

Climate Mitigation Planning:

Are Plans with Policy Tools
Measurably More Effective?

An Applied Research Paper
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Spring 2020

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I. Introduction

The Intergovernmental Panel on Climate Change (IPCC) issued a report in October of 2018 which explains the impact of global warming of 1.5°C above pre-industrial levels (IPCC, 2018). The report states that human activities are likely to be the cause of approximately 1.0°C of global warming above pre-industrial levels today, with a likely range of 0.8°C to 1.2°C, and if warming continues at the current rate then it is likely for global temperatures to reach 1.5°C above pre-industrial levels as early as the year 2030. Devastating impacts due to rising global temperatures are already being felt by cities across the world, by both inland and coastal cities, in the form of extreme heat waves, increased duration of drought seasons, and increased strength and frequency of major weather events like hurricanes and flooding.

For decades, nations across the world have been convening to discuss what national governments can do to address climate change. Goals and targets for reducing greenhouse gas (GHG) emissions have been set, agreements have been reached, treaties have been signed, but we still have not made the progress necessary to avoid the destructive impacts predicted by the IPCC. Although the federal government arguably has the most power to combat climate change, cities in the United States are playing a role in the fight against climate change like never before. Notably since the Trump administration withdrew from the Paris Climate Accord in 2017, the responsibility to combat climate change has largely been left to local governments. Cities are coming up with innovative ways to reduce their emissions and contribute less to climate change. Fourteen U.S. cities have joined C40 Cities, a network of cities around the world committed to maintaining the goals set in the Paris Climate Accord (C40 Cities, 2020).

A climate action plan (CAP) is the ultimate tool used by cities in their efforts to combat climate change. CAPs are used by cities as a guide to reduce their contribution of GHG emissions. Within a CAP it is common to find literature on the city's current emissions; information on the risks the city faces in a changing climate; goals and targets for reducing GHG emissions often broken down into sectors such as electricity, industry, and transportation; suggestions on how to reduce GHG emissions; and policy recommendations needed to achieve reductions.

A CAP can only go as far as leadership is willing to take it. Cities can come up with the greatest, most innovative climate action plans using the best available technology and practices as examples. This paper aims to explain, however, that a plan is not effective unless it is executed. Within climate action plans, there is a difference between implementation ideas and policy actions. Implementation ideas are the broad range of actions that can be taken in order to reduce greenhouse gas emissions, for example, planting more trees or investing in public transportation. Policy recommendations on the other hand, are explicit recommendations that can influence decision makers to adopt climate change mitigation policies, for example, recommending a strict tree ordinance or complete streets policy. Use of this paper is intended for city officials and policy makers. The end of this study offers suggestions on how climate action plans can be most effective.

The basis of this research is guided by the following question: Are climate mitigation plans with policy tools measurably more effective than plans without?

This paper begins with a review of current literature on the topic, and an addressment of gaps in the current literature and how this paper will be an asset to current and future research. Next is a

discussion of the methods and data used to conduct this study, followed by a descriptive analysis, and a review of the results found in the study. Finally, the paper will conclude with a list of recommendations.

II. Literature Review

A literature review was completed to gain an understanding of the research that has been done with respect to my question: Are climate mitigation plans with policy tools measurably more effective than plans without? In assessing the fundamentals of climate action plans, multiple studies were examined regarding common metrics seen in climate action plans, differences between climate adaptation and climate mitigation, and the government's role in climate change policy. A dive into current literature on climate action plans and their policy recommendations formulates an awareness of what researchers have done in this area of study. Lastly, a gap in the literature is identified. The purpose of this paper is to add to this body of knowledge and advance future research.

Climate Action Plans

Common metrics are found in CAPs. The structure of a CAP generally includes the following: the city's existing emissions, risks the city faces in a changing climate, targets, and goals for reducing GHGs, implementation ideas to reduce GHGs, and policy tools to achieve the reduction goals. Michael Boswell et al. developed a practical guide for local governments to use when preparing CAPs. Boswell et al. suggest CAPs typically focus on the sectors which are the largest emitters of GHGs: land use, transportation, energy use, and waste (Boswell et al. 2012). In Zhenghong Tang et al.'s evaluation of 40 local CAPs, they examine the extent to which the CAPs acknowledge the concepts of climate change and prepare for climate mitigation and adaptation. Following the results of their study, Tang et al. discuss three components which are imperative for incorporating climate change mitigation into local CAPs: a comprehensive understanding of climate change, a detailed analysis of the impacts of climate change, and a transfer of this understanding into tangible action policies (Tang et al. 2010). Current literature shows similarities among CAPs in their framework.

Climate mitigation and climate adaptation are different approaches to managing climate change. CAPs are often focused on either climate mitigation or climate adaptation, and sometimes CAPs incorporate elements of both strategies. It is important to know the difference between the two. Boswell et al. describes climate adaptation as the "actions taken to improve a community's resilience when confronted with impacts of climate change" (Boswell et al. 2012). Adaptation alone does not reduce GHGs. Adaptation is a measure taken to cope with the inevitable effects of climate change. These effects include "sea level rise, changes in weather and rainfall, and increased susceptibility to natural disasters such as wildfires, floods, and hurricanes" (Boswell et al. 2012). Sea walls, green infrastructure, and fire barriers are examples of climate adaptation strategies. Climate mitigation, as defined by the IPCC, is "an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases" (IPCC, 2012). To reiterate, climate mitigation is the effort taken to reduce GHG emissions, and in doing so, reduce the effects of climate change. The Center for Climate and Energy Solutions (C2ES) provides examples of climate mitigation strategies including using renewable energy sources such as solar and wind, switching to lower-carbon vehicle fuels, and reducing vehicle miles traveled by increasing efficiency of the transportation system (C2ES, 2011). Significantly reducing GHGs is crucial to avoiding the most severe effects of climate change, but some of the impacts of climate change are unavoidable and therefore mitigation alone is not enough (C2ES, 2011). Due to the pressing nature of climate change, I find it vitally important for cities to act on reducing their GHG emissions. We can only adapt for so long. We must work to reduce GHGs and reverse the effects of climate change. For

this reason, the focus of this paper will be on climate mitigation plans, or the mitigation component of a CAP.

Two essential components of a CAP are the implementation ideas and the policy tools. For the purpose of this paper, it is essential to know the difference. Typically found towards the end of a CAP, after the city has stated their existing GHG emissions, the risks the city faces in climate change, and the emissions reduction goals the city aims to achieve, the city will list their implementation ideas. Implementation ideas are the strategies the city will use to reduce GHGs, for example, building infrastructure for alternative transportation such as walking and cycling, or by changing the city's vehicle fleet to all electric. A policy tool on the other hand, is the connection between the idea of reducing GHG and how that idea will come to fruition. For example, developing a cap and trade system for CO₂ requires policy, or a policy requiring new buildings to be a certain level of energy efficient. Policy tools enable implementation ideas. Strong policy tools put the action in CAP. Without strong policy tools, a CAP is just a plan. The IPCC says policy tools can encourage incremental resources, "including through shifting global investments and savings and through market and non-market based instruments as well as accompanying measures to secure the equity of the transition" (IPCC, 2018).

The Role of Government in Climate Change

Government plays a critical role in planning for climate change. Without a doubt, the individual also plays a significant role in reducing the effects climate change. Individuals make an impact by their personal choices: by choosing to drive an electric vehicle, by choosing to use energy efficient lights and appliances at home, by choosing to eat a plant-based diet, by choosing to support businesses that are in the fight against climate change. These are all powerful ways in which individuals can contribute. Making these choices can be easier said than done, however. Often, making these choices involves a psychological switch from something that has been embedded into our everyday lives, such as eating meat and driving conventional cars. Adriaanse et al. completed a study in which they determined "counterhabitual implementation intentions that specify the replacement of a habitual response by an alternative response in a critical situation can change the relative strength of mental links between a habitual means and this critical situation" (Adriaanse et al. 2011). Take for example, if an individual drives their car to work every morning, the habitual response of picking up car keys and driving to work becomes instilled. A counterhabitual implementation intention in this situation could be that the city has implemented highly efficient and effective bus rapid transit (BRT) near the individual's home. The alternative response in this situation is for the individual to take the bus instead of driving their car. Given the addition of an alternative response, the strength of the habitual response, driving to work, becomes weaker (Adriaanse et al. 2011). Government's role in climate change is to facilitate individuals in choosing the alternative response, by providing counterhabitual implementation intentions through actions such as legislation, policies, and programs and incentives.

The federal government arguably has the greatest potential to impact GHG reductions. The nation's climate change policy has been defined by legislative acts, executive orders, court decisions, and agency rulemaking (Boswell et al. 2012). Federal legislation, including the Clean Air Act, the Clean Water Act, and the Energy Policy Act, is enforced by the Environmental Protection Agency (EPA). The federal government is capable of joining international agreements on climate change initiatives and providing technical assistance and funding to states and cities to aid in their climate change efforts. As part of the 1991 Intermodal Surface Transportation Efficiency Act, the federal government offered states new funding for mass transit but also encouraged states to pursue long-term planning to devise effective transportation options that would reduce pollution and energy consumption (Rabe, 2004).

Climate change is a global issue effecting everyone on the planet, therefore international agreements can be incredibly effective in reducing the impacts of climate change because larger populations are involved rather than smaller populations at the city or state level. In 1992, the United States joined other countries in an international treaty, the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC was set up as a framework for nations to coordinate on the issue of combatting climate change (UNFCCC, 2020). In 1997 the Kyoto Protocol was adopted, legally binding developed country parties of the UNFCCC to emission reduction targets (UNFCCC, 2020). Building on the Kyoto Protocol, the 2015 Paris Agreement seeks to reach ambitious GHG reduction goals by 2025 (UNFCCC, 2020). The current federal administration under Trump announced the decision to withdraw from the international Paris Agreement in 2017.

When federal administrations change is when setbacks in climate change policy at the national level typically occur. With a new president often comes a new agenda, and if climate change is not on the president's agenda then strategies and plans to reduce GHGs get put on the back burner. The current administration under Trump has made leaping efforts to diminish the federal government's role in acting on climate change. Trump and other Republicans in Congress have prioritized efforts to curtail "environmental rules it sees as burdensome to the fossil fuel industry and other big businesses" (Popovich et al. 2019). As federal administrations change, government agency personnel often changes. The EPA under Trump's administration is essentially attempting to reinterpret statutes within the Clean Air Act to weaken regulation on automobile emissions. The State & Energy Environmental Impact Center (SEEIC) at NYU School of Law released a special report in March 2019 which describes climate and health risks associated with the Trump administration's attacks on environmental rules. The Trump administration's determined attempt to reverse GHG reductions subverts the monumental steps that state and local jurisdictions have taken to mitigate the impacts of climate change, for example, states are changing their energy mix to favor increased use of clean, renewable energy which has helped a large number of states lower emissions from the very industrial sectors that the Trump administration now wants to let off the hook (SEEIC, 2019). Actions taken by federal government have an impact on how states and cities address climate change, by providing pathways to success or by hindering progress.

Cooperative federalism serves as the basis of environmental law in the United States; the federal government establishes the standards for reducing GHGs, enforced by the EPA, and then states have the responsibility to meet those standards by whichever way is best for the state. This gives states the opportunity to be creative while playing an essential role in planning for climate change. At the state level, state agencies with jurisdiction over energy, environmental protection, transportation, agriculture, forestry, and natural resources, are involved in planning for climate change whether it be directly or indirectly (Rabe, 2004). When the federal government is not fulfilling their duties to protect the environment, states can join one another to act themselves. A great example is the Regional Greenhouse Gas Initiative (RGGI), an effort between the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont to cap and reduce CO2 emissions from the power sector through a market-based cap and trade program (RGGI, 2020).

Among other powers, state governments can implement sales and use taxes, establish voluntary or involuntary GHG reduction programs, regulate electricity and utility usage, and regulate land use. Pollak et al. analyzed eleven state-level CAPs and determined "state-level climate and energy actions can be effective because states are responsible for many of the activities that directly effect GHG emissions, including transportation and land use planning, electric utility regulation, and building codes" (Pollak et al. 2011). States have the power to enact state legislation. For example, in 1999 the state of

Texas passed the Texas Public Utility Regulatory Act which “required Texas utilities to increase their reliance over the next decade on renewable energy sources that do not generate greenhouse gases” (Rabe, 2004). In 2008, Nicholas Lutsey and Daniel Sperling inventoried and analyzed the effect on national emissions from local, state, and regional policy actions. It was found that “the two major sector-specific mitigation efforts, those targeting vehicles and electricity, could put modest dents in national GHG emissions for their sectors with the current level of state involvement—and substantial reductions if extended to the entire US” (Lutsey et al. 2008).

Municipal government support for climate change mitigation policy is growing. Since the current federal administration has not been a supportive champion against the issue of climate change, local government at the city level has stepped up to address climate change like never before. Municipalities, in some respects, are better equipped to address climate change than federal and state governments. A major way city governments can impact GHG reductions is through land use and zoning. In a study on carbon emissions from land use and land-cover change, Houghton et al. explain the extent of carbon emissions “from the expansion of settled lands depends on the carbon content of the land converted, and the amount of urban vegetation established” (Houghton et al. 2012). Trees act as carbon sequesters, meaning they store carbon. When forested land is cut down and converted to make room for the built environment, the carbon that was stored in the trees is then released into the atmosphere. In an effort to reduce sprawl and deforestation, some cities, Portland, OR for example, have set an urban growth boundary to promote high-density development. Soil also acts as a carbon sequester. When land is converted to impervious surface, roads and parking lots for example, the soil can no longer perform the function of sequestration. For this reason, cities can focus on improving infrastructure for other modes of transportation such as biking, walking, trains, and buses, instead of expanding roads and developing surface parking lots. Boswell et al. found that “globally, cities consume 75% of the world’s energy and emit 80% of the GHGs...reductions can come from local communities reducing vehicle miles traveled (VMT) and requiring that new buildings meet strict energy codes and existing buildings be upgraded” (Boswell et al. 2012). Cities rely on federal and state funding for projects such as mass public transit infrastructure or energy savings programs, and city government has the power to allocate funding accordingly.

Climate Action Plans and Their Policy Recommendations

When implementing solutions and policy recommendations from climate action plans, cities face numerous obstacles. Michelle Betsill identified institutional barriers to climate policy making, such as the lack of an institutional home for climate policy making, the lack of administrative capacity to develop local policies and programs for controlling GHG emissions, and the unwillingness to invest financial resources in controlling GHG emissions since doing so often requires significant up-front costs (Betsill, 2001). There are also organizational and cultural barriers that limit the ability of local governments to persuade broad change (Droege, 2002). Several factors affect the process of adopting climate change policies. Damian Pitt identifies the factors which have the greatest impact on climate mitigation policy adoption as: the influence of neighboring jurisdictions, the presence of staff members assigned to energy and climate planning, and the level of community environmental activism (Pitt, 2010).

As discussed previously, CAPs cover an array of topics from existing emissions levels, to strategies and goals for reducing GHGs, to the policy recommendations. Some CAPs put emphasis on one or a few sections over others. After studying 40 recently adopted local climate action plans, Zhengong Tang et al. determined local climate change action plans have a high level of awareness and

understanding of climate change issues, moderate analysis capabilities for climate change measures, and relatively limited action approaches for climate change mitigation (Tang et al. 2010). It is important to mention the concepts of climate change, such as the causes of climate change and geographical challenges associated with climate change, to create an awareness of the issue. Also important are the analysis capabilities for climate change, to better understand the impact climate change is having on the city. Action approaches, including policy recommendations, financial tools, and strategies, are equally if not more crucial to a CAP than any other component. Emphasis must be placed on a multitude of effective action approaches to ensure the ability for GHG reduction strategies to be implemented.

Researchers have found several approaches which have been the most successful for cities adopting climate change mitigation policies. Damian Pitt's study on cities' approaches to energy and climate issues suggests municipalities are far more likely to adopt meaningful policies if they support community participation and coordinate with neighboring jurisdictions in their energy and climate planning processes (Pitt, 2010). In some cities, success is achieved through indirect strategies that avoid the political debate about climate change science, and instead focus on the ways in which reducing GHGs benefits the broader community by improving air quality, increasing employment, and improving the economy (Betsill, 2001). This is true for cities across the United States. For example, Port Lavaca, a coastal town in Texas dealing firsthand with the impacts of climate change. The city of Port Lavaca has a comprehensive plan that discusses the need to strengthen coastal resilience, but not once is sea level rise or climate change mentioned (Port Lavaca, 2016). Although the end goal to reduce GHG emissions is the same, some people respond more effectively to a plan which addresses economic opportunity rather than the science behind mitigating the impacts of climate change. Ideally, a CAP addresses both climate science and the economic advantages associated with mitigation. The most successful policies are ones that create incentives for fossil-fuel generators to reduce emissions intensity and consumers to conserve energy, rather than incentives for renewable energy producers alone (Fischer and Newell 2008).

Gaps in Current Literature

Current literature evaluates CAPs as a whole, looks at the barriers to CAP policy implementation, and determines successful strategies for CAP policy implementation. What is missing from the literature is an evaluation of CAPs which determines the effectiveness of policy recommendations. Which cities are accomplishing their GHG reduction goals, and can their success be attributed to policy recommendations? Perhaps this level of detail has been overlooked in the literature because of the premature state of climate action planning. To this day, some cities do not yet have a climate action plan, and some municipal leaders do not yet accept the reality of climate change. As Tang et al. suggest in their research, the transfer of climate change knowledge into concrete action policies is critical to the success of a CAP. Without compelling policy tools, a CAP is merely a suggestive document. It is important for a CAP to include unique, implementable policy tools so that suggestions can become action. This paper intends to build off the current literature and advance further research by thoroughly examining the effectiveness of policy recommendations within climate mitigation plans using a unique scoring technique.

III. Methods and Data

The CAPs I have chosen to analyze for this paper must meet three criteria:

1. CAP includes a mitigation component.
2. City represents one of the four regions of the U.S as defined by the Census Bureau.
3. CAP was published at least three years prior to this report.

It is crucial for cities to act on reducing their GHG emissions, therefore the CAPs used for this study will be climate mitigation plans, or CAPs containing a mitigation component, as opposed to an adaptation plan. For this paper, I am analyzing ten city CAPs. In order to capture a nationwide scope, the ten cities represent the four different regions of the United States defined by the Census Bureau: South, Northeast, Midwest, and West. In order for the policy recommendations in the CAP to have had enough time for implementation, the CAPs I analyze in this report have been published for at least three years. In the case where an update has been made to a CAP within the past three years, the previous version is analyzed. The cities and CAPs used in this report are identified in Table 1 below.

Table 1. Climate Action Plans analyzed in this report.

<i>City</i>	<i>Region</i>	<i>Title of CAP</i>	<i>Year Published</i>
<i>Austin, TX</i>	South	Austin Community Climate Plan	2015
<i>Baltimore, MD</i>	South	Baltimore Climate Action Plan	2012
<i>Miami, FL</i>	South	MiPlan: City of Miami Climate Action Plan	2008
<i>Boston, MA</i>	Northeast	Greenovate Boston	2014
<i>New York, NY</i>	Northeast	New York City's Roadmap to 80 x 50	2016
<i>Chicago, IL</i>	Midwest	Chicago Climate Action Plan	2008
<i>Kansas City, MO</i>	Midwest	Climate Protection Plan	2008
<i>Portland, OR</i>	West	Climate Action Plan	2015
<i>Sacramento, CA</i>	West	Sacramento Climate Action Plan	2012
<i>San Diego, CA</i>	West	City of San Diego Climate Action Plan	2016

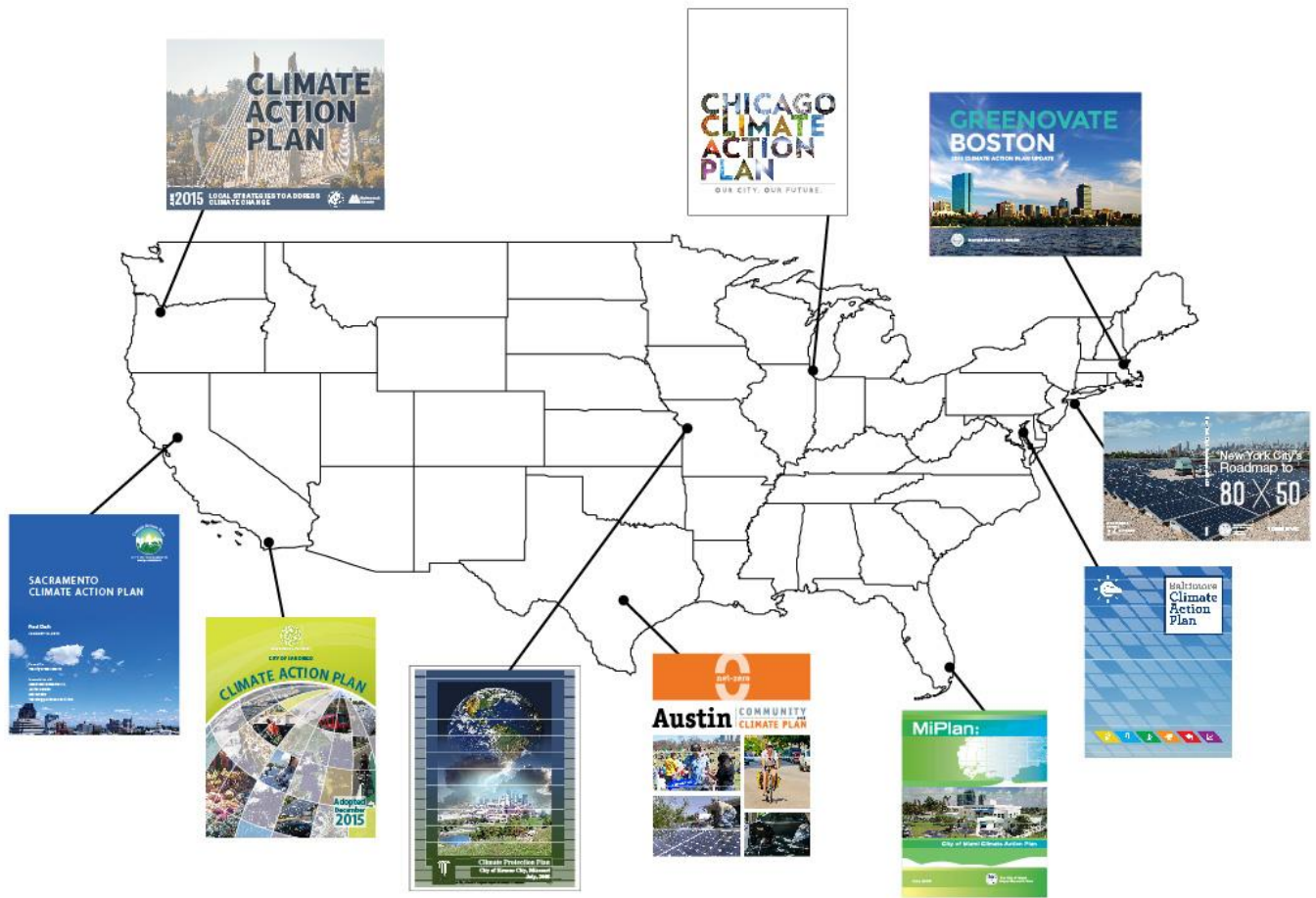


Figure 2. Map of U.S. with selected Climate Action Plan covers.

A scoring technique was designed to determine the effectiveness of CAP policy recommendations. For the purpose of this paper, effectiveness is defined as whether or not the city has seen progress in reducing GHG emissions since implementation of the CAP. Plans will be scored based on four standards of criteria, using a series of ten questions (see table 2). Four standards of criteria were established before determining the sub questions of each criteria: characteristics, ambition, involvement, and progress. The *characteristics* involve general aspects that should be found in a CAP, as discussed in the literature review. *Ambition* describes how determined the CAP is in achieving GHG reductions and climate mitigation. The *involvement* criteria references Damian Pitt’s research findings discussed in the literature review. Pitt found the greatest impact on climate mitigation policy adoption comes from “the influence of neighboring jurisdictions, the presence of staff members assigned to energy or climate planning, and the level of community environmental activism” (Pitt, 2010). Lastly, the *progress* criterion is necessary to see if implementation of the CAP has been successful.

Table 2. Criteria and associated questions for scoring mechanism.

Criteria	Questions
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?
	2. Does the CAP include policy recommendations?
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?
	5. Do the city’s mitigation efforts go beyond the state’s?
Involvement	6. Does the CAP engage community interests?
	7. Does the city have staff assigned to energy and climate planning?
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?
Progress	9. Has the city recorded GHG inventory since publishing the CAP?
	10. Is there any evidence of progress since the CAP was published?

Data used to answer the questions in Table 2 were retrieved directly from the ten CAP documents listed in Table 1. In addition to official CAP documents, an informal questionnaire was given to city personnel who were involved in the creation of the CAP or who are currently involved in implementing the city’s CAP. The questionnaire included the following:

1. Since the CAP has been published, which policies have been implemented?
2. Has the city measured GHG emissions since the CAP was published?
3. Since policy implementation, has the city seen a reduction in GHG emissions?
4. Which policies do you believe are directly linked to a reduction in emissions?

The questionnaire was supplemental to the questions in the scoring mechanism. Specifically, the questionnaire helped answer questions 9 and 10 from the scoring mechanism in Table 2, identifying if progress has been made since the CAP was published. Due to the small number of responses, the questionnaire was not used for analysis, and therefore did not affect the score given to the CAP. To answer question 5, I used official state websites and state CAPs if available. To answer question 7, I used official city websites in addition to the CAP. Lastly, to answer numbers 9 and 10, I looked at updated versions of the CAP if available, and the most recent GHG inventories which might indicate a change since the original CAP was published.

IV. Analysis

The analysis is an inspection of ten CAP documents. The analysis reflects how each of the ten CAPs listed in Table 1 meet the criteria described in Table 2. The analysis answers ten questions about each CAP pertaining to the criteria described in the methods section, where (Y)es is equal to one (1) point and (N)o is equal to zero (0) points. Each CAP can earn a total of 10 points.

City: Austin, TX

Plan: Austin Community Climate Plan

Year: 2015

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	Y
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	Y
Involvement	6. Does the CAP engage community interests?	Y
	7. Does the city have staff assigned to energy and climate planning?	Y
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	N
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		9/10

City: Baltimore, MD

Plan: Baltimore Climate Action Plan

Year: 2012

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	Y
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	N
Involvement	6. Does the CAP engage community interests?	Y
	7. Does the city have staff assigned to energy and climate planning?	Y
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	N
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		8/10

City: Miami, FL

Plan: MiPlan: City of Miami Climate Action Plan

Year: 2008

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	Y
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	N
Involvement	6. Does the CAP engage community interests?	N
	7. Does the city have staff assigned to energy and climate planning?	Y
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	Y
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	N
Score		7/10

City: Boston, MA

Plan: Greenovate Boston

Year: 2014

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	N
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	N
Involvement	6. Does the CAP engage community interests?	Y
	7. Does the city have staff assigned to energy and climate planning?	Y
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	Y
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		8/10

City: New York, NY

Plan: New York City's Roadmap to 80 x 50

Year: 2016

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	N
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	N
Involvement	6. Does the CAP engage community interests?	Y
	7. Does the city have staff assigned to energy and climate planning?	Y
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	Y
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		8/10

City: Chicago, IL

Plan: Chicago Climate Action Plan

Year: 2008

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	N
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	Y
Involvement	6. Does the CAP engage community interests?	N
	7. Does the city have staff assigned to energy and climate planning?	N
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	Y
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		7/10

City: Kansas City, MO

Plan: Climate Protection Plan

Year: 2008

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	Y
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	Y
Involvement	6. Does the CAP engage community interests?	Y
	7. Does the city have staff assigned to energy and climate planning?	Y
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	Y
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		10/10

City: Portland, OR

Plan: Climate Action Plan

Year: 2015

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	Y
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	N
Involvement	6. Does the CAP engage community interests?	Y
	7. Does the city have staff assigned to energy and climate planning?	Y
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	Y
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		9/10

City: Sacramento, CA

Plan: Sacramento Climate Action Plan

Year: 2012

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	Y
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	N
Involvement	6. Does the CAP engage community interests?	Y
	7. Does the city have staff assigned to energy and climate planning?	N
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	Y
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		8/10

City: San Diego, CA

Plan: City of San Diego Climate Action Plan

Year: 2016

Criteria	Questions	(Y)es/(N)o
Characteristics	1. Does the CAP identify specific actions which would reduce GHGs?	Y
	2. Does the CAP include policy recommendations?	Y
	3. Do the actions or policy recommendations reflect each sector that is described in the CAP as a source of emissions?	Y
Ambition	4. Does the CAP set a target for GHG reduction goals, and a timeline of when to achieve the goal by?	Y
	5. Do the city's mitigation efforts go beyond the state's?	N
Involvement	6. Does the CAP engage community interests?	Y
	7. Does the city have staff assigned to energy and climate planning?	Y
	8. Is there evidence of influence from, or coordination with, neighboring jurisdictions?	Y
Progress	9. Has the city recorded GHG inventory since publishing the CAP?	Y
	10. Is there any evidence of progress since the CAP was published?	Y
Score		9/10

Table 3. Climate Action Plan scores by question number (Q1-Q10). A black dot indicates one (1) point. Total CAP score provided on right column, Total question (Q) score provided on bottom row.

City	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	CAP Score
Austin, TX	•	•	•	•	•	•	•		•	•	9/10
Baltimore, MD	•	•	•	•		•	•		•	•	8/10
Miami, FL	•	•	•	•			•	•	•		7/10
Boston, MA	•		•	•		•	•	•	•	•	8/10
New York, NY	•		•	•		•	•	•	•	•	8/10
Chicago, IL	•		•	•	•			•	•	•	7/10
Kansas City, MO	•	•	•	•	•	•	•	•	•	•	10/10
Portland, OR	•	•	•	•		•	•	•	•	•	9/10
Sacramento, CA	•	•	•	•		•		•	•	•	8/10
San Diego, CA	•	•	•	•		•	•	•	•	•	9/10
Total Q Score	10	7	10	10	3	8	8	8	10	9	

V. Results and Discussion

Four city representatives responded to the questionnaire, three through email and one over the phone; Kat Eshel, Boston’s Carbon Neutrality Program Manager; Amy Petri, Austin’s Office of Sustainability Communications Manager; and Michele Crim, Portland’s Chief Sustainability Officer. I provided the questionnaire over the phone to Aubrey Germ, Baltimore’s Office of Sustainability Climate and Resilience Planner. As stated, answers to the questionnaire did not influence scores. Only CAP documents identified in Table 1 were used for scoring.

Questionnaire responses were intriguing. For instance, both Boston and Baltimore representatives mentioned it being difficult to attribute GHG reductions to a specific policy since there is a lag in when emissions data is available. The City of Baltimore relies on the Maryland Department of Transportation for emissions data, which they only produce every three years. Boston, Austin, and Portland suggested that GHG emissions in their cities have likely decreased as a result of energy efficiency programs and standards in buildings and homes. Portland attributed emissions reductions to their Renewable Fuel Standard which requires all gas stations to sell a minimum blends of biofuels.

With the exception of a few similarities, each plan varied with respect to the questions in the scoring mechanism. Kansas City’s CAP is the only one to receive a perfect score. New York City and Boston had matching results, each not receiving a point for question 2 and question 5. San Diego and Portland had matching results, each not receiving a point for question 5. Each plan shared similarities in their structure and content, for instance, each plan identified GHG reduction goals, and identified sectors contributing to emissions. The largest disparities were seen in questions 2, whether the CAP included explicit policy recommendations, and question 5, whether or not the city’s CAP went beyond the state’s efforts.

Results from the analysis that stand out in particular include:

- All ten CAPs identify specific actions which will reduce GHG emissions.
- All ten CAPs list actions or policy recommendations which reflect each sector that is described in the CAP as a source of emissions.
- All ten CAPs set a target for GHG reductions and provide a timeline of when they aim to achieve the target by.
- All ten cities have recorded GHG inventory since the CAP was published.
- Only three CAPs go beyond the state’s mitigation efforts.
- Nine out of ten cities have shown progress since implementation of the CAP.
- Seven CAPs include policy recommendations.

Table 4. Climate Action Plan final scores.

<i>City</i>	Score
<i>Austin, TX</i>	9/10
<i>Baltimore, MD</i>	8/10
<i>Miami, FL</i>	7/10
<i>Boston, MA</i>	8/10
<i>New York, NY</i>	8/10
<i>Chicago, IL</i>	7/10
<i>Kansas City, MO</i>	10/10
<i>Portland, OR</i>	9/10
<i>Sacramento, CA</i>	8/10
<i>San Diego, CA</i>	9/10

- Kansas City is the only city whose plan scored 10/10.
- Miami is the only city not showing progress since their plan was implemented.
- All ten CAPs received a score of 7 or higher.

The four measurements fulfilled by all ten CAPs stand out as characteristics that should always be found in a CAP. As stated in the literature review, the structure of a CAP generally includes the city's existing emissions, risks the city faces in a changing climate, targets and goals for reducing GHGs, implementation ideas to reduce GHGs, and policy tools to achieve the reduction goals. Specific actions, or implementation ideas, that will reduce GHG emissions were identified in all ten CAPs analyzed, and those actions reflected each sector that was described as a source of emissions. Goals for emissions reductions as well as a timeline of when to achieve the goals by were identified in all ten CAPs. Additionally, all ten cities have recorded GHG emissions since the CAP was published. This is an important finding because it shows that each city is concerned about achieving its GHG reduction goal.

Austin, Chicago, and Kansas City are the only three cities whose mitigation efforts go beyond their state's. This is telling because often, larger populations of people live in cities, therefore cities contribute more GHG emissions because more energy is used. For this reason, it would not be a surprise that a city would have stronger mitigation efforts, and more ambitious GHG reduction goals, than the state as a whole. The results from the analysis tell otherwise, however, that often the state has more ambitious GHG reduction goals than the cities. Most of the cities whose mitigation efforts do not go beyond the state's efforts are located in what are often considered progressively-leaning states, California and Oregon for example. These states have been front-runners in the fight against climate change since the beginning, so it comes as no surprise they have ambitious statewide GHG reduction goals. For example, San Diego and Sacramento set their GHG reduction goals to be consistent with the State's mandate, Assembly Bill 32, and Executive Order B-30-15; since the cities did not go beyond the state's goal, they did not receive a point for question 5. The states of Texas, Illinois, and Missouri have not developed state-wide CAPs; therefore Austin, Chicago, and Kansas City received a point for going beyond their state's goals.

Nine out of ten cities show evidence of progress since their plan was implemented. This means, based off GHG inventories recorded since the CAP was published, GHG emissions levels have been reduced. However, of those nine cities, only six include policy recommendations in their CAP. This contradicts my claim that policy tools are necessary for turning ideas into action. However, this finding would be more alarming if fewer CAPs included policy recommendations. Six out of nine successful CAPs stated explicit policy recommendations which is to say policy recommendations could be attributed to their success. Miami is the only city whose CAP included explicit policy recommendations but did not see progress after implementation. Those findings are discussed further below.

Policy recommendations were explicitly stated in seven out of the ten CAPs. The CAPs for Boston, New York, and Chicago do not explicitly list policy recommendations, instead they provided implementation actions that would then be the city's responsibility to craft policies based on the suggested actions. The seven CAPs that scored a point for including policy recommendations explicitly stated policies to be established, policies to be updated, or included the word policy in the section header for recommendations. For example, the section header for recommendations in Austin's CAP is "Policies and Plans that Support Emissions Reductions." The section goes on to include

recommendations that would require policy. Baltimore's CAP displays each GHG reduction strategy in a well-formatted table and lists the policy mechanism required for each strategy, for example, an incentive, a mandate, or a zoning code amendment.

Of the ten CAPs analyzed for this paper, Kansas City, MO is the only city whose CAP fulfilled all ten scoring measures. As one of the oldest CAPs used in this analysis, published in 2008, this came as a surprise. The organization of the document is not ideal, in that some specifics, such as emissions contributing sectors, are difficult to find. The graphics and format are terribly outdated, and a majority of the text in the document could have been displayed as a chart or graph. However unaesthetic, all of the information I sought in the scoring mechanism was found in the document.

Miami is the only city in this study that shows no evidence of progress since their CAP was implemented. According to Jane Gilbert, Miami's current Chief Resilience Officer (CRO), the 2008 CAP did not have success due to the recession and a new mayor. In an article published earlier this year by the Miami Herald, Gilbert attributed the lack of progress to the mayor and manager at that time, who decided that the plan was not a priority (Harris, 2020). Gilbert has served as Miami's CRO since 2016 and is taking climate action seriously. Under new leadership, a new CAP, Miami Forever Climate Ready, was unveiled in January 2020 and the city is aiming to go carbon neutral by 2050 (Harris, 2020).

Lastly, it was interesting to find that each CAP received a score of 7 or higher. This is particularly interesting because each question in the scoring mechanism is mutually exclusive. Just because one question answered yes, did not mean another question would by default also answer yes. This could have occurred for several reasons. Had I increased my sample size to more than ten CAPs, perhaps I would have found one or more that would score below 7. Additionally, my selection criteria discussed in the methods section was strict, and could have played a role in limiting my selection to only well executed plans.

VI. Conclusion and Recommendations

Successful CAPs are the result of conclusive content, meaningful partnership, and strong leadership. As seen with the case of Kansas City, as well as the four highest scoring questions in the analysis, content matters. It is important for CAPs to include general, but vital, components, such as GHG reduction goals and targets, a timeline, an explanation of the sources of emissions, and strategic actions that will reduce emissions. In addition, partnership goes a long way. Whether it is collaboration with neighboring jurisdictions, or larger entities such as the state, cities can expand their resources through thoughtful partnership. Policy recommendations are valuable, in that they seamlessly guide decision makers in what to do on their end. However, as we saw with the City of Miami, policy recommendations do not equate to progress. The results from the analysis suggest that policy tools may not always equate to action. It is worth noting, however, that policy recommendations contributed to higher scores overall. For the City of Miami, it came down to a change in leadership. It is indisputably crucial to have leadership support behind energy and climate action planning.

The recommendations listed below follow the reviewed literature and data collected, with the exception of the first recommendation. The first recommendation is not derived from the reviewed literature or data collected, but instead is intended to enhance the function of the subsequent recommendations. The second and third recommendations follow the findings from the questionnaire.

The final four recommendations follow both the findings from the scoring mechanism as well as Damian Pitt's research findings discussed in the literature review.

Recommendations and rationale:

1. Update the CAP annually.
 - a. Rationale: Providing frequent updates to the CAP is necessary to know precisely which actions in the CAP have been completed, which actions are in progress, and new actions should be identified as needed. The GHG inventory updates should be included in each CAP update so it is clear where the city is in working towards the GHG reduction goal. It is also important to update the CAP frequently for the public, so they know if progress is being made. Additionally, updating the CAP maintains that the city is held accountable for following through with proposed actions.
2. Update GHG inventories annually.
 - a. Rationale: Maintaining an up-to-date GHG inventory is an essential part of the process of reducing GHG emissions. It is important to know the emissions levels at the starting point, and to frequently check emissions levels until the reduction goal is met. Once the GHG reduction goal is met, GHG inventory must continue to ensure the level of emissions is maintained and does not increase. It is also important for researchers and the general public to have access to this updated information. The city of Portland does an exemplary job of updating their GHG inventory each year.
3. Establish a team of city staff responsible for working with state agencies on recording GHG emissions data.
 - a. Rationale: From the questionnaire findings it has come to my attention that cities are often waiting, sometimes for over a year, to receive data from state agencies necessary for updating GHG inventories and CAPs. This creates a lag in updating important documents. A team of city staff should be responsible for working with state agencies to make sure this data is recorded and updated in a timely manner.
4. Incorporate community engagement into climate action planning.
 - a. Rationale: Community engagement is one of the most important components to any planning process. The more community members involved in the planning process, the more people those community members might reach out to and inform about what is going on. Identifying implementable actions to reduce GHG emissions is easier with community engagement, because the city is able to hear what the community wants and needs out of this process. Community engagement is vital to receiving public support of CAP initiatives. Kansas City's CAP involved public engagement in more ways than one. First, an array of public members were involved in the process of creating the Climate Protection Plan. Second, their policy recommendations included one to develop a comprehensive public engagement plan to support the climate protection effort.
5. Coordinate with neighboring jurisdictions.

- a. Rationale: The biggest impacts are made by a collective effort. A city acting alone in reducing GHG emissions can only make so much of an impact. Collaborating with neighboring jurisdictions on planning efforts means casting a wider net and having a greater impact. More work can get done if we work together. Coordinating with neighboring jurisdictions is a way for a city to expand and share its resources.
6. Assign a team of city staff to work solely on energy and climate planning.
 - a. Rationale: Energy and climate planning easily fall off the radar if designated city staff are not constantly monitoring implementation of the CAP, therefore it is crucial for cities to have a team of staff members assigned to energy and climate planning. Some official city websites are difficult to navigate, and do not provide staff names or titles. This is concerning, especially for city residents. Residents should be able to easily identify which public officials are responsible for handling whatever their concern might be. The official website for the city of Baltimore's Office of Sustainability does an exceptional job at presenting staff members' names and titles; they even have a staff member who is the designated climate and resilience planner.
 7. Partner with larger jurisdictions, such as the state, to set collaborative GHG reduction targets.
 - a. Rationale: One way to ensure achievable GHG reduction targets are set is by collaborating with the county or state. Many cities and states have different GHG reduction goals. Perhaps different goals are necessary because one entity, the city or state, contributes more or less emissions than the other, but it should be communicated in the CAP that through partnership with the state, a GHG reduction goal has been set that is different from or the same as the state's. Collaborating with a larger jurisdiction shows that effort is being made to address climate change at different levels of government. Additionally, collaborating with a larger jurisdiction provides a platform for understanding how many GHG emissions are being contributed by the city, and by the state as a whole, and GHG reduction goals can be set accordingly. Kansas City's CAP includes a policy recommendation to join the State of Missouri in efforts to support GHG reduction strategies.

The recommendations listed above are targeted to city officials, city planners, and policy makers. The intention of these policy recommendations is to create the most effective city CAP. In a follow-up study, I would like to organize formal interviews with climate action planners to gain their insight on what has been successful in their cities and what has not been. Additionally, another follow-up study could include a larger sample of plans. For instance, one study of ten CAPs in southern cities, one study of ten CAPs in northeastern cities, one study of ten CAPs in midwestern cities, and one study of ten CAPs in western cities. The comparisons of such a study would be fascinating, but unfortunately with city CAPs being in their infancy, it is likely ten city CAPs do not exist in each of the four regions. With that, my hope is this study may reach the desk of a planner creating a city's CAP for the first time.

This study was guided by the question, are climate mitigation plans with policy tools measurably more effective than plans without? Of the nine cities to achieve progress after their CAP was implemented, six had included policy recommendations in their CAP. Therefore, I would say yes, climate mitigation plans with policy tools are measurably more effective than plans without. That is not to say,

progress cannot be achieved without policy tools. It is to say, however, progress is more likely to occur when policy tools are included in a CAP.

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