide greenhouse gas reduction goals (California Senate 2008). Specifically, it required the California Air Resources Board to set regional GHG reduction targets. As a result, local jurisdictions developed climate action plans (CAPs) to set their own emissions reduction goals as well as outline the specific actions they will take to meet them. However, the state does little to provide guidance to jurisdictions on how to produce CAPs. A review of California CAPs found that while they are useful in establishing baseline emissions and setting emissions reduction targets, the quality and quantity of information provided in them varies widely across the board (Lozano et al. 2020). Only half quantified the expected GHG mitigation of proposed strategies, even fewer quantified both emissions and costs, and many failed to provide a timeline for implementation, performance measures for the strategies, or explanations on how they will prioritize among the various strategies included. Further, it is unclear whether there are any repercussions if the goals are not met.

Certain policies were passed to promote benefits in historically and presently underserved communities who experience disproportionately high amounts of social and environmental burden. Many would consider these policies a push for environmental equity. Inequity in the United States can be indisputably tied to racist policies throughout the country’s history. The Center for American Progress provides an excellent resource, the five-part series “Systematic Inequality in America,” which examines both the history and present-day effects of policies on communities of color, such as access to housing, economic opportunity, and political participation (Solomon et al. 2019). Environmental injustices in the US can also be traced back to racial oppression and discrimination (Bell 2015). Not surprisingly, the early studies on environmental inequity actually used the term environmental racism (Pellow 2000).

Environmental equality became the next predominant term, as it encompasses other factors, such as socio-economic and immigration status. The term equality argues that all populations should be equal, from which it can be derived that resources should be split equally as well. However, it is important to consider that some populations are initially worse off and therefore need more resources to achieve parity with other populations. Therefore, researchers have shifted to using the term environmental equity, as it stresses the need to provide more support to historically disadvantaged and under-resourced populations.

To identify the communities that, because of historical decisions and policy making, currently face the highest amounts of burden across the state of California, the California Environmental Protection Agency sponsored the creation of the state's environmental health screening tool: CalEnviroScreen (CES). CES 3.0, the most recent iteration of the tool, considers various indicators when calculating burden, such as exposure to air pollutants, traffic density, proximity to waste sites, predisposition to health issues, and socioeconomic factors (OEHHA 2018). The full list of considered indicators is provided in the Appendix (Table A.1). Calculated burden is based on the averages of the percentile score for each of the indicators. That is, for each indicator, values are converted to percentiles for standardization, such that that highest score is assigned a percentile of 100 and the lowest score a percentile of 0. The communities in the upper quartile of burden scores are considered disadvantaged communities (DACs).

The creation of CES was directly caused by the passage of Senate Bill 535 in 2012, which required that 25% of the state's Greenhouse Gas Reduction Fund (generated by the cap-and-trade program) be invested in projects that benefit these communities (OEHHA 2018). This was supplemented by Assembly Bill 1550 in 2016 which amended the requirement so that the projects must actually be implemented in, and not just benefit, disadvantaged communities. Assembly Bill 617 also tackles environmental inequity by promoting the reduction of air pollution in communities experiencing the highest levels of exposure. These bills promote environmental actions in DACs, but they provide little guidance on what actions local jurisdictions should take, or even how to proceed.

Previous literature has examined factors that appear to explain a local government's apparent success in achieving sustainability targets. A study by Hawkins et al. (2015) found that local priorities, participation in regional governance, and membership in a regional group to address climate change all affect the likelihood that a jurisdiction will commit resources to sustainability, whereas a jurisdiction's financial health does not. They also find that prioritization of equity is positively correlated with commitment of sustainability resources. Importantly, this area of scholarship is far from settled. For example, other studies find that wealthier jurisdictions are more likely to adopt sustainability plans than more resource-limited ones (e.g., Sharp et al. 2010). Some studies find that jurisdictions that experience more environmental problems are more likely to adopt sustainability or climate plans (e.g., Brody et al. 2008), while other studies find no such relationship (e.g., Yi et al. 2017). This research examines the inclusion of emissions, cost, and equity data in CAPs, and explores correlations between the extent to which data is included and various demographic factors.

While still other literature has explored opportunities and barriers for localities committing resources to sustainability (e.g., Lubell et al. 2009; Sharp et al. 2010; Krause 2011; Krause 2012; Hawkins et al. 2015; Yi et al. 2017; Hawkins et al. 2018), there is little to no information on how jurisdictions prioritize between different proposed sustainability actions. For this reason, this study also includes a survey aimed at exploring the extent to which jurisdictions consider various factors across climate action planning and implementation.

This research will provide insight to the priorities of local government policymakers, which will not only allow them to reflect on their current approaches to setting and meeting emissions reduction goals, but also will provide information useful to facilitating state-level policies intended to be implemented at the local level.

2. Materials and Methods

2.1 Evaluating the State-of-Practice in California CAPs

To assess the inclusion of quantitative data and equity considerations in California CAPs, a standardized approach, or framework, is needed. Because such a framework does not exist, this project develops a framework that enables a numerical value reflecting the extent to which quantitative data or equity themes are included in a CAP. In prior research on the inclusion of equity in CAPs in major cities across the United States, Schrock et al (2015) developed and published a scoring rubric that is immediately relevant to the current research. They developed a qualitative coding scheme (Miles and Huberman 1994) to assign each CAP a score from 0 to 3 according to prominence and specificity of equity themes included in the plan. The score was dependent on both the quantity and quality of information provided. Each CAP was reviewed by two raters, and they considered three types of equity: procedural, geographic, and social. Their rubric was adapted in this study to include slightly more specificity, and provided inspiration for similar rubrics to quantify the inclusion of emissions data and cost data in reviewed CAPs. The scoring rubric used in this study for the three variables, emissions, cost, and equity, and can be found in Table 1.

The developed scoring rubric was applied to a total of 33 CAPs across 32 jurisdictions (with one jurisdiction having published two CAPs thus far). The list used in this study was developed for previous work (Lozano et al. 2020). At the time, there was no comprehensive, up-to-date list of CAPs in California, so the list used herein was developed using several different resources. The Institute for Local Government provided information on some CAPs published through 2014. This list was corroborated by online searches for jurisdictions expected to have well-developed CAPs. The Global Covenant of Mayors for Climate & Energy, an international group of local governments committed to combating global climate change and long-term sustainability, requires members to publish CAPs, so additional California jurisdictions were identified from their list of members (GCM, 2021). Particular attention was then given to Caltrans districts that were not yet represented augment the list used previously in Lozano (2020). An additional search was performed in mid-2021 of jurisdictions already on the list to find if any had published new versions of their CAP.

To assess CAPs for their inclusion of equity, the CAP documents were searched for key words, including “equity”, “environmental justice”, and “disadvantaged community(ies)”. Additionally, the researchers carefully read the introduction sections as well as reading through the proposed actions (and examining the information included for each) in case the word-search function missed information (such as information presented in images).

When reviewing for the inclusion of emissions and cost data, the researchers checked the information provided for the proposed emissions reduction strategies, the results or summary section (when available, such as in tables), and the supplementary material (when available). The documents were also searched by keywords including “life cycle” or “lifecycle”, “emissions”, and “cost” to supplement the manual review. Each CAP was subsequently assigned

an Emissions Score, a Cost Score, and an Equity Score according to the rubric presented in Table 1.

Like the study conducted by Schrock et al., the values determined by the rubric were then compared to demographic data of the jurisdictions that released the CAPs to explore any trends. Except for a CAP's year of publication (which was attained from the CAPs themselves), the collected data were drawn from the U.S. Census Bureau (2021) via their online database, wherein the jurisdiction name is matched with demographic information. Ultimately, the scores assigned by the framework were compared to: (1) year of CAP publication, (2) population of the jurisdiction (as of July 1, 2019), (3) the white non-Hispanic population, (4) the proportion of the population with a Bachelor's degree or more, (5) median household income, (6) poverty rate, and (7) population density. This data is presented alongside other pertinent CAP information in Table 3. The correlation between variables and the inclusion of equity, emissions, or cost data were calculated using simple linear regression. One linear regression was performed to compare each of the three scores to the demographic data, and the scores were also compared to each other. Ultimately, four linear regressions were performed.

Just as a framework was developed to quantify the inclusion of equity, emissions, and cost data in CAPs, it is easy to envision similar quantification of other important themes, such as the inclusion of co-benefits, stated level of community engagement, and mentions of indigenous communities and tribal lands. All of these themes warrant inclusion in climate action planning, so an additional scoring framework was developed to guide future work, as provided in Table 1, alongside the framework for the first three variables.

Table 1. A scoring rubric to quantify the extent to which various themes are included in CAPs

Score	0	1	2	3
Equity	No mention of equity	Mentions of equity concerns or themes with little depth or specificity, or prominence as a plan goal	Mentions were more prominent but with less depth or specificity, or specific but not a prominent goal	There were both prominent and specific themes (i.e., for each proposed strategy)
Emissions	Little to no mention of expected emissions reduction, contextual or quantitative	Includes some sort of language or metric (likely qualitative) to gauge approximate emissions reduction	Has provided a quantitative estimate on expected emissions reduction that can be achieved, but does not consider the project's life cycle OR qualifies for Score 1 but also mentions life cycle impacts throughout the CAP	Lifecycle consideration of emissions
Cost	Little to no mention of expected cost, contextual or quantitative	Includes some sort of language or metric (likely qualitative) to gauge approximate cost	Has provided a quantitative estimate on expected cost, but does not consider the project's life cycle AND/OR includes sources of funding for proposed actions	Lifecycle consideration of costs
The following were not quantified in this study, but rather serve to guide future work.				
Co-Benefits	No mentions of co-benefits	Mentions of co-benefits with little depth or specificity	Co-benefits are mentioned more prominently but with less specificity (e.g., for the entire CAP)	Co-benefits are a prominent theme and are presented with specificity (e.g., for most or all proposed strategies)
Community Engagement	No mentions of community engagement	Community engagement mentioned with little depth or specificity	Community engagement is mentioned more prominently but perhaps only for one phase (e.g., only during planning)	Community engagement is a prominent theme and occurs across multiple phases of the project (planning, implementation, renewal, etc.)
Indigenous Communities	No mentions of indigenous communities and/or their lands	Indigenous communities are mentioned with little depth or specificity	Indigenous communities and their lands are mentioned more prominently but not thoroughly considered throughout the CAP	Indigenous communities and the importance of their lands are considered throughout the CAP and across proposed strategies

2.2 Survey to Examine the Current State of CAP Planning and Implementation

While evaluating CAP documents generated by local agencies or their contractors may provide some insights into the stated priorities of a given jurisdiction, it does not reveal the process of developing a CAP nor the reality of implementing stated objectives or plans. For example, are resources available to fulfill stated commitments? Do jurisdictions really use CAPs when deciding on climate-relevant projects or investments? Answering these questions and better understanding the planning and implementation process will provide insight to the priorities of local government policy-makers, allowing them to reflect on their current approaches to setting and meeting emissions reduction goal, and provide information useful to state-level policies intended for local implementation.

Some literature has explored opportunities and barriers faced by localities committing resources to sustainability (e.g., Lubell et al. 2009; Sharp et al. 2010; Krause 2011; Krause 2012; Yi et al. 2017; Hawkins et al. 2018), yet even within this literature, there is little to no information on how jurisdictions prioritize between different proposed sustainability actions. This research proposes to further elaborate CAPs by the addition of life cycle-based accounting of economic and GHG costs and benefits, but without knowledge of how CAPs do or do not guide decision-making, and without knowledge of how life cycle-based accounting is understood, it is difficult to understand how stakeholders will engage with the proposed scoring frameworks developed previously. In short, we do not know how they will judge the importance of life cycle effectiveness or environmental equity alongside other priorities.

To address this, a survey aimed at those responsible for developing and implementing CAPs was developed. To identify potential survey respondents, contact information for the elected and unelected members of the local government that approved the reviewed CAPs was collected, and a survey was prepared with the goal of answering the following two broad questions:

1. How strongly are different factors considered in the CAP planning and implementation process, and is there a difference between the two phases?
2. How familiar are jurisdictional representatives with life cycle assessment (LCA), life cycle cost assessment (LCCA), and equity; how likely are they to include them in future CAPs, and what would prevent them from doing so?

2.2.1 Survey Methods)

To develop the survey questions, field-tested and validated survey questions already worded to avoid biases and minimize the range of subjective interpretation were collected from previous studies (e.g., Lubell et al. 2009; Sharp et al. 2010; Krause 2011; Yi et al. 2017). These previous studies used survey approaches to study local adoption of climate mitigation and sustainability plans, and here we extend that work to specifically consider CAPs in California. In addition, the survey scope includes a new dimension, by exploring whether and how local officials consider *life cycle effectiveness* and *equity* in their planning and implementation process. As such, new questions specific to CAPs, life cycle effectiveness, and equity were developed, and mirrored language used in other surveys.

After developing a draft set of survey questions, the survey was piloted with two groups of local agency employees from Yolo and Unincorporated Los Angeles Counties who had previously cooperated with the research team. After the agency employees responded to the survey, the researchers requested feedback on the appropriateness and clarity of questions, developed new questions that arose from conversations about the relevant topics, and subsequently revised the survey.

The finalized survey contained two parts: a set of quantitative questions and a set of free-response questions. At the start of the survey, respondents were asked to identify which jurisdictions' CAPs they have worked on, followed by whether they have been involved in planning, implementation, or both. They were subsequently asked to reflect on the extent to which various factors were considered during climate action planning and/or implementation, with access to one or both sets of questions dependent on their reported experience. Their responses were recorded on a Likert scale, with potential responses ranging from "not at all" (score of 1) to "a great deal" (score of 5). The factors they were asked to consider were: (1) expected GHG emissions reduction potential of proposed strategies, (2) expected cost, (3) improvements to local pollution, (4) the stated priorities of the local community, (5) impacts on the local community, (6) impacts on other/external communities, (7) effects (positive or negative) on disadvantaged communities (DACs), and (8) expected timeline of implementation of proposed strategies. This combination of factors was based both on previous literature (e.g., Hawkins et al. 2015) and the interests of this research.

The primary goal of the rest of the survey was to elicit free-response answers to questions on the inclusion of LCA, LCCA, equity, and life cycle equity in climate action planning. Respondents were also asked about how they fund proposed climate actions, as well as how they fund updates to the CAP. There was also a question that procured information on what affects the likelihood that proposed actions get implemented. Finally, they were asked how they gauge CAP efficacy, and how often they report on progress to their constituents. The specific questions asked in both the quantitative and free-response sections are presented in Table 2.

Table 2. The questions asked in the survey are presented below. Note that the quantitative questions applied to the eight factors listed in the text, with five possible answers on a Likert scale to gauge the level of consideration for each factor.

Quantitative questions
When developing a CAP for your jurisdiction, how much did you consider the following?
When implementing a CAP for your jurisdiction, how much did you consider the following?
Score: 1 – “Not at all”, 2 – “A little”, 3 – “A moderate amount”, 4 – “A lot”, 5 – “A great deal”
Free-response questions
Please explain your response to the previous question: What explains the likelihood of using LCA in future climate action planning?
Please explain your response to the previous question: What explains the likelihood of using LCCA in future climate action planning?
Please explain your response to the previous question: What explains the likelihood of you incorporating environmental equity into future climate action planning?
Please explain your response to the previous question: What explains the likelihood of you incorporating life cycle-based environmental equity in future climate action planning?
How are the projects proposed in CAPs funded? What are your funding sources for these projects?
Specifically, how does your jurisdiction fund updates to the CAP?
What explains the likelihood of a project listed in a CAP getting implemented?
How does your jurisdiction assess efficacy of implementation of the plan?
How often do you report back to constituents on the progress of the CAP? What information is included?

After the final survey received an exemption from the UC Davis Institutional Review Board (IRB), it was published online through the web-based survey platform, Qualtrics. The full survey can be found in the Appendix. Best practices for survey implementation, including multiple reminders in multiple modes (e.g., phone and email), were used to increase the response rate (Dillman et al. 2009; Monroe and Adams 2012). Of the 32 jurisdictions invited to complete the survey, a total of 25 responded, resulting in a response rate of 78%. Of these 25 responses, 4 completed the quantitative section of the survey but did not answer the free-response questions. The response rate was compared to jurisdictional demographic data reviewed previously (see Section 2.1), but no statistically significant correlations were found. That is, no combination of the reviewed demographic data could significantly predict the likelihood that a jurisdiction would respond to the survey.

2.2.2 Survey Response Analysis

Because the purpose of the first part of the survey was to determine the relative importance of factors to each other, responses were normalized for each respondent. That is, for each survey response, the average score of all Likert responses was calculated, and individual responses were normalized accordingly, such that positive scores meant the factor was considered more than average, and negative scores meant that the factor was considered less than average. Note that the Planning and Implementation phases were considered separately, therefore responses were processed accordingly. The normalizing calculation is summarized in the equation below, calculated for factor “X,” which is one of the eight factors listed previously, for phase “Y,” which is either planning or implementation.

$$\text{Normalized Score}_{X,Y} = \text{Survey Score}_{X,Y} - \text{Average Survey Score}_{All,Y}$$

For example, if a respondent assigns “Emissions reduction” a consideration score of 5 in the survey, and the average score of all their responses is 4, then the normalized score for “Emissions reduction” would be +1, meaning that the expected reduction in GHG emissions of the climate actions was considered more than average. Alternatively, a survey score of 3 would lead to a normalized score of -1, meaning the expected GHG emissions reduction was considered less than average.

This method requires the potentially contentious assumption that the ordinal data (qualitative responses) provided by the Likert-scale questions can be converted to equally-spaced interval data (quantitative values from 1 to 5). For example, this method assumes that the difference between “No consideration” and “A little consideration” is the same as the difference between “A little consideration” and “A moderate amount of consideration”, which is also the same as the difference between “A lot of consideration” and “A great deal of consideration”. It is not possible to infer such a perfect distribution in sentiment, so some authors argue that it is incorrect to perform descriptive statistics (i.e., calculating mean and standard deviation) on ordinal data, and instead analysis should be restricted to the rank, median, and range of the data set (Allen and Seaman 2007). Another author notes that while literature tends to frown upon this sort of statistical analysis of Likert data, many peer-reviewed studies do so anyway (Jamieson 2004). Yet another author acknowledges this disparity in theory and practice, and proceeds to advocate for interval analysis of Likert data since the stated drawbacks of such analysis do not outweigh the benefits of getting some understanding of the data, even if it is imperfect (Norman 2010). Having acknowledged the drawbacks of assuming interval distribution from ordinal data, this study still proceeds to do so in an effort to gain a different understanding of the data distribution.

This study also normalized the responses to the quantitative questions for each respondent and for each phase. Normalizing the responses in each phase helps distinguish between the amount of consideration factors receive (according to each individual respondent) compared to the other factors during that phase. For example, consider a jurisdiction assigning a score of 3 to Cost in the planning phase, and 4 in the implementation phase. Comparing these two raw scores would suggest that Cost is considered more during implementation than planning. If we

assume the average score during planning was 3, then Cost received a normalized score of 0, suggesting an average amount of consideration. Now, if all other factors received a greater increase in consideration during implementation than Cost did, such that the average score during implementation is greater than 4—say, 4.5—then in fact the relative consideration of Cost would have gone down (standardized score of -0.5). In other words, Cost would have received below-average levels of consideration during implementation, though the jurisdiction reported a higher level of overall consideration.

Consider another example where a jurisdiction assigns all factors a score of 3 during planning and a score of 5 during implementation. A comparison of raw scores shows that all factors are more highly considered during implementation than planning, but the difference in consideration between these factors remains constant. That is, no factor is considered more or less than any other across the phases. Since what this study aims to highlight is the relative consideration of factors in each phase, and not necessarily the difference in reported consideration between the two phases, the scores for factors within each phase were normalized.

A one sample t-test was performed on the normalized scores to determine whether any were statistically non-zero, signifying that it is likely they were considered above or below average. Scores that did not have a significant p-value are indistinguishable from a zero score, signifying that their consideration could be considered average. This analysis was conducted for all eight factors and distinguishes between responses for the planning and implementation phases.

There are four topics from the second section of the survey, comprised of open-ended questions (see Table 2), that are highlighted in this report: equity, lifecycle equity, funding, and project implementation. Responses to the question(s) for each topic were reviewed and subsequently categorized into broad themes. The broad themes were generated to capture the sentiments and ideas expressed by respondents and were not pre-determined, since the researchers did not know what kinds of responses would be received. The number of responses that fall into each theme is provided in addition to an explanation of the theme and, occasionally, representative quotes.

3. Results

3.1 Emissions, Cost, and Equity Scores

Results from scoring CAPs with the developed rubric are presented in Table 3 by jurisdiction, along with the corresponding demographic data. Score data is also presented visually in the bubble plots seen in Figure 1. Each bubble is centered on the average score for that year, and the size of the bubble is proportionate to the number of reviewed CAPs that were published that year. As is evident in Figure 1, the cost and equity scores are, on average, generally lower than the emissions scores. Because these are the average of all CAPs from a given year, the variability within each year is not evident.

Table 3. Summary of Scores and Demographic Data for each Reviewed CAP

Name	Year	Emissions_ score	Cost_score	Equity_score	Population	White_NH	Bachelors_ deg	Med_house_ income	Poverty_rate	Pop_density
Benicia	2009	1	0	0	28240	65.10%	44.70%	\$103,413.00	7.10%	2088.1
Berkeley	2009	1	1	1	121363	53.30%	73.80%	\$85,530.00	19.20%	10752.6
Hayward	2009	1	0	0	159203	16.20%	27.70%	\$86,744.00	8.40%	3181.3
San_Leandro	2009	1	1	0	88815	23.20%	31.70%	\$78,003.00	9.60%	6366.6
Yolo_County	2011	2	0	0	220500	46.00%	41.40%	\$70,228.00	16.90%	197.9
Fremont	2012	2	1	0	241110	20.20%	57.00%	\$133,354.00	4.30%	2763.9
Humboldt_County	2012	0	0	0	135558	73.80%	30.40%	\$48,041.00	19.10%	37.7
Santa_Barbara_city	2012	2	0	0	91364	55.60%	49.20%	\$76,606.00	12.50%	4541.3
Santa_Cruz_city	2012	0	0	0	64608	61.60%	53.80%	\$77,921.00	20.90%	4705.3
Shasta_County	2012	2	0	0	180080	79.20%	22.20%	\$54,667.00	13.30%	46.9
San_Francisco_city	2013	1	0	1	881549	40.50%	58.10%	\$112,449.00	10.30%	17179.1
Alameda_County	2014	2	2	0	1671329	30.60%	47.40%	\$99,406.00	8.90%	2043.6
Fresno_city	2014	1	0	0	531576	26.90%	21.90%	\$50,432.00	25.20%	4418.3
Stockton	2014	3	3	0	312697	20.60%	18.30%	\$54,614.00	17.90%	4730.1
Cupertino	2015	3	1	2	59267	25.20%	78.80%	\$171,917.00	6.00%	5179.6
Los_Angeles_County	2015	2	2	0	10039107	26.10%	32.50%	\$68,044.00	13.40%	2419.6
Santa_Ana	2015	2	1	0	332318	9.40%	15.00%	\$66,145.00	15.70%	11900.6
Emeryville	2016	1	0	1	12086	40.30%	71.50%	\$102,725.00	13.90%	8089.9
Lancaster	2016	1	1	1	157601	30.10%	17.60%	\$55,237.00	21.70%	1661.4
Monterey_city	2016	2	0	0	28178	66.70%	52.80%	\$80,694.00	10.90%	3284.9
Palo Alto	2016	2	2	0	65364	54.90%	82.80%	\$158,271.00	6.10%	2696.5

Name	Year	Emissions_ score	Cost_score	Equity_score	Population	White_NH	Bachelors_ deg	Med_house_ income	Poverty_rate	Pop_density
Sacramento_County	2016	2	2	0	1552058	43.80%	30.90%	\$67,151.00	12.60%	1470.8
Sonoma_County	2016	2	2	1	494336	62.90%	35.50%	\$81,018.00	7.20%	307.1
Yountville	2016	2	2	0	2934	80.20%	41.80%	\$63,561.00	6.40%	1973
San_Rafael	2017	2	1	2	58440	57.00%	52.20%	\$91,742.00	12.20%	3504.1
Solana_Beach	2017	2	1	0	13296	76.20%	68.00%	\$108,118.00	5.30%	3655.4
Woodland	2017	2	1	0	60548	39.30%	27.30%	\$69,612.00	11.20%	3624.6
Piedmont	2018	1	1	0	11135	70.90%	83.40%	\$224,659.00	2.40%	6357
Riverside_County	2018	2	1	0	2470546	34.10%	22.30%	\$67,005.00	11.30%	303.8
San_Jose	2018	3	2	1	1021795	25.70%	43.70%	\$109,593.00	8.70%	5358.7
Fresno_city	2020	2	1	0	531576	26.90%	21.90%	\$50,432.00	25.20%	4418.3
Marin_County	2020	2	0	2	258826	71.10%	59.50%	\$115,246.00	6.90%	485.1
Oakland	2020	2	1	3	433031	28.30%	44.00%	\$73,692.00	16.70%	7004

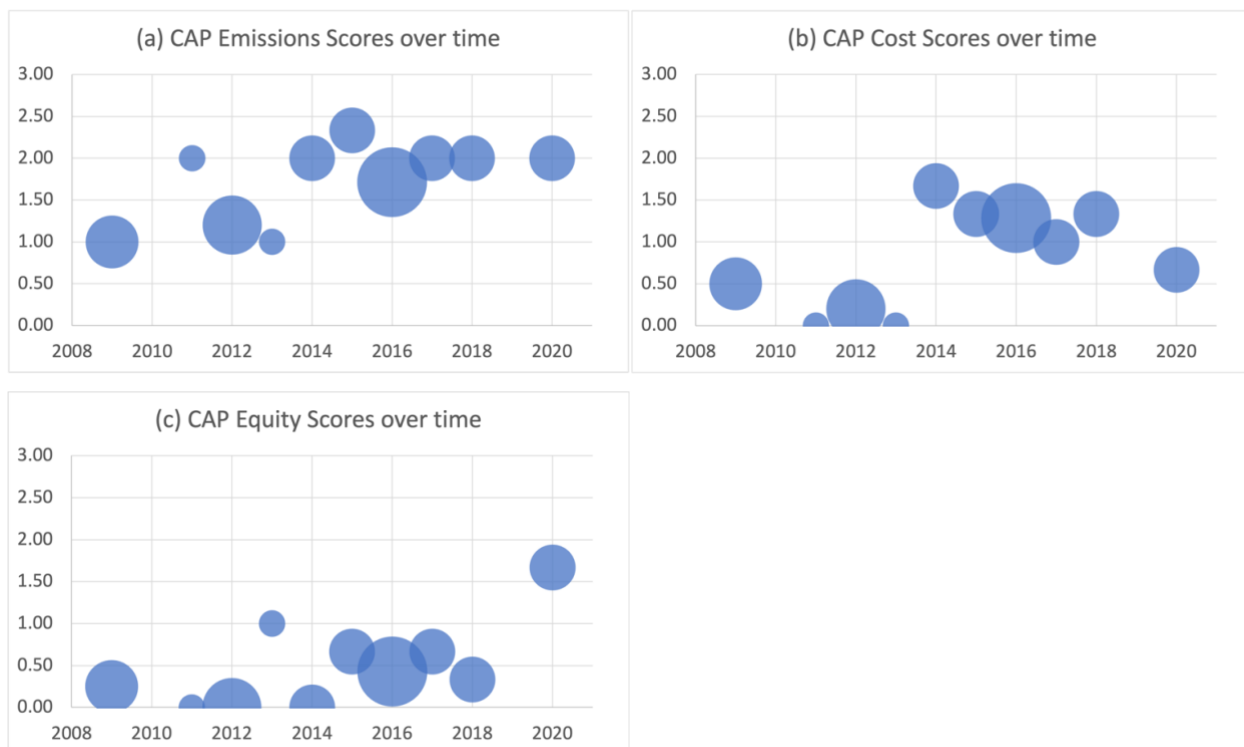


Figure 1. (a) Trend of average emissions scores plotted over time. (b) Trend of average cost scores plotted over time. (c) Trend of average equity scores plotted over time. The size of each bubble corresponds to the number of CAPs reviewed for that a given year.

Examining the average score and year of publication is insufficient for understanding trends or patterns in high and low scores for equity, cost and emissions. To do this, the scores assigned to each CAP were compared to the year of publication and various demographic data (see Table 3) using simple linear regression. Additionally, the scores were regressed against each other to identify any relationships therein. The linear model tests the null hypothesis that there is no relationship between the response variables (e.g., Equity Score) and the subsequent predictor variables. One of the outputs is a t-value, which can be interpreted as a measure of relationship strength between the response and the predictor variable, such that larger t-values suggest stronger relationships. The p-value can be interpreted as the probability that the relationship between the two variables could happen by chance, such that a smaller p-value suggests a smaller probability that the relationship is randomly-occurring. Studies will establish an alpha value (typically 0.05) such that any p-value smaller than the alpha value rejects the null hypothesis, thereby rejecting the idea that there is no relationship between the two variables. The results of the four regressions conducted are available in the Appendix (Figure A.1–Figure A.8). Statistically significant relationships have been highlighted in Table 4, where columns contain the response variables and rows contain the predictor variables. Significant relationships are also depicted in Figure A.8.

Table 4. Results from the linear regressions conducted on the three response variables: equity, emissions, and cost scores. Demographic data with a p-value greater than 0.1 are considered not significant, whereas data with smaller p-values are significant at certain values for alpha, as denoted at the bottom of the table.

	Equity		Emissions		Cost	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Equity	-	-	n.s.	n.s.	n.s.	n.s.
Emissions	n.s.	n.s.	-	-	0.69	<0.001***
Cost	n.s.	n.s.	0.49	<0.001***	-	-
Year	0.11	0.014**	0.11	0.005***	0.08	0.093*
Education	2.66	0.067*	n.s.	n.s.	n.s.	n.s.
Poverty rate	n.s.	n.s.	-7.44	0.011**	n.s.	n.s.
N.H. population	n.s.	n.s.	-1.83	0.015**	n.s.	n.s.
Med. house inc.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Population	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Pop. Density	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
n.s.: not significant; *: alpha = 0.1, **: alpha = 0.05, ***: alpha = 0.01						

3.2 Survey to Examine the Current State of CAP Planning and Implementation

The survey can be considered as consisting of two parts: the quantitative response questions, and the qualitative, free response questions. The first sub-section of these results focuses on the quantitative responses, with all subsequent sub-sections presenting information collected from one set of qualitative questions.

3.2.1 Quantitative Assessment of Factors Considered in Planning and Implementation

The following results are derived from the survey sent to local jurisdiction representatives. Respondents used a Likert scale response to indicate how important various factors were during climate action planning and implementation phases. The range of original responses is presented in Figure 2, whereas the range in normalized responses is presented in Figure 3. Note that normalizing the data was done to focus on the relative consideration of factors according to each respondent, and in doing so, removed a number of outliers present in the non-normalized data.

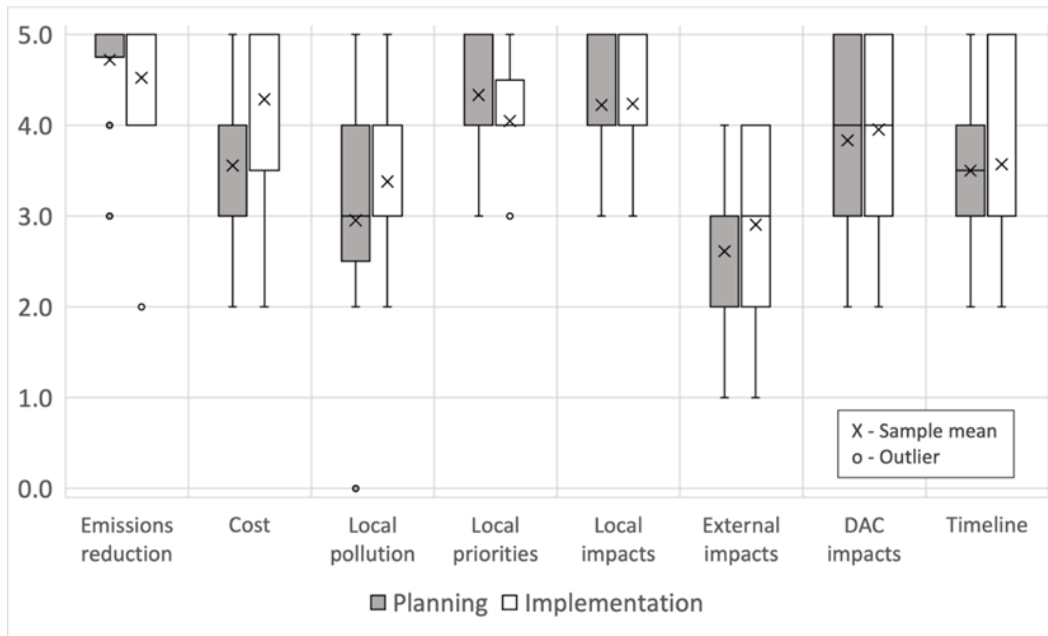


Figure 2. This box and whiskers plot shows the range of original consideration scores received by all factors for both the planning and implementation phases. The data is presented in quartiles. The line dividing each box represents the sample median, with a quarter of responses falling between the median and the edge of the box. Each line extending from the edge of the box, a “whisker”, encompasses another quarter of responses.

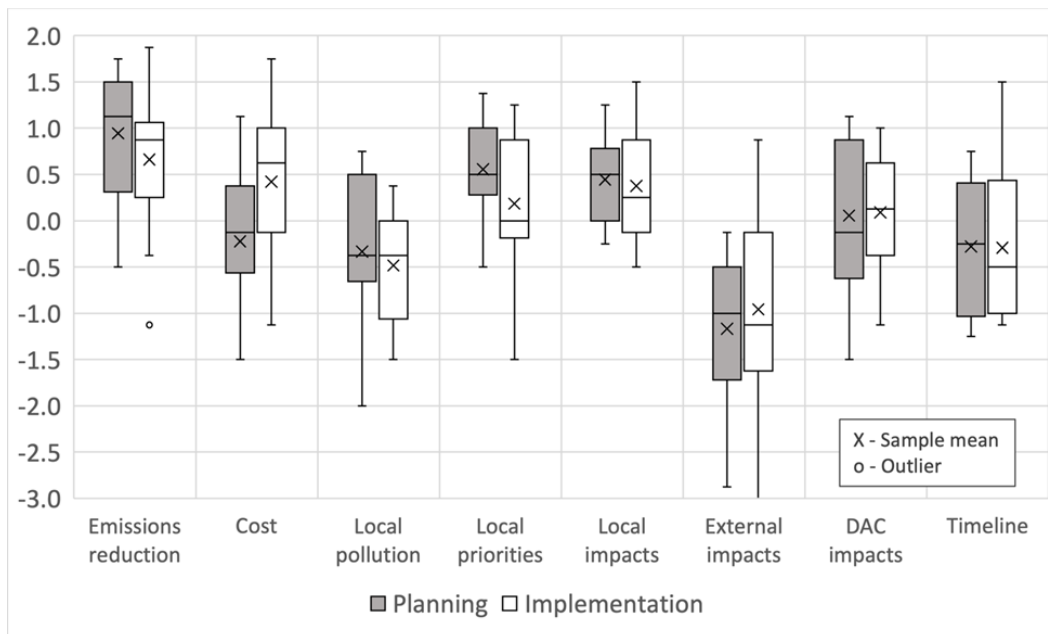


Figure 3. This box and whiskers plot shows the range of normalized consideration scores received by all factors for both the planning and implementation phases. The data is presented in quartiles. The line dividing each box represents the sample median, with a quarter of responses falling between the median and the edge of the box. Each line extending from the edge of the box, a “whisker”, encompasses another quarter of responses.

Various sets of t-tests were conducted on the normalized data to determine whether any factors had non-zero values (in other words, had non-average levels of consideration). The results of these t-tests are presented in Table 5. The table includes the sample mean, the 95% confidence interval of the mean, and the corresponding p-value. The p-value determined whether or not the null hypothesis can be rejected that the mean is equal to zero. P-values smaller than the alpha value (Table 3 shows alpha values of 0.05 and 0.01) reject the null hypothesis, thereby suggesting that the mean is non-zero. This is interpreted as the corresponding factor having a non-average level of consideration. Figure 4 highlights the mean normalized score assigned to each factor in addition to the 95% confidence interval of the mean, and is also presented across both phases. Figure 5 graphs the difference in reported consideration between the implementation and planning phases for all factors.

Table 5. Results of a one-sample t-test for the reported importance of various factors during the planning and implementation phases of local climate action. This includes the sample mean, the 95% confidence interval of the mean, and the p-value for the null hypothesis that the mean is equal to zero.

Factor	Planning (df = 17)			Implementation (df = 20)		
	Mean	95% C.I.	p-value	Mean	95% C.I.	p-value
Emissions reduction	0.94	0.35	3.10E-05**	0.66	0.33	4.25E-04**
Cost	-0.22	0.35	1.96E-01	0.42	0.38	3.13E-02*
Local pollution	-0.33	0.40	9.63E-02	-0.48	0.26	1.01E-03**
Local priorities	0.56	0.26	3.16E-04**	0.18	0.31	2.23E-01
Local impacts	0.44	0.21	4.16E-04**	0.38	0.25	5.28E-03**
External impacts	-1.17	0.41	1.55E-05**	-0.96	0.43	1.72E-04**
DAC impacts	0.06	0.39	7.67E-01	0.09	0.30	5.45E-01
Timeline	-0.28	0.35	1.11E-01	-0.29	0.37	1.19E-01

Note: *Value is significant for an alpha of 0.05; **value is significant for an alpha of 0.01.

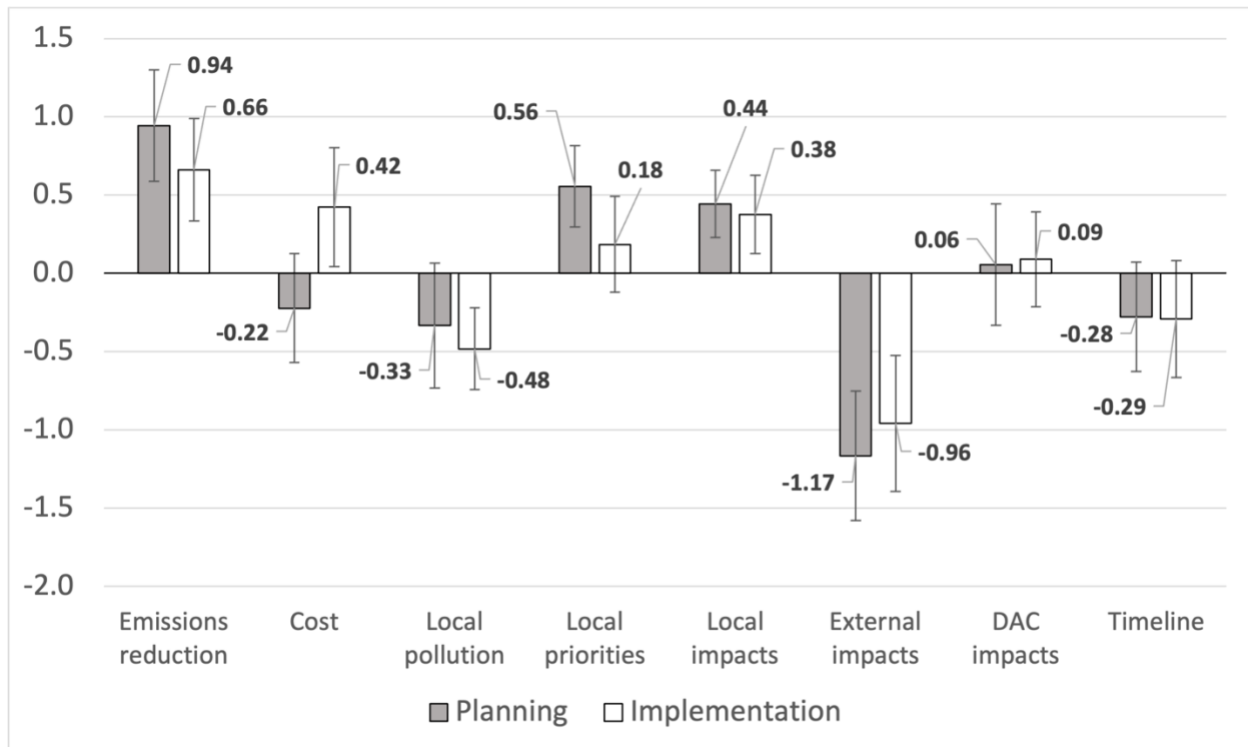


Figure 4. A comparison of the mean reported relative consideration for planning (grey) and implementation (white). Positive values signify that the factor was considered more important than average during that stage, with the opposite being true for negative values. The error bars show the 95% confidence interval about the mean, which is the range of values for which we are 95% confident that the true mean falls within.

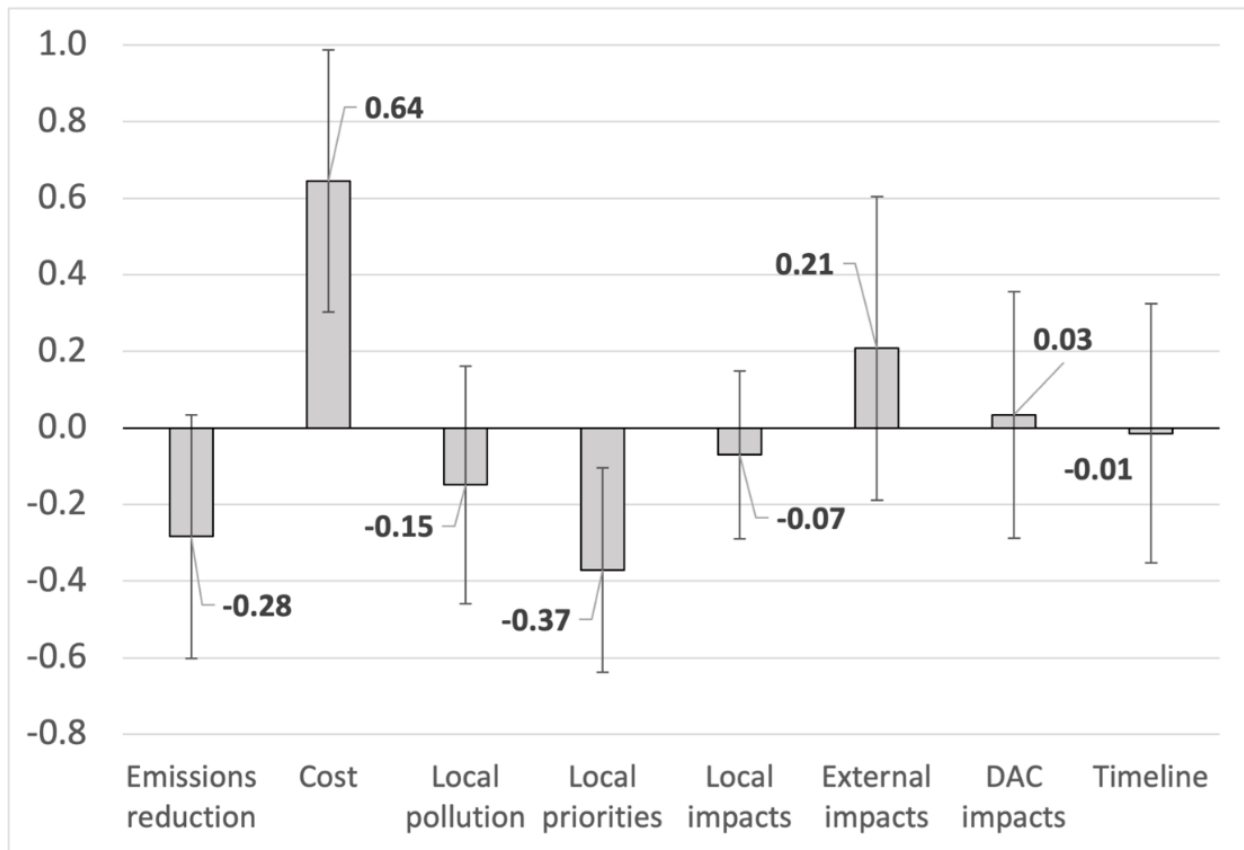


Figure 5. The difference in mean reported consideration of various factors during implementation compared to planning is plotted above. The graph also includes the 95% confidence interval for each difference, which is a range of values for which we are 95% confident that the population difference is within. Note that positive values signify that a factor was more important during implementation than during planning, with the opposite being true for negative values.

3.2.2 Qualitative Assessment of Factors Considered in Planning and Implementation

The following sections summarize the responses received for the free-response questions. The questions have been grouped by topic: equity, lifecycle equity, funding, and project implementation.

Equity

Survey respondents were also asked to reflect on equity themes specifically. All but one jurisdiction responded that they are “very likely” (maximum score) to include equity themes in future CAPs. Respondents were then asked to clarify what affects the likelihood of including equity in future CAPs, and while some outlooks were generally positive, others expressed doubt on how to proceed. These responses have been categorized and expanded upon below.

- **Communities pushed for equity** (n = 5) – Many jurisdictions mentioned that equity has recently become a central discussion point in meetings held with community members.

This could be, in part, because of the nation-wide attention garnered by the Black Lives Matter movement in the Summer of 2020, in response to the killing of George Floyd. One jurisdiction mentioned that the increased awareness of equity issues has made it “easier to plan and consider” equity in climate action. Another clarified that while equity is not explicitly highlighted during CAP development, this community push has led to the development of an equity-centered initiative for the jurisdiction, and that now, “implementation of every action within the CAP is done with an equity lens on it.” One county clarified that while equity as a topic is of utmost importance, their jurisdiction did not contain any disadvantaged communities as determined by CalEnviroScreen. However, they do have low-income, underserved communities within the county’s unincorporated areas that “identify with the importance of and opportunities presented by [environmental justice]”, which encourages the inclusion of equity-centered actions in the county’s plan.

- **Not explicitly or sufficiently in the CAP** (n = 4) – Several jurisdictions mentioned that while equity is an important theme, it is not included in their climate action plan, but rather in other jurisdictional documents, typically either the jurisdiction’s General Plan or a separate document altogether. Others also noted that their CAP could do a better job, as it does not currently include enough detail.
- **Equity-centered funding is key** (n = 2) – Some jurisdictions mentioned that the increased importance placed on equity over the last couple of years has led to policy that provides funding to programs that promote equity. These policies include SB 535 and AB 1550, which explicitly direct funds to DACs and low-income communities, as well as AB 617, a bill aimed at reducing air pollution in communities experiencing the highest levels of exposure.
- **Doubt about effective implementation** (n = 1) – While acknowledging that equity and the environment go hand-in-hand, some jurisdictions expressed doubt about meaningfully and impactfully addressing equity issues through implemented measures. Respondents expressed uncertainty on whether it is better to have equity play a role in the CAP development process, or more as a lens through which CAP measures are evaluated during implementation. Compare this to the response of yet another jurisdiction, which clarified that they are currently doing both: proposed projects, programs, and policies must include an equity impact statement, and climate measures are considered and evaluated through an equity lens (among others).
- **Equity is not in scope** (n = 1) – One jurisdiction explained that the priority of a CAP is to enact jurisdiction-wide change. Therefore, actions are implemented that bring the greatest positive change to the jurisdiction (e.g., air quality improvement) regardless of the individual affected communities.

Lifecycle Equity

Respondents were briefly introduced to the concept of lifecycle equity, which posits that the equity lens should be applied not just at the point of implementation, but across the lifecycle of a proposed action. Particularly, there are impacts that may be outside the jurisdictional borders, and the question is whether and to what extent these are considered. For example,

electrifying transit buses reduces local pollution along the routes of those buses, but it (1) requires the mining of minerals like cobalt for battery production, which generates significant burden in mining communities (e.g., in the Democratic Republic of the Congo), and (2) induces an increased demand for electricity which may generate additional local pollutants in communities near fossil fuel power plants that provide electricity to the grid. Lifecycle-based environmental equity attempts to capture local impacts beyond the site of project implementation.

Respondent's sentiments on the inclusion of lifecycle equity in CAPs could be separated into three simplified categories: not enough resources (n = 7), not their responsibility (n = 5), and not under their control (n = 3). Generally speaking, respondents acknowledged that there are impacts from decisions made within the jurisdiction that impact communities beyond its borders, but ultimately, local governments have to focus on efforts to improve the state of life within their borders, not outside them. In other words, lifecycle equity is outside their scope and not something they could, or even should, pursue. Local jurisdictions feel primarily responsible to their own residents, with one respondent expressing that local governments must show that they "are spending tax payers' dollars on projects and plans that will benefit their immediate life." It was also shared that it is challenging to convince residents to make lifestyle changes for benefits not experienced by them directly (e.g., not purchasing low-emissions vehicles because of impacts in another country). Many respondents suggested that the inclusion of lifecycle equity is a change that needs to occur in other areas, such as in the consulting industry (which is largely responsible for providing the quantitative data that local governments use in their CAPs) or at the state or federal level through policy (e.g., requiring fair trade certifications for materials and products). To paraphrase one response, the inclusion of lifecycle equity would require a change in the data provided to jurisdictions, which necessitates a change in the way the industry operates, which in turn could be supported by policy. The most frequently cited barrier, though, was that even if local governments did want to include lifecycle equity to some extent, they simply do not have the resources to pursue acquiring the relevant data, especially since there is currently no tool or database that readily provides it. Ultimately, respondents felt that local governments have limited power to change this through the decisions they can make.

Funding

There were two questions in the survey that addressed sources of funding. One was for funding proposed climate actions, and the other was for funding updates to the CAP. Potential funding sources indicated in survey responses are summarized in Table 6, which highlights under which circumstance that source was referenced.

Table 6. Ways that jurisdictions fund (1) climate actions included in their CAPs, and (2) updates to their CAP.

	Climate Actions	Updates to the CAP
Grant opportunities	X (n = 15)	X (n = 5)
City/County General Fund	X (n = 11)	X (n = 8)
Community generated fees	X (n = 7)	X (n = 2)
Public/private partnerships	X (n = 4)	
Self-generated savings	X (n = 2)	
Developer fees	X (n = 2)	
Bonds	X (n = 1)	
Volunteering/Free	X (n = 1)	X (n = 3)
Unsure moving forward		X (n = 5)

Grant opportunities include state, federal, and private grants (e.g., electric bus purchase subsidies or DAC funds), and were the most frequently cited source of funding for CAP implementation. The City or County's General Fund was another frequently cited source of funding for climate actions. Community generated fees may include increases in electricity rates, air quality fees, recycling funds, and even direct taxes. Some projects may be self-financed through the savings they generate, or those savings may be used to fund different actions (e.g., renewable energy installations that produce savings through electricity generation once the initial investment is recuperated). Many jurisdictions mentioned volunteering and pro-bono work as a major contributor to CAP updates, with some expressing uncertainty on their plan moving forward due to limited resources.

Project Implementation

The final question of the survey asked respondents to reflect on the likelihood that all proposed actions are implemented, and then expand on what affects that likelihood. The developed categories and the number of responses that fell into each are summarized in Table 7.

Table 7. A summary of how many jurisdictions mentioned that the listed factor affected an action's likelihood of implementation.

	Factor affects implementation
Budget/Cost	n = 16
Political will	n = 8
Community support	n = 5
Ease of implementation	n = 5
Staff capacity/resources	n = 4
State of technology	n = 3
Advances equity goals	n = 1

Many jurisdictions mentioned financial reasons, such as budget limitations and upfront implementation cost. Project-centered factors included ease of action implementation and the state of technology (e.g., expected technological advancements, supply chain issues), both of which directly affect the expected outcome of proposed actions. External factors mentioned include political will of those in power and community support of an action (for example, an action with divided community support is electrifying stoves). Successful implementation is also dependent on staff capacity and available resources, which, more often than not, was reported to be insufficient. Only one jurisdiction mentioned that an action's ability to meet equity goals affected its likelihood of implementation. Finally, one jurisdiction commented that a CAP doesn't "give teeth" to any proposed actions, since a plan for implementation is largely determined predetermined by funding and political will. Ultimately, the consensus was that implementation plans depend mostly on available funding and political will, with many new projects being considered only if new funds appear.

Gauging and Reporting CAP Progress

When reflecting on gauging CAP success, jurisdictions mentioned referencing evaluation metrics or progress indicators, such as quantity of solar panels installed, miles of new bike lanes, or electric vehicles miles traveled. Some jurisdictions tracked progress on a online dashboard. Others rely on updated greenhouse gas inventories to quantify the impacts. Still others answered they were unsure of the best way to quantify progress, or simply know they cannot gauge it.

Frequency of reporting varied widely, as did the method of reporting. One jurisdiction reports at least every other month in City Council meetings and disburses information both in written format (e.g., local news outlets and newsletters) and verbally (e.g., meeting presentations), while others aim to provide updates every four years. The majority of jurisdictions report on progress every 1-2 years, and do so either by referring to pre-determined metrics, or by updating the jurisdiction's greenhouse gas inventory. The range of information that is reported includes: implementation level of actions, estimated emissions reduction, changes to key performance indicators (e.g., energy or water use, vehicle miles traveled, etc.), new or proposed projects, and new partnerships.

4. Discussion

4.1 Evaluating the Data in CAPs to Make Suggestions

This portion of the study sought to identify correlations between the inclusion of data in CAPs and a jurisdiction's demographic data. While the scoring rubric used to quantify the inclusion of data was developed to standardize the quantification of qualitative variables, the scoring process is still subjective. The scores were assigned by a single researcher, and it is possible that another researcher would assign different scores using a different rubric. Correlations between the scores generated and demographic data should be interpreted in this context.

There were some demographic data that correlated with the inclusion of emissions, cost, or equity data. Higher emissions scores were positively correlated with the year of CAP publication, suggesting that CAPs have been trending towards more quantitative emissions data over time. A higher emissions score was negatively correlated with both the jurisdiction's poverty rate as well as its non-Hispanic population. In other words, wealthier jurisdictions and those with a higher proportion of Hispanic residents tended to have CAPs with higher emissions scores. Wealthier jurisdictions may be able to more readily provide the resources to produce more robust CAPs, so the first finding seems intuitive. However, the negative correlation between emissions score and the proportion of the non-Hispanic population is unexpected and warrants more attention, perhaps in future work. There was a weak relationship between cost scores and the year of CAP release, and no other significant relationships were identified.

Equity scores were positively correlated with both the year of CAP publication as well as the proportion of the jurisdiction's population who earned at least a Bachelor's degree, suggesting that CAPs include more equity themes over time, and that jurisdictions whose resident received higher education push for the inclusion of more equity themes in the document. One interesting trend is that the average Equity score stagnated below 1 for many years, in large part because many CAPs failed to mention equity at all. However, 2020 saw a spike in Equity scores, with three CAPs achieving scores of 0, 2, and 3. This is likely to be a trend in the coming years, especially given how supportive survey respondent were of including equity themes in future CAP updates. However, it should be recognized that some jurisdictions concurrently or subsequently release equity-focused documents apart from their CAPs. This could affect results since only CAPs were reviewed to maintain consistency. That being said, climate action and equity are not the same, so even if the equity document is separate, it should at least be referenced in the CAPs moving forward. In particular, a jurisdiction's CAP is the main climate action guiding framework and should be a primary point of contact, so in the best case scenario, it wouldn't require people to look for a separate document that they may not even know exists, to understand whether equity has shaped the development of a CAP, or is part of the planning or implementation process for CAPs.

Among other findings, there is a statistically significant increase in the extent to which equity themes are included in CAPs over time. This warrants exploration into what newer CAPs are doing that older CAPs did not, and what additional themes could be included in future CAPs. The goal was to develop a set of guiding questions for current and future CAP developers that

would facilitate the inclusion of equity themes in their planning and implementation processes. First, CAPs with higher equity scores were examined to identify themes they mentioned that other failed to include. Subsequently, additional literature was reviewed to explore major themes in the overlap between climate action and equity. These themes and questions were pulled from a variety of metrics, framework, and scoring rubrics. These include CARB's "California Climate Investments Co-benefit Assessment Methodologies" (CARB 2020), the CEC's "Proposed Evaluation Criteria for Benefits and Impacts to Low Income and Disadvantaged Communities" (CEC 2019), and NCST's "Framework for Life Cycle Assessment of Complete Streets Projects" (Harvey et al. 2018). These resources, along with a few others, were also used to create metrics in a study that assessed the equity impacts of heavy-duty transportation electrification programs (Bush 2021). After reviewing the aforementioned sources, the following set of questions was generated to guide discussion on the equity impacts of local climate actions.

General Questions:

- Co-benefits - Does the strategy:
 - Decrease levels of local pollutants?
 - Generate local jobs (near and/or long term)?
 - Increase grid reliability?
 - Affect green space?
 - Promote exercise/other health impacts?
- What are the upstream impacts of the strategy? Who is affected?
 - E.g., generated emissions, job production?
 - Are any of these impacts beyond jurisdictional borders? State borders? National borders?
- What are the downstream or end-of-life impacts? Who is affected?
- Does the strategy impact (i.e., reduce, preserve, or return) native lands?
- Does it affect native flora and/or fauna?
- Across which phases was or will the community be engaged?
 - Design of the climate action plan
 - Implementation of the listed strategies
 - Education and updates on actions and progress
 - End-of-project debriefing
 - Updates to or development of a new CAP
- When engaging the community, how were social and/or linguistic barriers addressed?

While the above questions broadly explore themes around equity relevant to CAPs, equity issues can also be considered on the basis of specific sectors, and may be more actionable in the context of CAP planning and implementation. A subset of sector-specific questions have been provided below for the energy and transportation sectors. A similar set of questions could

be produced for other sectors including waste and water management, land use, and agriculture.

Energy Strategies:

- Does this increase access to renewable energy in disadvantaged communities (DACs)?
- How are the benefits of building electrification distributed?
- How are costs distributed? Particularly for DACs.
- How transparent is the allocation of energy revenues?
- Does the strategy promote distributed generation and/or microgrids?
- Are there indirect long-term repercussions of electrification? I.e., higher utility bills for using electricity over natural gas; thinking about rates per tier of usage

Transportation Strategies:

- Does this increase access to clean(er) transportation in DACs?
- Does this affect traffic/congestion?
- Does it increase access to community resources? I.e., proximity or transportation to schools, jobs, other transit hubs?
- Access to active transportation modes i.e., walking, biking?
- Does it affect/increase safety for active and transit transportation users?

Guiding the development of new CAPs using the questions developed in this section could lead to plans that have considered the broader impacts of strategy implementation on their community, particularly disadvantaged or vulnerable communities. Further considering equity themes that are sector-specific adds context to and understanding of the impacts of individual strategies and not just the broader CAP. It is especially important to note some impacts are outside of jurisdictional borders and this beyond the control of local governance, which highlights the importance of state and even federal planning centered on environmental equity.

4.2 Survey to Examine the Current State of CAP Planning and Implementation

In assessing the quantitative results of the survey, we examine three trends: relative consideration of factors in the planning phase, relative consideration of factors in the implementation phase, and the difference in relative consideration between the two phases. During the planning phase, the priorities of the jurisdiction's constituents, the expected GHG emissions reduction of proposed actions, and actions' local impacts receive above-average consideration, with emissions reduction being the most highly considered. At the same time, the external impacts of climate actions receive significantly below-average consideration during the planning phase. Upon examining consideration in the implementation phase, much remains constant: expected emissions reduction and local impacts of actions receive above average consideration (with emissions reduction again being the most highly considered), while external impacts again receive below-average consideration. In addition, change to local pollution was considered below average during implementation, while expected cost (albeit with slightly less

significance) received above average consideration. During both planning and implementation, impacts of actions on DACs receive an average amount of consideration, as does the timeline of implementation.

It is unsurprising that expected emissions reduction would be at the forefront in decision-making during both planning and implementation since the primary goal of CAPs is to accomplish just that. It is also unsurprising that external impacts were considered the least across both phases, especially considering responses to the concept of lifecycle equity: local governments serve their constituents, and do not have the power or capacity to consider extra-jurisdictional communities in their decision making.

It was also interesting to examine changes in the level of consideration between the two phases. Cost was considered significantly more during implementation than during planning. This is in line with the frequency of which respondents cited cost and resource limitations as reasons they were restricted in their actions. One interpretation of this result is that while the planning phase allows jurisdictions to consider a plethora of different factors, such as impacts on DACs and action co-benefits, at the time of implementation, it becomes a discussion of what is fiscally feasible. This interpretation is supported by the fact that reported local priorities were considered less during implementation than during planning. The difference in consideration between implementation and planning for all other factors was not statistically different from 0. It may be relevant to note that two jurisdictions lamented their inability to participate in this study's survey because they were under-resourced. That is, while they would have liked to participate, they were behind on planning and/or implementation, and so could not spare the time. This may be true of other jurisdictions that did not respond.

All jurisdictions expect equity to play a large role in the future, and yet it received average consideration during both planning and implementation, and when asked what affects the likelihood of an action's implementation, only one jurisdiction mentioned equity. One explanation for this is that jurisdictions are under-resourced and under-funded, such that these two factors take priority during implementation, consistent with this study's findings. The quantitative assessment found that the expected cost of actions are considered significantly more during implementation than during planning, and an open-ended question on implementation saw twice as many jurisdictions cite cost and budget as the next most-important factor (political will).

Additionally, jurisdictions cited outside grants as the most common funding source, suggesting that many jurisdictions are not self-sufficient when it comes to implementing their CAPs. While the state of California has certainly made an effort to promote equity and sustainability through its policies, local governments may in fact need additional support from both the state and federal governments to implement their proposed emissions reduction actions, and even more so if they are to do so equitably. This study compiled questions in Section 4.1. to guide climate action planning and assess implementation, and while this is hopefully a welcome resource, it does little to alleviate the financial barrier that jurisdictions currently face. The fact that some jurisdictions require volunteer work to update their CAP, means they likely do not have the

funds to include sufficient data in their CAP to make the best long-term and equitable decisions. This is a systemic problem that requires top-down support.

The results and interpretation of this study are subject to some limitations. First, the relatively small sample size of respondents to the survey (25 total responses, 18 and 21 responses for planning and implementation phases, respectively, and between 16 and 22 responses for the free-response questions) is challenging for quantitative analysis. Though the distribution of the quantitative responses was small enough to yield statistically significant results, the reliability of would benefit from more responses. A similar argument could be made for the free-response questions. It is also possible that the quantitative questions did not list all relevant factors taken into consideration during planning or implementation. One example is political will, which was mentioned frequently in the free-response questions, but was not an option in the survey responses. If this and other relevant factors had been listed, it is possible that respondents would have reported their consideration for other factors differently, thus affecting the findings.

While the validity of assuming interval distribution of ordinal data has already been discussed, another question of interest is whether there was a better way to collect data. For example, perhaps the study should have used a 7 point Likert scale instead of a 5 point Likert scale. However, a study by Dawes (2012) showed that there is no difference in the sample mean between these two scales, but that a 10 point Likert scale could yield better results. Both this paper and others (e.g., Jamieson 2004) argue that for this type of data collection, it is better to use a sliding scale than a Likert scale. To simplify an already lengthy survey, a Likert scale was used in this study. However, future studies could use a 10 point Likert or sliding scale and evaluate whether it changes the result.

On the topic of survey length, it may be advisable to focus on fewer topics in a single survey to improve the quality of responses, as (1) jurisdictional representatives have little time to devote to this kind of activity, and (2) a number of respondents to open-ended questions in this survey did not answer the entire question, and as is evident by the response rate, some jurisdictions opted to not answer some questions at all.

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Data Summary

Products of Research

Data collected and used in this study, as well as the resulting datasets generated via analysis include the following:

1. The results of a review of California CAPs scored based on the inclusion and quality of Environmental, Cost and Equity factors, and demographic data collected on the CAPs' jurisdictions.
 - a. Data Description: "Assessing the three Es— environment, economy, and equity – in CAPs" contains the scoring of publicly available California CAPs (using the frameworks developed in this study) as well as publicly available demographic data acquired from the US Census Bureau.
2. The collected and analyzed data of survey responses. The survey was distributed to local officials responsible for CAP development or implementation.
 - a. Data Descriptions: ("Assessing the three Es— environment, economy, and equity – in CAPs" Survey Results - Numerical and - Written) are the redacted versions of the responses downloaded directly from Qualtrics. Specifically, they include the responses in numerical and written format. The third Excel sheet ("Assessing the three Es— environment, economy, and equity – in CAPs" Survey Results - Processed) contains the work done to process the survey results.

Data Format and Content

Data developed as an outcome of CAP scoring and demographic data of the jurisdictions where the CAPs were developed are uploaded to Dryad as an Excel spreadsheet and contain scoring outcomes for each reviewed CAP.

Data collected through the survey were uploaded to Dryad in Excel spreadsheets after identifying information was removed to preserve anonymity of respondents. This process included: removing the IP address, latitude, and longitude data for each response; and redacting the name of each jurisdiction, any mentions of the jurisdiction's name in responses (including websites), mentions of City or County to further protect anonymity, and any other potentially identifying information (e.g., reference to the region they belong to, partners, specific organizations, etc.).

Data Access and Sharing

Lozano, Mark; Kendall, Alissa; Arnold, Gwen (2021), Assessing the three Es— environment, economy, and equity – in CAPs Survey, Responses, and Results, Dryad, Dataset, <https://doi.org/10.25338/B8SS6T>

Reuse and Redistribution

There are no restrictions for reuse of the data. They are published under the CC BY license and only require attribution.

Appendix

A.1 CalEnviroScreen Indicators

Table A.1. The list of indicators considered in CalEnviroScreen3.0 to identify disadvantaged communities in California (OEHHA 2018).

Category	Indicator
Exposure Indicators	Air Quality: Ozone
	Air Quality: PM2.5
	Diesel Particulate Matter
	Drinking Water Contaminants
	Pesticide Use
	Toxic Releases from Facilities
	Traffic Density
Environmental Effect indicators	Cleanup Sites
	Groundwater Threats
	Hazardous Waste Generators and Facilities
	Impaired Water Bodies
	Solid Waste Sites and Facilities
Sensitive Population Indicators	Asthma
	Cardiovascular Disease
	Low Birth Weight Infants
Socioeconomic Factor Indicators	Educational
	Housing Burden
	Linguistic Isolation
	Poverty
	Unemployment

A.2 Linear Regressions Testing

```
lm(formula = Response ~ Year + Population + White_NH + Bachelors_deg +
    Med_house_income + Poverty_rate + Pop_density, data = data)
```

Residuals:

	Min	1Q	Median	3Q	Max
Residuals	-0.8729	-0.5431	0.1937	0.3155	0.4523

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	4.566e+01	5.540e+01	0.824	0.418
Year	-2.237e-02	2.755e-02	-0.812	0.424
Population	5.194e-08	5.184e-08	1.002	0.326
White_NH	-3.593e-01	5.652e-01	-0.636	0.531
Bachelors_deg	7.708e-01	9.180e-01	0.840	0.409
Med_house_income	-8.020e-07	5.294e-06	-0.151	0.881
Poverty_rate	2.520e-01	2.187e+00	0.115	0.909
Pop_density	-1.141e-05	2.817e-05	-0.405	0.689

Residual standard error: 0.4832 on 25 degrees of freedom

Multiple R-squared: 0.1082, Adjusted R-squared: -0.1415

F-statistic: 0.4332 on 7 and 25 DF, p-value: 0.872

Figure A.1. Linear regressions testing correlations between responding to the survey and demographic data.

```
lm(formula = Equity_score ~ Year + Population + White_NH + Bachelors_deg +
    Med_house_income + Poverty_rate + Pop_density, data = data)
```

Residuals:

	Min	1Q	Median	3Q	Max
Residuals	-0.9466	-0.4456	-0.2842	0.3358	1.5968

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-2.218e+02	8.363e+01	-2.652	0.0137 *
Year	1.104e-01	4.159e-02	2.655	0.0136 *
Population	-7.207e-08	7.826e-08	-0.921	0.3659
White_NH	-1.088e+00	8.532e-01	-1.275	0.2139
Bachelors_deg	2.656e+00	1.386e+00	1.916	0.0668 .
Med_house_income	-9.375e-06	7.993e-06	-1.173	0.2519
Poverty_rate	-6.378e-01	3.302e+00	-0.193	0.8484
Pop_density	1.612e-05	4.253e-05	0.379	0.7078

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7295 on 25 degrees of freedom

Multiple R-squared: 0.3408, Adjusted R-squared: 0.1562

F-statistic: 1.846 on 7 and 25 DF, p-value: 0.1223

Figure A.2. Linear regressions testing correlations between cap equity scores and demographic data.

```
lm(formula = Emissions_score ~ Year + Population + White_NH +
    Bachelors_deg + Med_house_income + Poverty_rate + Pop_density,
    data = data)
```

Residuals:

Min	1Q	Median	3Q	Max
-0.83727	-0.28282	-0.03222	0.22104	1.27854

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	-2.098e+02	6.845e+01	-3.065	0.00516	**
Year	1.061e-01	3.404e-02	3.118	0.00454	**
Population	-2.223e-08	6.406e-08	-0.347	0.73152	
White_NH	-1.831e+00	6.984e-01	-2.621	0.01469	*
Bachelors_deg	1.093e+00	1.134e+00	0.963	0.34467	
Med_house_income	-1.031e-05	6.542e-06	-1.575	0.12774	
Poverty_rate	-7.438e+00	2.703e+00	-2.752	0.01087	*
Pop_density	-3.735e-05	3.481e-05	-1.073	0.29351	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5971 on 25 degrees of freedom

Multiple R-squared: 0.4747, Adjusted R-squared: 0.3276

F-statistic: 3.228 on 7 and 25 DF, p-value: 0.01404

Figure A.3. Linear regressions testing correlations between cap emissions scores and demographic data.

```
lm(formula = Cost_score ~ Year + Population + White_NH + Bachelors_deg +
    Med_house_income + Poverty_rate + Pop_density, data = data)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-1.22287	-0.50253	-0.07381	0.28326	2.04682

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-1.576e+02	9.156e+01	-1.721	0.0975 .
Year	7.945e-02	4.553e-02	1.745	0.0932 .
Population	8.772e-08	8.567e-08	1.024	0.3157
White_NH	-1.356e+00	9.341e-01	-1.452	0.1590
Bachelors_deg	2.297e-01	1.517e+00	0.151	0.8809
Med_house_income	-4.329e-06	8.750e-06	-0.495	0.6251
Poverty_rate	-5.023e+00	3.615e+00	-1.389	0.1770
Pop_density	-2.307e-05	4.656e-05	-0.496	0.6245

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7986 on 25 degrees of freedom
 Multiple R-squared: 0.2984, Adjusted R-squared: 0.102
 F-statistic: 1.519 on 7 and 25 DF, p-value: 0.2065

Figure A.4. Linear regressions testing correlations between cap cost scores and demographic data.

```
lm(formula = Equity_score ~ Emissions_score + Cost_score, data = data)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-0.7291	-0.5383	-0.3475	0.6045	2.4617

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.06184	0.35704	0.173	0.864
Emissions_score	0.33364	0.23334	1.430	0.163
Cost_score	-0.19082	0.20163	-0.946	0.352

Residual standard error: 0.7933 on 30 degrees of freedom
 Multiple R-squared: 0.06463, Adjusted R-squared: 0.002271
 F-statistic: 1.036 on 2 and 30 DF, p-value: 0.3671

Figure A.5. Linear regressions testing correlations between cap equity scores and the other assigned scores.

```
lm(formula = Emissions_score ~ Equity_score + Cost_score, data = data)
```

Residuals:

Min	1Q	Median	3Q	Max
-1.1615	-0.3395	-0.1482	0.3451	0.9626

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.1615	0.1678	6.921	1.1e-07 ***
Equity_score	0.1912	0.1337	1.430	0.163087
Cost_score	0.4934	0.1260	3.915	0.000483 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.6006 on 30 degrees of freedom

Multiple R-squared: 0.3624, Adjusted R-squared: 0.3199

F-statistic: 8.526 on 2 and 30 DF, p-value: 0.00117

Figure A.6. Linear regressions testing correlations between cap emissions scores and the other assigned scores.

```
lm(formula = Cost_score ~ Equity_score + Emissions_score, data = data)
```

Residuals:

Min	1Q	Median	3Q	Max
-1.1858	-0.5005	-0.1858	0.6514	1.1289

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-0.1848	0.3169	-0.583	0.564195
Equity_score	-0.1519	0.1605	-0.946	0.351510
Emissions_score	0.6853	0.1751	3.915	0.000483 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7078 on 30 degrees of freedom

Multiple R-squared: 0.3387, Adjusted R-squared: 0.2946

F-statistic: 7.682 on 2 and 30 DF, p-value: 0.002024

Figure A.7. Linear regressions testing correlations between cap cost scores and the other assigned scores.

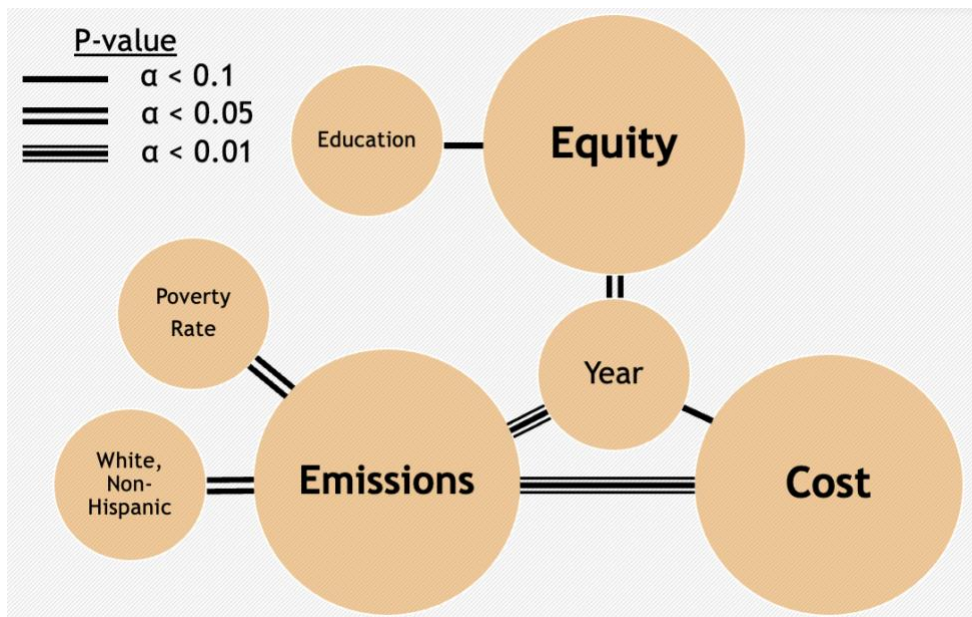


Figure A.8. The number of lines connecting two variables represents the extent to which they are statistically correlated, such that their p-value is significant at the denoted alpha value.

A.3 Survey questions

The following includes the questions asked of respondents in the survey sent to representatives from local jurisdictions in California:

Which of the following have you participated in with regards to climate action plans in California?

- ☐ Development
- ☐ Implementation
- ☐ Both

When developing a CAP, which of the following did you consult? Check all the apply.

- ☐ Third party/Consulting agency
- ☐ In-house professional(s)
- ☐ Utility providers
- ☐ Local industry
- ☐ Education sector (K-12)
- ☐ Higher Education (College, University)
- ☐ Small and commercial businesses
- ☐ Other _____

Which jurisdiction's CAP have you worked on?

Did the push to develop a CAP come from a top-down mandate (e.g., Mayor's goals), bottom-up (e.g., community request), or a combination of both?

When **developing** a CAP for your jurisdiction, how much did you consider the following?

	A great deal	A lot	A moderate amount	A little	Not at all
Expected GHG emissions reduction	☐	☐	☐	☐	☐
Expected cost	☐	☐	☐	☐	☐
Improvements to local pollution	☐	☐	☐	☐	☐
Impacts on local community	☐	☐	☐	☐	☐
Impacts on other communities	☐	☐	☐	☐	☐
Shorter timeline of implementation	☐	☐	☐	☐	☐
Priorities of the local community	☐	☐	☐	☐	☐
Effects (positive or negative) on disadvantaged communities	☐	☐	☐	☐	☐

When **implementing** a CAP for your jurisdiction, how much did you consider the following?

	A great deal	A lot	A moderate amount	A little	None at all
Expected GHG emissions reduction	☐	☐	☐	☐	☐
Expected cost	☐	☐	☐	☐	☐
Improvements to local pollution	☐	☐	☐	☐	☐
Impacts on local community	☐	☐	☐	☐	☐
Impacts on other communities	☐	☐	☐	☐	☐
Shorter timeline of implementation	☐	☐	☐	☐	☐
Priorities of the local community	☐	☐	☐	☐	☐
Effects (positive or negative) on disadvantaged communities	☐	☐	☐	☐	☐

How familiar are you with lifecycle assessment (LCA) as a quantitative methodology?

- ☐ Extremely familiar
- ☐ Very familiar
- ☐ Moderately familiar
- ☐ Slightly familiar
- ☐ Not familiar at all

Lifecycle assessment (LCA) considers the impacts across the supply chain and over the lifecycle of a project or product, as illustrated in the figure below. The lifecycle includes the use phase, which is when stakeholders interact with the product or system, which may last a few months or decades. Because emissions can be produced or reduced across all lifecycle phases, LCA provides a more holistic estimate of the actual emissions impacts of a project or product.

In your experience, does lifecycle thinking play a role in climate planning?

- ☐ Yes
- ☐ No
- ☐ Unsure

Given what you know about LCA, how likely are you to use it in future planning?

- ☐ Extremely likely
- ☐ Somewhat likely
- ☐ Neither likely nor unlikely
- ☐ Somewhat unlikely
- ☐ Extremely unlikely

Why? Please explain your response to the previous question.

How familiar are you with lifecycle cost assessment (LCCA) as a quantitative methodology?

- ☐ Extremely familiar
- ☐ Very familiar
- ☐ Moderately familiar
- ☐ Slightly familiar
- ☐ Not familiar at all

LCCA is an application of the LCA methodology to the cost of a product or project. Specifically, LCCA's consider upfront or initial costs, maintenance costs, the monetary value of benefits that are accrued through project implementation (e.g., energy production), end-of-life costs or benefits (e.g., demolition, salvage value). The goal of LCCA is to consider more than simply the upfront cost, as projects may be even more expensive, or produce net-savings, over a longer analysis period.

Given what you know about LCCA, how likely are you to use it in future planning?

- ☐ Extremely likely
- ☐ Somewhat likely
- ☐ Neither likely nor unlikely
- ☐ Somewhat unlikely
- ☐ Extremely unlikely

Why? Please explain your response to the previous question.

How familiar are you with the concept of disadvantaged communities?

- ☐ Extremely familiar
- ☐ Very familiar
- ☐ Moderately familiar
- ☐ Slightly familiar
- ☐ Not familiar at all

How familiar are you with the concept of environmental equity?

- ☐ Extremely familiar
- ☐ Very familiar
- ☐ Moderately familiar
- ☐ Slightly familiar
- ☐ Not familiar at all

The concept of environmental equity addresses the issue of environmental disparities across communities. Initial efforts to frame this problem used the term environmental racism, a nod to the types of policies that created those disparities in the first place. Environmental equality was the next term used by researchers, as it encompassed factors in addition to race, such as socio-economic and immigration status. The term equality argues that all populations should be equal, from which it can be derived that resources should be split equally as well. However, it is important to consider that some populations are initially worse off and therefore need more resources to achieve parity with other populations. Therefore, researchers have shifted to using the term environmental equity, as it stresses the need to provide more support to historically disadvantaged and under-resourced populations. This difference is highlighted in the figure

below, which also depicts the concept of environmental justice, or the removal of the barrier(s) that blocks access to a healthy environment.

In your experience, does environmental equity play a role in climate planning?

- ☐ Yes
- ☐ No
- ☐ Unsure

Given what you know about environmental equity, how likely are you to use it in future planning?

- ☐ Extremely likely
- ☐ Somewhat likely
- ☐ Neither likely nor unlikely
- ☐ Somewhat unlikely
- ☐ Extremely unlikely

Why? Please explain your response to the previous question.

Lifecycle-based environmental equity considers the impacts of a project on communities across the supply chain. That is, it applies the lifecycle approach to the generation of burdens and benefits to local communities, and assesses how equitably they are distributed. For example, electrifying transit buses reduces local pollution along the routes of those buses, but it (1) requires the mining of minerals like cobalt for battery production, which generates significant burden in mining communities (e.g., in the Democratic Republic of the Congo), and (2) induces an increased demand for electricity which may generate additional local pollutants in communities near fossil fuel power plants that provide electricity to the grid. Lifecycle-based environmental equity attempts to capture local impacts beyond the site of project implementation.

In your experience, does lifecycle-based environmental equity play a role in climate planning?

- ☐ Yes
- ☐ No
- ☐ Unsure

Given what you know about lifecycle-based environmental equity, how likely are you to use it in future planning?

- ☐ Extremely likely
- ☐ Somewhat likely
- ☐ Neither likely nor unlikely
- ☐ Somewhat unlikely
- ☐ Extremely unlikely

Why? Please explain your response to the previous question.

How are proposed projects funded? What are your funding sources for these projects?

Specifically, how does your jurisdiction fund updates to the CAP?

How likely is it that all projects listed in CAPs get implemented?

- ☐ Extremely likely
- ☐ Somewhat likely
- ☐ Neither likely nor unlikely
- ☐ Somewhat unlikely
- ☐ Extremely unlikely

Why? Please explain your response to the previous question.

How does your jurisdiction assess efficacy of implementation of the plan?

How often do you report back to constituents on the progress of the CAP? What information is included?

Do you have any feedback or comments on this survey, or information that you think might be helpful?

If you would like to be available for follow-up questions, please provide your email here.

If you know of others who may be interested in completing the survey, please provide their email address(es) here.