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Local Climate Plans in Practice: Evaluating Strategies and Measuring Progress in Five U.S. Cities

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Local Climate Plans in Practice: Evaluating Strategies and Measuring Progress in Five U.S. Cities

by

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Abstract

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Local climate action plans have become more prevalent in recent years yet information on their success is limited. While unlikely, on their own, to be able to mitigate enough carbon emissions to prevent catastrophic impacts of global temperature increase, local climate planning has the potential to play an important role in a number of key ways. Cities have traditionally exercised control in areas that have GHG abatement potential at low cost (e.g. building codes, land use, energy procurement) and the total population represented by cities committed to GHG reduction efforts is not insignificant and continues to grow. The extent to which local climate plans can serve as a meaningful element in a larger (but currently woefully inadequate) policy picture, will depend on their ability to set aggressive goals, dedicate resources, test innovative strategies, and measure progress systematically. Looking at the plans and progress reports of five U.S. cities, many have set aggressive goals and created innovative programs that could be replicated at other levels of government, but most are somewhat lacking in measuring and reporting progress metrics and financial resources committed to these efforts. For local climate planning to contribute

significantly to broader climate policy, it will need to develop more rigorous progress metrics so the highest yield, lowest cost abatement strategies can be identified and advanced in other cities and at higher levels of government.

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Introduction

As scientific consensus on global climate change has built, action to meet this confront this problem has remained fractured and limited. Leading emitters of greenhouse gases like the United States and lack comprehensive policies to reduce their contributions to climate change and have declined to sign international agreements to decrease emissions.

In the absence of federal action in the United States, state and local climate plans have emerged in an attempt to fill the yawning gap in policy on this pressing issue. In particular, the number of cities with local climate plans has grown substantially in recent years. The U.S. Conference of Mayors Climate Agreement now has 1,054 signatories, up from 600 in 2007, which represents a commitment on behalf of the each municipality to reduce GHG emissions in line with the goals set forth in the Kyoto Protocol (U.S. Conference of Mayors 2012). As of 2011, 204 cities had set formal emissions reduction targets and 162 had approved a climate action plan (ICLEI 2011), moving from simply stating their commitment to formalizing it through official policy planning documents.

Yet with a growing number climate action plans (CAPs, also referred to as climate protection plans in some cases) in place, there is presently only a small body of research on this emerging phenomenon. In some regards this is unsurprising; it was only in 1989 that Toronto adopted the first climate action plan (Pew Center for Climate 2006) and the number of plans has been limited until fairly recently. Certainly other planning documents - including comprehensive plans, energy plans, and sustainability plans - have addressed some of the factors related to GHG emissions in many localities. But the progenitors of these efforts have had more diverse goals, focusing more on overall quality of life, pollution reductions, sustainability, cost savings, or energy production than on GHG reductions as the number one priority. Climate action plans are, in some sense, a new breed of local plan, still very much evolving and worthy of investigation.

Many bodies, national and international, including ICLEI (Local Governments for Sustainability), the US EPA, the US Conference of Mayors, and the Center for Climate Strategies have supported the development and propagation of these plans. Yet only a limited amount of research has been done around this still emerging field. With climate action plans becoming so commonplace - almost a requisite feather in the cap of any forward-thinking municipality - it is incumbent upon planning, as a field, to examine these documents and ask how they are working, or if they are.

Some have written off local action. After all, the problem of climate change, as Sir Nicholas Stern puts it in his landmark study, "is the greatest and widest ranging market-failure of all time," (Stern 2006). Some economic theorists argue that we need cooperative *global* action and that local climate initiatives may even be counterproductive. Others would argue that local efforts to reduce

GHG emissions are merely drops in a vast bucket, that even successful reductions by the largest cities or states will have little impact in achieving the scale of reductions called for by the International Panel on Climate Change (IPCC). Even some supporters of local climate initiatives view them as ineffective in reducing emissions but believe they are critical and potent "performative" acts (Trisolini 2010).

Despite criticisms, cities are moving ahead with climate action plans. The United States' failure to develop a stronger federal climate policy has shifted the locus of action to cities and states. The established scientific consensus warns of dire consequences if swift reductions are not made, and many cities are taking this warning to heart. And the forecasts are disturbing indeed. Scientific models predict global temperature increases of at least 2 degrees Celsius even if swift action is taken to reduce global emissions by 50% or more of year 2000 levels by 2050 (IPCC 2007), though it could be 4°C or greater if emissions are allowed to grow even modestly (only 10-60% of 2000 levels by 2050). Given assumptions about the reductions by other nations, The Union of Concerned Scientists believes the United States must pursue a goal of *at least* 80 percent below 1990 levels by 2020 to stabilize global emissions at or below 450 ppm, the upper limit of what is needed to avoid a dangerous temperature increase (Luers, Mastrandrea, Hayhoe, and Frumhoff 2007), though many environmental advocates argue for 350 ppm stabilization as the necessary target. In any case the effects of an over two degree increase will have unpredictable and unevenly distributed effects throughout the world, which may include rising sea levels, melting ice sheets, more severe and frequent storms, drought and reduced crop yields, and damage to ecosystems that threatens the extinction of 15 – 40% of species (Stern 2006).

The introduction to most local climate plans will mention a desire to combat these potentially disastrous changes to the planet, yet, little is known about whether or not these types of plans have been effective in reducing GHG emissions or what their potential to do so might be. This provides the main focus of this work. In particular I seek to address the following questions regarding local climate action plans and related actions:

Where have existing plans focused their efforts, and are they focused on areas with highest reduction potential at the lowest cost? What elements of local climate plans have been most successful at achieving reductions? Are local efforts serious and systematic in their reduction efforts? How are cities measuring and reporting their progress and adjusting planning efforts accordingly? Is there evidence that climate policy created in individual cities can be replicated by other cities or higher levels of government?

In order to address these questions, case studies were conducted of 5 U.S. cities with local climate plans. In each case the plan was assessed based on its contents and strategies, and progress reports were examined to determine the approaches to monitoring program success and if progress was being made. Each case study deals first with a descriptive evaluation of the plan, progress report, and other climate planning products. Then, an evaluative framework is applied to each case to analyze the depth of its commitment, progress towards goals, quality of progress measurement and reporting, and opportunities created for policy learning and transfer. This evaluative framework asks the same set of questions of each plan, with the intention of describing often substantially different planning efforts in common terms with each other so comparisons can be made and general conclusions be drawn.

This research was focused only on local climate planning in the U.S. context. While local plans are certainly not unique to the United States, the lack of higher-level climate policy and gridlock in national legislature and international agreements have placed state and local action in the foreground of climate discourse in this country. The first chapter will give a primer on local climate planning, giving a brief history of the development of these documents and the national and international bodies advocating for and these plans. The second chapter will review the current literature on local climate action planning, setting out the main arguments for and against local action on global climate change (Engel and Saleska, Weiner). It will describe the general nature of these efforts and the actions typically taken to reduce GHG emissions, and look at the factors that may influence a municipality to choose to develop a CAP. Drawing on a number of pieces of research (Wheeler, Boswell et. al., Bassett & Shandas) it will attempt to explain the strengths and limitations local climate planning.

The third chapter will delve in to a small sample of current plans and progress reports, analyzing them for the types of policy actions and outcome measurements they include. This will build on the work of a Wheeler (2008), Basset & Shandas (2010), and others who have conducted reviews of a local climate plans and have provided an early foundation for further research. The fourth through eighth chapters will focus on individual case studies and present a comparative analysis of the selected plans and progress reports. The analysis will evaluate the emissions reduction strategies employed by each city and compare how cities are measuring and communicating their progress. The final chapter will discuss overall findings and identify potential areas for improvement in local planning efforts.

Chapter 1: The Case for Local Action

Local vs. Global Action: The Theoretical Foundation

Does local climate planning make sense? In the face of what is perhaps the most complex global commons resource problem ever encountered, this is a question worth asking. This chapter will present arguments for and against local climate planning and make an argument for the usefulness of local action despite its shortcomings and limitations.

Worldwide GHG emissions continue to rise steadily, making the threat of catastrophic global climate change increasingly likely each year they go unabated. Data released by the International Energy Agency showed record global emissions in 2011, an increase that the Agency's chief economist said places the world on track for a temperature increase of 6 degrees Celsius by 2050 (Rose, 2012). International agreements to reduce greenhouse gases have been largely ineffective to date; the world's largest emitters (the U.S. and China) are not signatories to the 1992 Kyoto Treaty, and the latest round of serious negotiations in at the 2009 U.N. Climate Summit in Copenhagen did not produce a binding agreement. While the U.S. recently established important new federal fuel economy standards, comprehensive GHG policy remains elusive. The 2009 Waxman-Markley bill, which would have established and cap and trade program, passed the U.S House of representatives but died in the Senate (Broder 2009).

Climate protection is a non-exclusive and non-competitive public good. It is shared by seven billion people of vastly different means and circumstances who are members of over 200 sovereign states with diverse interests and geopolitical realities. So, how then might loosely organized unilateral action undertaken by hundreds bodies at lower levels of government even begin to address this this highly complex global concern?

Some would argue that it can't. Greenhouse gas abatement creates a "free rider" problem; since the benefits of GHG abatement undertaken by any one actor will be enjoyed by all, this argument posits that there is no incentive to undertake costly emissions reductions of your own accord without some collective agreement among multiple parties. Many economists and policymakers generally agree that the best, perhaps only way to substantially limit the discharge of GHGs into the atmosphere is by putting a price on carbon emissions through a system agreed to by all significant global actors – either through a carbon tax or a cap and trade system.

Weiner (2007) shares this view and argues against the development of local climate legislation. He argues that, "local action is not well suited to regulating mobile global conduct yielding a global externality," and warns that while the desire to enact local climate policy is understandable in light of inaction on behalf of the federal government, that it could even prove counterproductive by shifting GHG producing activities to areas with less oversight and regulation. The key to his argument is that the sources of greenhouse gas emissions are *widespread* and *moveable,* and means that in a world of incomplete and fragmented regulation, GHG producing activities will go unchecked in many areas or will relocate to areas without burdensome regulation. Wiener states that,

> Each state (or country) has an incentive to free ride on other states' (or countries') actions, enjoying the global benefits without bearing the local costs. The result is underinvestment in abatement, unless cooperation can be organized. Indeed, a "race to the bottom" is even more likely in the case of a globally mixing pollutant with no local impacts, because local decisions to relax regulations would reduce costs without incurring the local pollution harms associated with conventional pollutants (1965).

Greenhouse gas emissions are widespread and moveable to be sure, but only to a degree. His argument hinges on this premise, but it is equally true that some GHG emissions are *concentrated* in discrete locations rather than widespread across the landscape and some are inherently *stationary* rather than moveable. Emissions *do* occur all across the globe but are increasingly tied to human activity in cities. Further, much of this activity is inherently local. Weiner's argument might apply to certain firms that are highly and globally mobile, or, to some extent, power production (if the U.S. stops burning coal, demand is lessened, prices drop, and it is cheaper to burn coal elsewhere). But even highly mobile firms have to consider a large number of factors beyond the costs imposed by GHG regulation in deciding where to do business, including the cost and availability of labor, existing infrastructure, location efficiency and existing capital investments. And some amount of GHG emissions is unlikely to travel across the border (of a country, state, or county) because of local regulation, including much of the enormous amount of emissions attributable to buildings. As Rawlins and Paterson (2010) note, "The building sector is responsible for 50.1% of total annual U.S. energy consumption… [and] represents 49.1% of total annual U.S. greenhouse gas emissions…" (344). So while GHG emissions *are* truly global in nature, they may not as perfectly *widespread* and *moveable* as Weiner's argument demands; and some types of emissions simultaneously display characteristics that would allow them to be described as *concentrated* and *stationary*. Buildings, for example, tend to stay where they are regardless of the regulatory regime in place, and inefficient ones continue to be responsible for more GHG emissions than necessary.

The solution in Weiner's view, which he shares with many other economists, requires the cooperation of major global players acting in their own self-interest and to form agreements of their own free will to reduce emissions. Despite his strongly stated position opposing local climate action, he acknowledges that well-designed policy at lower levels of government could yield significant results by stimulating technological innovation, allowing experimentation with policy design, and by creating an inconsistent patchwork of state regulation that motivates industry to support for federal regulation (Weiner, 2007). But these potential benefits, in his opinion, are limited at best and do not outweigh the potential drawbacks of sub-global and/or sub-national climate action.

Others would make the case that sub-global action can, in fact, be rational in some circumstances. Economic theorists Kirsten Engel and Scott Saleska (2005) argue against the prevailing wisdom that casts climate regulation as a classic "tragedy of the commons" problem, and instead put forward an argument for individual government action even in the absence of an international agreement among primary actors. Instead, they present the case for a "glass half full" scenario, which, in the absence of the ideal condition of cooperative global action, results sub-optimal regulation by individual countries but still has payoffs for GHG reduction. As they argue, "…it may be the case that the sum of local actions, taken by *local* jurisdictions, each deciding individually to set economically rational standards in the face of competing jurisdictions around them, can provide a sufficient solution," (201). Using a game theory approach to demonstrate their "glass half full" conceptual model of non-cooperative climate regulation, they build the theoretical case for dispersed sub-global action on climate change. In their simple two-country prisoner's dilemma model, the best interest of each country is for *some* action, even if the other chooses to "free-ride," and enjoys half the benefits of action with none of the cost.

The global reality, however, is much more complex than this two country model. The actors vary substantially in terms of the size of economy and the amount of GHG emissions, and benefits of action (or, conversely, the costs of inaction) will not be evenly dispersed. Attempts have been made, however, to build economic models that better reflect the true nature of the world and its constituent actors with the specific goal of modeling climate change regulation scenarios. The authors here examine two of these large-scale complex models; the RICE model developed by Nordhaus and Yang which includes every country in the world, and a similar model developed by Hackl and Pruckner involving 135 countries. In these models, each nation chooses a) its level of consumption and investment in capital and b) the rate at which it reduces CO_2 emissions. The countries face a tradeoff between present levels of consumption and engaging in emissions abatement that expands potential future output / consumption (or rather prevents reduced economic output in the case of unabated global warming).

Interestingly, both models find that short of the optimal scenario of cooperative global regulation, sub-global action taken by benefit-maximizing countries can produce significant reductions in GHG emissions. In the RICE model, emissions are reduced by 24 percent and achieve 40% of the global mean temperature reduction (from 2000 to 2100) as compared to the globally optimal scenario. The Hackl and Pruckner model finds that 77 percent of globally optimal reductions can be achieved through the non-cooperative model (Engel & Saleska 2005). While the conventional "tragedy of the commons" view of emissions abatement still carries much weight in the climate change discourse, these models demonstrate that it is not presumptively irrational that local climate action could produce a significant percentage of GHG reductions.

In addition, action taken at the local level often has benefits that can be enjoyed locally, and not necessarily by free riders. Reducing local fossil fuel consumption is often complementary with reductions in other harmful chemical pollutants including Nitrogen oxides (NOx), Sulfur oxides (SOx), ozone, and particulate matter (Union of Concerned Scientists 2005). Efforts to reduce emissions can have important economic benefits as well including job creation and cost-savings for certain reduction strategies.

Climate Economics – The cost of inaction and the cost-efficiencies of abatement

The potential effects of global climate change on human civilization and ecological systems should be familiar to most, at least anecdotally. The threat of sea level rise, more severe and frequent storms, species extinction, drought and reduced agricultural yields are among these potential consequences. Yet, as frightening as some scenarios may be solely in terms of the disaster it could bring to humans and ecological systems, climate change has the potential to severely disrupt the global economy as well.

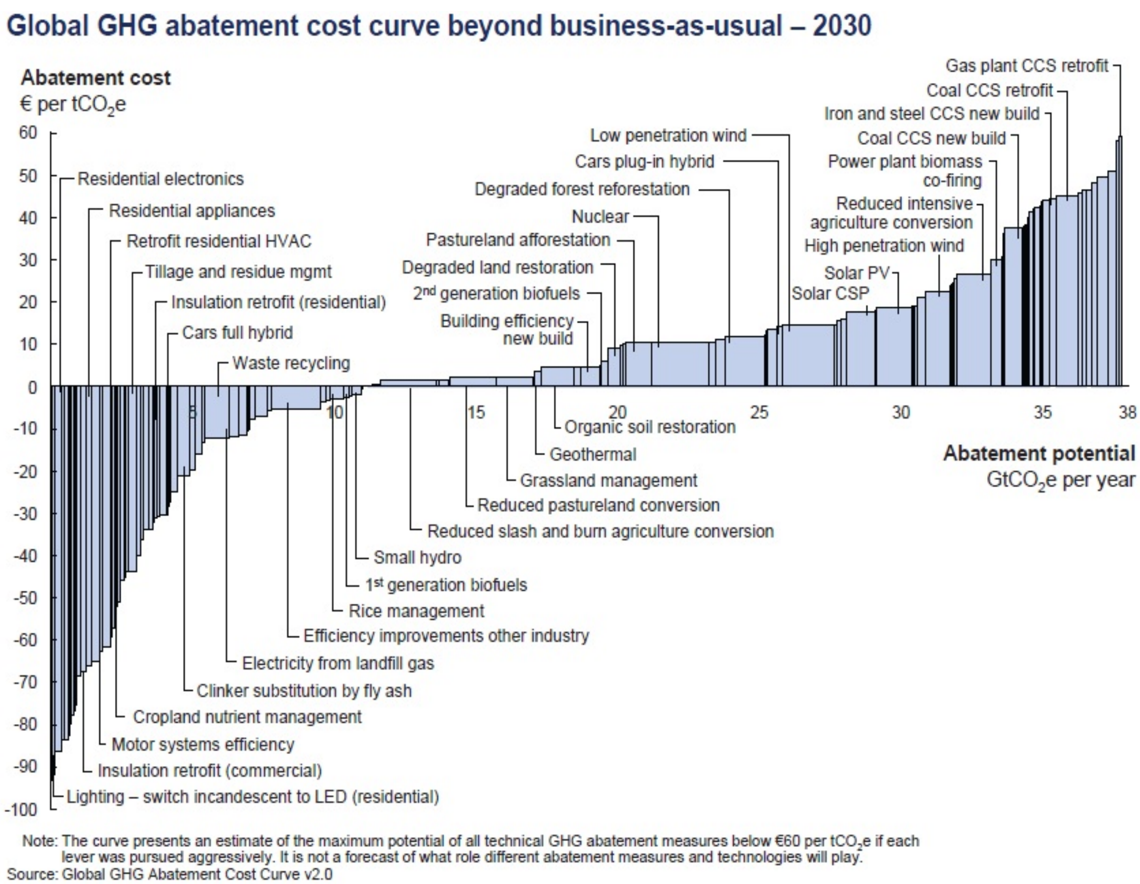
Many economists have attempted to quantify the potential economic impact of climate change and evaluate what different levels of GHG abatement might mean compared to "business as usual" scenarios. The Stern Review is perhaps the most exhaustive study of this variety to date. The large-scale study commissioned by the British Government in 2005 and led by economist Sir Nicholas Stern endeavors to quantify the costs of action and inaction on GHG abatement using the best available climate and economic models. Among its main findings the report asserts, simply, that, "the benefits of strong, early action considerably outweigh the costs," (Stern 2006) and places the cost of 550 ppm atmospheric CO_2 stabilization at about 1% of world GDP per year. While this is certainly not an insignificant sum, the report asserts that this cost is, "fully consistent with continued growth and development, in contrast with unabated climate change, which will eventually pose significant threats to growth." Disagreement does exist around the projected economic costs of climate change; there is uncertainty inherent in climate and economic models, and some have argued that impacts may be much less severe (Carter et. al. 2006) while others have taken issue with assumptions about the falling cost of mitigation technology and discount rates used to value present and future costs (Mendelsohn 2006). Despite these criticisms, the Stern Review provides strong support for early action to prevent future economic damage, particularly considering the high risk of catastrophic impacts should more dire climate forecasts come to pass.

The costs of mitigation, of course, also vary by mitigation strategy. While Stern makes the case that short-term costs are outweighed by long term benefits, there are also mitigation strategies with relatively low costs or that even result in net *benefits* in the short term. A study conducted by business consulting firm McKinsey & Company in 2009 set out to examine in which sectors and at what price carbon emissions could be cut in order to avoid a rise in temperature above 2°C. The report agrees that action must be swift, and that a delay of only ten years may make it virtually impossible to keep global warming below 2°C. Like Stern, McKinsey finds that dramatic reductions are needed in all sectors, but also that the cost of many measures needed to achieve these reductions is not staggeringly high.

The McKinsey study looked at all technical opportunities currently available for greenhouse gas abatement, up to a cost of 60 euro per ton of CO_2, and estimated the total abatement potential of each strategy. The research considered the cost of each measure from a societal perspective (not from a consumer or business perspective) and excluded potential transaction costs involved in the implementation of each measure. Their findings are distilled into a GHG abatement cost curve (Figure 1.1), which breaks down mitigation strategies by cost per ton of carbon dioxide mitigated and by potential CO_2 emissions reductions per year. As the chart shows, many strategies have net economic benefits (those below the x-axis toward the left side). This cluster is dominated by residential and commercial efficiency measures, and also includes some waste management, agricultural, and transportation strategies. As the chart progresses toward the right, the cost per ton of each measure grows, but there are still many reasonably priced strategies with high abatement potential. Many land restoration and reforestation strategies fall into this category, along with wind and solar energy. On the more pricey end of the cost curve are more highly technical carbon capture and storage techniques, which are largely still in the development phase.

Figure 1.1

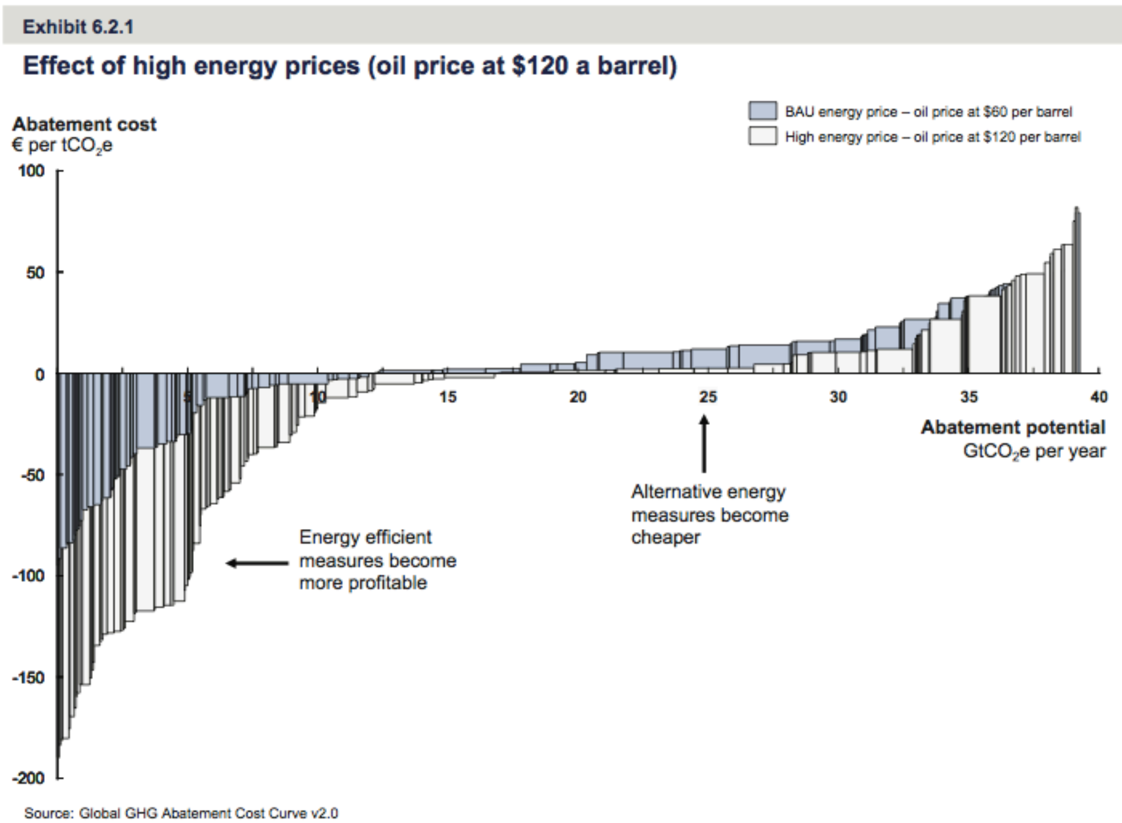
The McKinsey GHG Abatement Cost-Curve



The measures on the left end of the cost curve might be thought of as the "low-hanging fruit" of climate mitigation – solutions that make use of existing technology, are widely applicable, and have little or no cost (or have net benefits). According to the IPCC, mitigation opportunities with net benefits have the potential to reduce emissions by around 6 $GtCO_2eq$/year by 2030, which is roughly 15 percent of year 2000 emissions (IPCC 2007). Moreover, according to McKinsey, low-hanging fruit solutions could provide even greater benefits and make up a larger portion of abatement potential given the right market conditions. The chart in figure 1.2 above is based on oil prices at $60 per barrel, and shows that roughly one third of GHG abatement could be achieved through measures with net economic benefit. But higher energy prices (oil at $120 / barrel) could dramatically increase the net benefits of efficiency measures and make alternative energy more cost competitive (Figure 1.2). This is not hard to imagine, given that prices soared to $147 in July 2008, have hovered around $100 in recent years, and are forecast by the IEA to reach over $200 / barrel by 2035 (IEA 2011?). As figure 1.3 demonstrates, with higher energy prices, the amount of GHG abatement that could be achieved through measures with net economic benefit moves to roughly to 45% of the total.

Figure 1.2

The McKinsey Cost Curve Adjusted for High Energy Price



For local climate planning this cluster of abatement measures with low costs or net benefits holds promise for a number of reasons. First, planning traditionally deals with the built environment and may be particularly well positioned to implement policies related to development of the built environment, transportation infrastructure, and energy procurement in certain cases. According to the Pew Center on Global Climate Change (2006),

> In the United States, local governments are responsible for issuing building and development permits and for making land-use decisions about residential and commercial neighborhoods—decisions that profoundly influence local energy use, especially in the transportation sector. Local governments also have the authority to determine the availability of public transit, and to set building codes that influence the energy efficiency of houses and commercial buildings in their communities. Many local governments also control the local electricity supply through municipal utilities; others wield substantial influence through franchise agreements with utilities (2).

Second, cities have shown promise in developing policy innovations to address market failures that have prevented the realization of larger cost savings and emissions reductions from energy efficiency. Where free markets often fail to realize the full private benefits of energy efficiency and its positive public externalities (reduced emissions), government intervention can be necessary and desirable. Rogers (2007) identifies a number of barriers to realizing the full value of building energy retrofits, including: (1) poor information (on costs, savings, people to do the work, etc.), (2) lack of capital or access to capital, (3) split incentives (tenant pays energy bill instead of owner), and (4) limited tenancy or ownership preventing full realization of benefits of investments (5) high transaction costs (to both consumers and potential investors in energy efficiency). In the buildings sector, knowledge of the character and age of local building stock, trends in occupancy and tenure, and awareness of local climate may assist in the development of programs better tailored to address needs in a particular place.

Finally, these measures achieve multiple sustainability goals in terms of equity, environment, and economy, making this cluster more politically feasible, particularly when local budgets may be strapped by the present economic downturn. Yet, the fact that these opportunities offer net economic benefits does not mean that these benefits are easy to realize. On the contrary, designing the right policy framework to capture this potential in a cost-effective manner is a significant challenge, one that requires overcoming an array of market failures and imperfections. In the buildings sector it is estimated that about 30% of projected GHG emissions could be avoided while providing a net economic benefit, but that barriers including availability of financing and technology and the high cost of reliable information (IPCC 2007). High up-front costs, split-incentives, and information failures can keep the benefits of energy efficiency from being maximized, leaving the low-hanging fruit to rot on the vine.

Yet smart, well-directed policy has the potential to address these market failures and realize immediate GHG abatement through existing technology. While many programs that incentivize energy efficiency upgrades or renewable energy production have come from federal government support (i.e. block grants for home energy retrofits or solar energy subsidies), local programs may be well suited, in some cases, to scale up actions taken to address these issues at the local level.

Drops in a Bucket?

As local climate planning gains a foothold as a mainstream urban planning strategy, citizens and scholars must ask whether or not these plans have been or can be effective in reducing GHG emissions locally, and ultimately if local climate planning in the aggregate can be useful in reducing national emissions in the absence of comprehensive federal climate policy. This is not to argue that federal policy and international action is not necessary, but rather to ask if local climate planning has been or can be effective as a stopgap measure, demonstrating real reductions cities that have chosen to act and serving to prototype effective policy moving forward. But what difference can any single municipality or even state have on total emissions? Could overall emissions be reduced even through the combined climate planning efforts of a large number of U.S. cities or will CAPs only provide drops in a bucket?

The answers to these questions are up for debate, as the theoretical arguments for and against sub-global climate regulation have established. Many have argued that local action will not yield substantial reductions or could even prove counterproductive. Yet it is impossible to ignore the potential of local regulation in the U.S., if only based on the total population of cities involved and the related emissions local plans might encompass. The 1,055 mayors who have signed the U.S. Mayors Climate Protection Agreement represent a total population of roughly 89 million residents (U.S Conference of Mayors, 2012).

According to a Brookings Institution report, 20 percent of the nation's transportation and residential carbon emissions come from the 10 largest metro areas (Brown et al. 2008). Other studies have shown that local authorities control policy that deals with 30-50% of national emissions (Lindseth 2004). And perhaps the one inescapable and overwhelming demographic event in the last decade has been the global shift from a predominantly rural world to one that is now predominantly urban. The United Nations reported in 2008 that for the first time in history over half the world population would be living in cities by the end of that year (UN 2008). The percentage of urban population in the United States passed this milestone long ago, sometime in the 1920s; today the vast majority – 82 percent – of the total U.S. population lives in cities (CIA 2010). With the most recent census reporting 308 million people living in the United States, urban areas account for roughly 253 million of those people (US Census 2010).

These population numbers alone do not necessarily prove the promise of local action on climate change, but should merely serve to point out that within this population and through the policy levers available to cities there does exist an enormous potential for emissions reduction. This potential is separate, to some degree, from the question of whether or how local climate plans might be a useful tool in achieving these reductions. Population and emissions numbers for urban America only serve to demonstrate the potential reach of local climate planning and says little about how much difference CAPs could have or are having, and if local action is the (or an) appropriate approach to climate mitigation.

It is beyond the scope of this paper to conduct a thorough analysis of the GHG reduction potential possible through local action alone. It is one thing to demonstrate the substantial size of the carbon footprint of metro areas; it is quite another undertaking to estimate what amount of these emissions might be reduced by local action. Indeed, even with concerted and aggressive local action by the majority of U.S. cities, significant abatement (an amount that could meaningfully contribute to achieving reduction targets set forth by the IPCC) may be outside the reach of these jurisdictions.

Certainly, much of the abatement needed to avoid the worst impacts of global climate change will need to come from still developing clean energy technologies and a carbon pricing mechanism – either a cap and trade system or a carbon tax. Comprehensive action on the national and global scale *will* be necessary. While cities may have some ability to significantly reduce their own emissions, or even potentially influence overall emissions in the aggregate with a truly heroic effort, the most optimal solutions are still for approaches at the national and global scale. While a city may impose energy efficient building codes, for example, federal standards would ensure these standards in buildings across the country. Rawlins and Paterson (2010) acknowledge the important role of traditionally local controls on land use, transportation, and building codes, but argue for federal action that would bear on and coordinate national, state, and local GHG reduction efforts. Shellenberger et al (2008) argue the need for massive public investment in research and development of the clean energy economy that the private sector is unwilling or unable to make.

How can local action be explained then, if it is not the case that local reductions can prevent a global climate disaster? Zahran et al (2006) sought to answer why cities undertook climate planning efforts when,

> (1) reducing local emissions will not fully insulate a locality from the adverse trans- boundary effects of global climate change; (2) the costs of climate-change mitigation are significantly higher than the expected benefits when participation is voluntary; (3) the collective benefits of climate protection are nonexcludable and nonrival; and (4) there is no federate mandate or significant assistance for the implementation of climate-change protection programs (546).

To assess this they tested a number of hypotheses, using climate risk variables, socioeconomic variables, and demographic control variables to explore factors that might influence the adoption of a CAP. Using GIS analysis and descriptive statistics, the authors found that CAP committed localities tend to have greater vulnerability to climate change, which explains their willingness to absorb costs of climate change protection. The study also found that no low socioeconomic capacity cities are committed to CAPs, and that nearly all committed cities are comparatively high socio-economic capacity, high-risk (Ibid).

Local climate planning by itself may not be able to reduce global GHG emissions dramatically enough to avoid the worst consequences of climate change, but could play an important role in a number of ways. As of now, state and local action are the only games in town, and do have the potential to address significant reductions in energy use, alternative energy, transportation, and solid waste sectors, while prototyping and experimenting with policy in ways that help governments at all levels address climate change. Building on the theoretical and economic arguments set out in earlier sections of this chapter it seems an argument can be made for the climate plans with well-defined purposes and concerted set of actions that best achieve these purposes.

(1) Local plans can address areas with the high potential abatement, available immediately, for high returns on investment. Delayed action on the part of higher levels of government makes it even more crucial to be aggressive in the near term, and as the McKinsey cost curve demonstrates, there is significant abatement potential among actions with net benefits or low cost that can be executed using existing technology. (2) Local climate plans can prototype innovative policy by acting as laboratories for developing the most effective policy approaches. The success of this “policy testing” capacity will depend on the ability of cities to develop robust and systematic evaluations for measuring progress and analyzing program outcomes. (3) Local climate action can engage the public in an issue that has largely been abandoned at the federal level in the

U.S. and press for more comprehensive policy at higher levels of government.

In order to be successful in any of these three areas, local climate plans will have to advance aggressive policies, contain strong implementation measures and be able to effectively monitor and measure plan outcomes. Cities have been increasingly attempting local action, but it remains uncertain if the growing numbers of plans are having success by any of these measures. There is a case for local action as a meaningful component of a multifaceted approach to global climate change, but the verdict is still out on whether they are living up to this billing. The following chapter will move from the theoretical role of local climate plans and address them as they have been put into practice.

Chapter 2: The state of local climate planning

While some cities have had climate plans on the books for nearly two decades, the vast majority are much more recent. Strangely enough, the very first GHG reduction target at *any* level of government was set by Toronto in 1989 (Pew 2006). Others were soon to follow, as Portland did when it adopted the first CO_2 reduction plan in the U.S. in 1993, but the growth of local plans was slow and did not really gain a strong foothold until the 2000s, many of them cropping up in the latter half of that decade. The literature reviewed for this thesis, somewhat surprisingly, did not produce a study that examines the evolution of local plans and tracks changes in their content over the years on a comparative basis; perhaps at roughly 20 years old the field is still too young for a meaningful and systematic study of this nature. That said, even a cursory look at the earliest plans compared to the most recent reveal an obvious growth in comprehensiveness and complexity of the plans, corresponding with the growing body of science and public awareness surrounding climate change. And while some plans may be too new to expect much in terms of tangible and significant outcomes, other plans as little as a few years old have already produced multiple progress reports documenting their GHG reductions.

Inception, Development, and Organization

The early push for local climate action was supported by a handful of NGOs, who helped promote and expand these efforts through technical support and best practices. The International Council on Local Environmental Initiatives (now known as ICLEI – Local Governments for Sustainability) claims status as first mover in this role (ICLEI 2012). Its Cities for Climate Protection campaign, initiated in 1993, provided early support for the development and dissemination of local climate mitigation actions by providing cities with training, tools for accounting and monitoring emissions, and city-to-city networking (Ibid). As the organization's website claims, it has some 1220 member cities worldwide with roughly 200 of these in the U.S. As local climate planning has proliferated, ICLEI and its Cities for Climate Protection (CCP) campaign have developed standards for local plans and suggested benchmarks for polices and reduction targets which many cities have adopted. While it is clear that local climate plans are far from uniform, ICLEI appears to be the organization most responsible for creating what standards and consistency do exist amongst these efforts.

ICLEI promotes a planning process based on five milestones: measuring emissions, committing to reduction targets, developing policies, implementing the climate action plan, and monitoring emissions reductions (Ibid). Local governments joining its Cities for Climate Protection Campaign pay small dues, in exchange for which ICLEI provides support resources such as software to aid in conducting a GHG inventory and city to city networking to promote policy transfer and learning among participants. In providing this technical assistance and guidance for many cities and creating a large network of local actors, the organization proliferates a some manner of consistency to local efforts. While this may seem like a positive and necessary function, some have questioned to what extent ICLEI encourages or stifles policy innovation in CAPs. As Portland State University researchers Basset and Shandas (2010) observe,

> "…[ICLEI], whose explicit goal of motivating local action on climate change globally through its Cities for Climate Protection program (ICLEI, 2008), has shaped and contributed to the adoption of many CAPs in the United States… As the dominant policy entrepreneur, ICLEI and its network influence the climate action planning process and what its products look like. Since it provides direct assistance to municipalities agreeing to participate in its program, ICLEI can either act as a homogenizing force in planning, limiting innovation through standardization, or it can facilitate the development of robust place-based strategies that reflect local biophysical, political, and economic realities," (437).

There are other organizing bodies in the field of local climate action, similar in some respects to ICLEI, but with notable differences as well. The World Conference of Mayors and the affiliated U.S. Conference of Mayors also promote local climate action, though in contrast to ICLEI, which pushes only sustainability related initiatives, these organizations have a much broader issue agenda. Currently there are 1,055 Mayors who are signatories to the U.S. Conference of Mayors Climate Protection Agreement (U.S. Mayors 2012), but membership here does not necessarily equate to their city having an official local climate plan on the books. Instead, in signing the agreement mayors make a commitment to meet or beat very modest Kyoto goals, to advocate for Kyoto-style reductions from all levels of government, and push for emissions trading systems at the federal level (Ibid). Many of the signatories have yet to complete a climate plan, or are undertaking actions to meet this pledge while forgoing a more explicit climate plan *per se.* While the organization publishes surveys and reports outlining best practices for cities, it functions in more of a professional association role trying to demonstrate best practices for and advocate for local climate action than in a plan-support and research role, as ICLEI does. Its Best Practices Guide provides many dozens of short case studies on innovative climate and environmental policies being carried out by its member cities (U.S Mayors, 2007). Rather than attempting to make particular policy recommendations, the organization highlights actions by individual cities it deems to represent best practices in the various categories of climate and energy and across transportation and building sectors in an effort to promote interaction and learning across jurisdictions.

Another, more recent, nongovernmental actor in local action is the Clinton Climate Initiative and its C40 Cities climate leadership group. This initiative seeks to help large, global, cities reduce their GHG emissions. Despite what its name implies, the C40 Cities are made up of 58 (40 participating and 18 affiliate) large cities from around the world, ten of which are in the U.S. These cities alone account for 8% of the global population, 14% of global GHG emissions, and 20% of global GDP (Clinton Foundation 2012). Achieving reductions in these cities alone would not be insignificant, but C40 Cities is trying to expand its influence in local climate action more broadly as well. In June of 2011 at its summit in Sao Paulo, the C40 Cities announced a partnership with ICLEI to create a Global Community Protocol for greenhouse gas accounting and reporting standards, a pilot version of which was released in May of 2012 (C40 Cities 2011).

The U.S. Environmental Protection Agency and the UN have demonstrated interest in local plans but plays a minimal role compared to the NGOs already discussed in this chapter. The EPA maintains information on state and local plans through its website, and provides information to cities on cost-effective strategies and best practices and links to federal funding opportunities for local programs. Though its advice is useful, the agency appears to play a more limited role than other bodies. The United Nations Framework Convention on Climate Change UNFCCC has produced an agreement from local actors as well; the Global Cities Covenant on Climate or "Mexico City Pact" of 2010 established a commitment by signatories to transparency and accountability through regular reporting – the carbon*n* Cities Climate Registry. The registry was developed with support from ICLEI and the World Mayors Council on Climate Change. It is unclear the extent to which this agreement and mechanism duplicates the efforts of these and other organizations operating in the local climate arena, but it appears that there is certainly some overlap between this effort and ones already mentioned.

Plan Content and Strategies

Though local climate planning is a relatively new phenomenon, there are a number of useful surveys in the current literature that endeavor to describe plan content and provide analysis and criticism of existing plans. Even as ICLEI and others try to guide local governments with planning standards and benchmarks, local climate plans can vary widely in scope and content. In their relatively small but instructive survey of 20 local climate plans, Bassett and Shandas (2010) attempt to reveal the general composition of these plans with the motive of identifying the extent to which CAPs represent policy innovation. As is made evident from a cursory look at a handful of plans, the authors note that plans can range from just a few pages to much more voluminous documents, and can take the form of a standalone plan or be incorporated into broader sustainability or comprehensive plans (Basset & Shandas 2010). Indeed, the variability in the scale and scope of LCAPs is notable; Austin's 2007 plan comes in the form of a 6-page city council resolution, while Sacramento's newly minted 2012 plan is over 250 pages with appendices. The study concluded that local efforts can vary substantially, with some plans appearing to be motivational documents more than anything else while others contain very clear goals, objectives, and implementation steps. They also found that most plans tend to focus on a common set of actions, which commonly in the categories of energy efficiency, renewables, and transportation.

In his foundational survey on state and local climate plans, Wheeler (2008) also examines the current contents of a sample of existing climate plans. Choosing plans from 30 representative large and smaller cities, and including all existing state plans, he evaluates plan content ranging from emissions targets and GHG inventory method to areas of action (residential, commercial, transportation etc.) and implementation measures. A set of tables found in the appendices to his article provide a broad, if somewhat superficial overview of plan content and reduction strategies employed. He notes that while the emergence of local plans across the country shows that planners and elected officials are taking climate change seriously and that while some plans have been remarkably detailed and comprehensive. Yet, he finds current plans lacking in five distinct ways: (1) near-term goals are too low; (2) progress is slow; (3) proposed measures are inadequate; (4) implementation is a problem, and; (5) public involvement is inadequate (Ibid).

Perhaps Wheeler's most salient criticism of local plans is not that their implementation is poor or that their progress is slow, but that goals and measures are generally inadequate to begin with, and do not relate to the scope and scale of the reductions necessary to stabilize temperature increase. Many cities have based their goals on those set out in the Kyoto Protocol, using 1990 as the benchmark year, striving to reduce emissions by 7 or 10 percent by around 2010. But as Wheeler points out, the Kyoto goals may be too weak to avoid the worst consequences of climate change. And while some states and cities have adopted very aggressive reduction goals – 80% by 2050 for places like California, Portland, Boston, Berkeley, and others – their specific near-term targets do not put them on this track. Much of the emissions abatement cities count on assumes major technological improvements in coming years, and strong actions taken at higher levels of government. Wheeler proposes more aggressive targets for cities, a long-term focus, regular reporting and progress assessment, more serious commitment of financial resources, and aggressive marketing campaigns to properly address the climate crisis (Ibid).

In another study, Tang et al (2010) analyzed 40 local climate plans using an empirical model for assessing local plan quality. The study sought to answer what variables might influence the quality of a local plan, including capacity, climate risk, and emission stress. They developed 36 indicators of plan quality and tested eight hypotheses regarding the relationship of political will, state mandates, wealth, coastal climate risk, population density, historic hazard damage, lower energy consumption, transport use, vehicle emissions, and commute time to the quality of a local plan. The results showed the breadth and depth of planning, reduction, implementation, and monitoring strategies amongst the 40 plans as a group (Figure 2.1). This was meant to measure the extent to which plans, on the whole, employed various strategies (breadth) and how well did at employing and analyzing them (depth).

Figure 2.1

CAP Indicator Performance (Tang et al 2010)

Sub-category	Indicators	Breadth (%)	Depth (%)
Communication and collaboration policies	Public awareness, education, and participation	85.0%	75.0%
	Inter-organisational coordination Procedures (business, government, IPCC, CCP, etc)	82.5%	77.3%
Financial tools	GHG reduction fee	47.5%	68.4%
	Establish a carbon tax	37.5%	76.7%
Land use policies	Disaster-resistant land use and building code	17.5%	57.1%
	Mixed Use and compact development	65.0%	88.5%
	Infill development and reuse of remediated brownfield sites	37.5%	80.0%
	Green building and green infrastructure (i.e. urban forests, parks and open spaces, natural drainage systems) standards	60.0%	83.3%
	Low-impact design for impervious surface	0.0%	0.0%
	Control of urban service/growth boundaries	35.0%	67.9%
Transportation policies	Alternative transportation strategies	80.0%	85.9%
	Transit-oriented development and corridor improvements	77.5%	88.7%
	Parking standards adjustment	65.0%	90.4%
	Pedestrian/resident-friendly, bicycle-friendly, transit-oriented community design	72.5%	77.6%
Energy strategies	Renewable energy and solar energy	80.0%	65.6%
	Energy efficiency and energy stars	82.5%	86.4%
Waste strategies	Landfill methane capture strategy	70.0%	75.0%
	Zero waste reduction and high recycling strategy	82.5%	75.8%
	Waste and storm water management	20.0%	75.0%
Resources management strategies	Creation of conservation zones or protect areas	7.5%	66.7%
	Watershed-based and ecosystem-based land management	7.5%	50.0%
	Vegetation (forest/woodlands) protection	30.0%	87.5%
Implementation and monitoring strategies	Establish implementation priorities for actions	55.0%	75.0%
	Financial/budget commitment	20.0%	62.5%
	Identify roles and responsibilities among sectors and stakeholders	52.5%	61.9%
	Continuously monitor, evaluate and update	70.0%	73.2%

Each plan, then, received an overall score based on its inclusion and level of employment of these strategies. Austin, surprisingly, receives lowest score of all 40 plans, which the authors attribute to it having an abstract rather than a full plan (Tang et al 2010). It is true that Austin's official plan is a simple council resolution, but its efforts under the auspices of its Climate Protection Plan have earned the city national recognition, including an award from ICLEI in 2011 (City of Austin 2011). This raises questions about the relationship between the climate plan of record for a city and the actual efforts and investments it is making to reduce GHG emissions. The widely different assessment of Austin's plan produced by these researchers compared to ICLEI's evaluation indicates a potential mismatch between what Tang et al have defined as plan quality and the actual effectiveness of local climate action in practice.

As these studies have shown, despite the ongoing work of NGOs to research, promote and develop best practices and standards within the field, local climate action seems to produce a wide range of approaches with varying success. While many plans share common elements, the strength of their goals, level of implementation, quality of monitoring, and overall results can be substantially different. The research outlined in the following chapter will continue to address these issues by looking at 5 local plans in greater detail.

Chapter 3: Methodology

This research seeks to explore the strategies employed by local climate plans to reduce GHG emissions, measure outcomes and effectiveness, and communicate those results to critical audiences of citizens and policymakers. In pursuit of this objective, a case study approach was chosen to assess where local climate plans are focusing their efforts and to determine where they have had successes and failures. While a number of surveys of local plans exist in the current literature that give a broad view of local climate planning efforts, a deeper understanding of meaningful planning, implementation and outcomes and results calls for closer examination of specific and notable cases. In focusing on a small number of plans, the intention is to build a more thorough understanding of the context within which these plans are created and must operate, and more thoroughly understand the individual experiences of cities undertaking GHG reduction efforts at the local level. The research will look at the products of the planning process, including plans themselves, progress reports, and individual program results in hopes of building knowledge of existing practices and identify areas where CAPs might improve to better achieve their role in the greater climate policy sphere.

The study will focus on the climate plans of five different U.S. municipalities: Austin, TX; Denver, CO; Boulder, CO; Chicago, IL; and Portland, OR. Plans were selected for study based on a number of criteria. First, using information on planning commitments from ICLEI and the U.S. Conference of Mayors, a large number of cities were identified as potential case studies. From this universe, selection was limited by the online availability of both a climate action plan and at least one progress report. The number of cities that have undertaken progress reports thus far is relatively limited; as of the beginning of 2011 only 25 of the total of the roughly 600 U.S. ICLEI cities had reached this step in the process (ICLEI 2011). From there, a final selection of plans was created, looking to create a selection of plans that operate at different scales, represent a number of different planning contexts, and finally to include cities that have set ambitious reduction targets and have a reputation for implementing local environmental initiatives.

These final selection criteria are subjective to some degree. Yet, certain plans have distinguished themselves by setting ambitious GHG reduction targets or implementing innovative strategies, have received awards from ICLEI or other bodies, or come up repeatedly in the literature on local climate action. Specifically, Tang et. al (2010) and Wheeler (2008) were useful in informing the selection of plans, though disagreement on what constitutes a "good" plan was evident in these surveys. It seems appropriate to focus on ambitious and well-drafted plans from cities that are recognized for taking environmental issues seriously. The plans of these cities, in theory, are less likely to be merely symbolic or political actions, and instead should be making the best attempts within their limited ability to achieve actual GHG reductions.

An evaluative matrix was created to maintain consistency across the five case studies. Each city's planning effort is assessed on five questions: (1) Are the planning efforts serious and systematic? (2) Has significant progress been made toward goals? (3) Is progress clearly measured and reported on a consistent basis?;(4) Are key measurements used to assess and improve policy? and (5) Does the plan create opportunities for innovation and learning? Answers to these questions are produced by connecting 2-3 criteria to each of the broader questions and using these criteria to evaluate each case. Each criterion rated with a simple "yes" or "no" where the evidence of meeting the criterion is clear, and a "partially" or "unclear" where there it is less-so. Adjacent to each simple response are notes describing the justification for the rating given. As there is significant variability in the quality of information available in each case, assessing the criteria is still not a black and white endeavor, but still provides a good comparative framework between case studies.

The plans chosen vary in a number of ways. While most climate plans bear resemblance to one another to some degree in terms of presentation and the general palate of reduction measures presented, there are notable differences as well. Among these differences are distinct foci on individual strategies and CO_2 reduction plans and policies, the level of detail of GHG reductions forecasts from individual measures, the existence of budget data and spending commitments for climate initiatives, and detailed cost/benefit analysis of policies and programs. The selection of plans will demonstrate cities working within the constraints of their state and local context to assess the extent to which they have been able to implement meaningful and innovative policy on the local level.

The following chapters will proceed with individual case studies of each plan and its associated progress report(s), available planning process documents, and data and information available on city climate program websites. Information on plans was gathered through online resources, documents made available by persons affiliated with each city's climate plan, and number of short interviews where possible. The availability and type of information varied in each case, sometimes substantially. The non-uniform nature of plans and progress reports, as well as the differences in the amount and quality of information collected and disseminated by each city makes systematic comparison complicated.

In examining these individual cities, the research will seek to answer whether cities are employing strategies that target GHG reductions on the left end of the McKinsey cost-curve (low-cost or net benefit), and whether actions are taken to effect outcomes over which the city can exert an substantial influence. If local plans can be an effective form of climate policy, cities will need to demonstrate that they do not impose unnecessarily high costs on themselves through the regulation of their greenhouse gas emissions while other areas enjoy the benefits of their action without sharing the costs of reduction.

The case studies will also address the extent to which cities are monitoring the performance and cost-effectiveness of individual actions and overall plans. This will be addressed through examining progress reports and other monitoring data where available. ICLEI's final milestone for climate mitigation at the local level is monitoring and evaluating progress (ICLEI 2010). If local climate plans are to serve as policy laboratories for other cities and higher levels of government, as is the hope, a concerted effort monitor progress and develop useful metrics for success must exist.

Following these case studies, a short analysis and discussion of findings will be offered, with suggestions for further research. Though the number of plans examined is limited, analysis of these specific case studies should yield some insight into the effectiveness of local climate planning, both in terms of its ability to directly reduce GHG emissions and in terms of its potential to innovate and refine policy that can be applied in other cities and higher levels of government.

The following chapters will proceed with five individual case studies. Figure 3.1 gives a broad overview and comparison of each of the plans, identifying reduction targets, primary strategies, and years when plans and progress reports were undertaken.

Figure 3.1

Local Climate Plan Case Study Overview

City	Reduction Targets	Primary Strategies	Progress Report
Austin (2007)	70 percent by 2030 City operations carbon neutral by 2020; 35% renewable energy, 800 MW reduced demand and 200 MW solar by 2020	Municipal Operations; Renewable Energy production; EE Residential and Commercial Building Requirements	2009, 2010, 2012
Boulder (2006)	Kyoto (7% below 1990 by 2012)	EE Buildings; Renewables and Offsets; Transportation; Waste Reduction	2011
Chicago (2008)	25% below 1990 levels by 2020, 80% by 2050	EE Buildings; Renewables; Transportation; Waste & Pollution Reduction	2010
Denver (2007)	Reduce per capita emissions by 10% of 1990 levels by 2012; absolute reduction to below 1990 levels (25% absolute reduction by 2020)	Corporate & Residential Efficiency; Energy Conservation Incentives; Voluntary Offsets; Municipal Operations	2012
Portland (2009)	40% by 2030; 80% by 2050	Building Efficiency / Retrofits; On-site Renewables; Urban Form and VMT; Consumption and Waste Reduction	2010, 2012

Chapter 4: Austin Texas

The City of Austin Climate Protection Plan is different than most. Austin has garnered awards for achievement in climate protection through ICLEI (City of Austin 2011), yet the city lacks a comprehensive climate plan document that many other cities have. Instead, a 6-page city council resolution serves as a mandate to city officials who must interpret and implement its measures. Considering the somewhat unconventional nature of this arrangement in comparison to other cities climate planning approaches, Austin's achievements are particularly notable.

Austin stands out for its ambitious goals in a number of categories, and employs a decidedly aspirational tone in its statement of these goals.. The resolution, passed in February 2007, lays out seven initiatives to make Austin "the leading city in the nation in the effort to reduce and reverse the negative impacts of global warming," (City of Austin 2007). The city has set a very aggressive target for municipal operations, seeking to make all City of Austin facilities, fleets, and operations carbon neutral by the year 2020. This includes a switch to all renewable energy by 2012, vehicles that will be electric or use non-petroleum fuels, and individual climate plans for all city departments to achieve maximum reduction in GHG emissions and energy consumption.

The city also asserts that it intends to make its power utility the leader in the nation in GHG reductions by achieving 700 MW of savings through energy efficiency and conservation and produce 30 percent of all energy needs through renewable sources including 100 MW of solar, which Austin Energy Later revised to 800 MW of energy efficiency savings, 35 percent renewables and 200 MW solar and adopted in the departmental plan it developed to meet the objectives laid out in the council resolution (Austin Energy 2008). Austin also intends to "implement the most energy efficient building code in the nation and aggressively pursue energy efficient retrofits and upgrades to existing building stock," (City of Austin 2007). This statement again stands out in its aspirational tone; the effort to "lead the nation," which includes measures to implement building codes to make all new single-family homes net zero energy capable by 2015 and increase the energy efficiency of all other new private and public sector building by 75 percent by that same year, seems so ambitious as to be nearly out of reach.

In spite of the ambitious measures and aspirational tone of Austin's climate initiatives, it is difficult to gauge the scale of its efforts. Despite the resolution's clearly aggressive goals, the document lacks an overall GHG reduction target that many other plans contain - typically stated in terms of cutting emissions to a percentage of year 2000 or 1990 levels, framed in language that owes its legacy to the targets set at the Kyoto Accords. Nowhere in Austin's plan or in any available progress reports or supporting documents was there a mention of a benchmark year or percentage emissions target toward which the plan is striving. Conversations with city staff and a report put out by the Carbon Disclosure Project (2012) did reveal the existence of an extremely aggressive target – 70 percent reduction by 2030; however, the major strategies that Austin is pursuing through its climate protection plan preceded the reduction target (Baumer 2012), which may explain why an overall GHG reduction goal is not used to frame the city's efforts in any of the available documents.

Instead, the actions are framed around a handful of aspirational reduction targets that are mostly limited to areas over which the city has the most direct control. For example, since Austin owns its own electric utility, it may be in a better position to set guidelines for the production of power and more easily implement energy efficiency upgrade and rebate programs than other municipalities that purchase power from a private utility. The lack of a Kyoto-style goal, while unorthodox, does not mean Austin's CAP cannot achieve significant reductions and set precedent for other local action to follow.

Though lacking a plan document typical of most CAPs, the city was charged with interpreting and implementing each of the seven items in the climate protection plan resolution. The council resolution directed the city manager to implement each of the targets and resulted in the formation of 5 individual sub-plans: (1) Municipal Plan (2) Utility Plan (3) Homes and Buildings Plan (4) Community Plan and (5) Go Neutral Plan. The municipal plan resulted in the creation of 23 individual departmental plans which detail the measures each city department is taking to reduce its GHG emissions (City of Austin 2012b). Instead of a "backcasting" approach, Austin established 2007 for its baseline year for its GHG inventory. The city conducted two inventories: one for municipal operations and one for the county as a whole. Its municipal operations estimate for that year was 168,000 mtCO_2e, while Travis County GHG emissions were nearly 15 million mtCO_2e (City of Austin 2009a). That makes municipal operations share emissions slightly over 1% of the county total.

Austin has initiated some innovative strategies meant to tap into potential reductions with economic benefits. In 2008 the city passed the Mandatory Energy Audit and Disclosure Ordinance, which placed a number of requirements on single-family, multi-family, and commercial facilities. Revised in 2011, the ordinance requires the sellers of single-family homes over 10 years old to disclose the results of a mandatory energy audit to potential homebuyers (Austin Energy 2011). The Brookings Institution identifies home energy cost disclosure and on-bill financing as one of five major federal approaches to reduce metropolitan carbon emissions (Brookings 2008); Austin's local attempt at this policy could provide useful information for on potential impacts and scalability of a national energy disclosure mandate. The Ordinance also requires multi-family facilities with energy use over 150 percent of the average to participate in mandatory upgrades to bring energy use down at least 20 percent. It also requires owners of commercial facilities over 10,000 square feet to calculate energy use ratings or audits beginning in 2012, 2013 or 2014 (depending on square footage of the building) and report them in each subsequent year.

The ordinance is of particular interest because it attempts to address market failures in information and split-incentives to get at GHG reductions that are also economically beneficial. By providing consumers with energy consumption information before purchase it is possible to take this formerly hidden cost into account when purchasing a home. And in the multi-family and commercial properties there is often a split-incentive issue that prevents energy-efficient upgrades; the owner does not perceive a benefit to these upgrades because the tenant pays the utility bill, and the tenant has a limited rights and ability to make upgrades or may not fully recoup any investment in doing so if upgrades are made. By providing information to potential homebuyers and mandating upgrades be made by landlords who might otherwise have little incentive to do so (because the tenant is paying the utility bill) these requirements help address at least some potential reductions that might otherwise not be realized.

Austin's Green Building program, which was the first in program of this kind when it was launched in 1992, has a long history of leadership and predates the U.S. Green Building Council's LEED program by eight years. It is a great example of how environmental policy created at the local level can transfer to other localities; by the year 2000 around 26 programs had emerged in 16 different

U.S. states (Moore & Engstrom 2005). Austin's CAP has continued this legacy by aggressively expanding green building principles to make all new single-family homes "net zero energy capable," by 2015. This means that homes must be designed to an efficiency standard that will allow them to eventually be powered on-site if the homeowner chooses to do so. According to the Real Estate Council of Austin (2007), these requirements are estimated to increase the cost of the average home by $1,179.00 but reduce annual energy costs by $227.68 per year.

Austin has employed a variety of evaluations of its climate plan progress. There are three overall yearly progress reports available for the years 2009, 2010 and 2012, however each report is presented in a notably different manner than the others. Overall, Austin's reporting and progress monitoring system appears to be fairly robust, especially in the municipal operations category. For each of the 23 departmental plans, quarterly progress reports are required to be submitted to the Climate Protection Program (City of Austin 2009b). While this has allowed the city to track its internal GHG emissions fairly accurately and provide progress updates, the overall reduction goal and progress toward it aren't as easy to decipher from available reports. As noted earlier, Austin lacks an overall reduction percentage that most other plans employ, but relies instead on a number of targets with highly visible and memorable goals (i.e. carbon neutral city operations by 2020) as the basis for its efforts. So while progress towards each of its noteworthy goals are trackable with some effort, it is much more difficult to obtain a picture of individual program and overall progress in terms of total tons of CO_2.

Austin's initial progress report serves as both an elaboration of the city's stated targets and as an enumeration of program efforts accomplishments to date. Austin's climate protection plan was initiated by a legislative action in 2007 by city council in and not through a more typical local climate planning approach that might involve various stakeholder groups, city departments, and outside consultants. Accordingly, this report represents the first substantive documentation of the interpretation of council's brief resolution into the more elaborate sub-plans and actions that exist today. It functions simultaneously as a more fully developed climate plan and first progress report, though it is more similar in content to other cities climate plans than to progress reports generally. While it documents avoided emissions achieved by program and on the whole (188,453 tCO_2e over the first two years) an equal of the document is dedicated to describing more fully what efforts the city will take as it moves forward with the plan (City of Austin 2009a). Compared with the 2007 council resolution that initiated Ausitn's climate plan, the 2009 progress report lays out the city's strategies in much greater detail; it attaches expected emissions reductions from some (but not all) strategies, provides municipal and community GHG inventories, and details specific actions to be taken to achieve the broad goals first expressed in the council resolution.

In contrast to subsequent progress reports put out by the city, the 2009 plan provides a breakdown of emissions avoided by program/project, along with future projections if available. Figure 4.1 shows a selection of these reduction estimates that highlights some of the city's more substantial reductions. The table, however, lacks any figures that would give an indication of total cost or cost per ton of these emissions reductions

Figure 4.1

Avoided CO_2e from Selected ACPP Projects

	Avoided CO_2-eq. Tonnes	
Program / Project	**Through 2008**[1]	**Future Projections**[2]
Austin Energy - Energy Generation		
Solar PV Rebate Program	2,800 (through March 2009)	N/A
City Departments on Green Choice	33,900	47,200 (FY09)
Austin Energy - Energy Conservation		
Demand Side Management (existing buildings)	123,400	N/A
Energy Conservation Audit and Disclosure (existing buildings)	N/A	365,300 (10 years)
Single-family Homes Building Code Changes (new buildings)	3,700	
Commercial & Multi-family Building Code Changes (new buildings)	12,200	N/A
Compact Fluorescent Lamp Recycling Program	200 (through March 2009)	N/A

Without a typical goal stated in terms reduction percentage from a baseline year, it can be difficult to grasp the scope of Austin's measures in comparison to other cities. Though some emissions numbers are not readily apparent in the report, a bit of digging does make some comparison possible.

The 2009 progress report contains a greenhouse gas inventory that estimates the Austin's total GHG footprint for 2007 at just shy of 15 million $mtCO_2e$. Of this number, municipal operations were estimated to make up 168,000 $mtCO_2e$, or roughly 1.1 percent of the total. Austin Energy represented emissions of 6.3 million $mtCO_2e$, or roughly 42% of the total. These two numbers give the best indication of the scope of reductions the city hopes to achieve, as the plan's major goals for this are framed in municipal operations and energy. While the city's goal of having 35% of its generation come from renewable sources by 2020 is certainly ambitious, it unclear about absolute GHG reductions. Figure 4.2 below shows Austin Energy's 2009 recommendation for additional generation capacity (Austin Energy 2010).

Figure 4.2

Austin Energy's Generation Capacity Plan to 2020

Generation Resources in MW

Year	Coal/Nuclear	Gas	Biomass	Wind	Solar	Renewable Energy %
2009	1,029	1,444	12	439	1	13%
2010		100			30	10%
2011				(77)* 200		15%
2012			100			17%
2013				150		25%
2014					30	25%
2015		200		100		28%
2016			50		20	30%
2017				(126)* 200	30	33%
2018					20	32%
2019					30	32%
2020				115	40	35%
Total	1,029	1,744	162	1,001	201	

* Wind contracts expire.

The plan would add 912 MW of renewable capacity and 300 MW of natural gas capacity to achieve the 35% goal. Generation capacity in MW is different than total electricity use and hence, is not directly related to total GHG emissions. Still, this 1.2 gigawatts of added capacity (presumably for expected continued population growth), 300 MW of which are from fossil fuel sources does not make it obvious that Austin is poised to achieve an absolute reduction in GHG levels. The energy mix will certainly have an enormous impact on reducing the per capita carbon footprint of an Austin resident, but it is not clear from goals or progress reports what the GHG reduction of this effort is expected to be. A presentation on the Austin Energy plan does show projected GHG emissions for the utility through 2020; these projections put total emissions at roughly 4.5 million mtCO_2e in the final year of the plan.

Overall, Austin has set very aggressive reduction targets, largely in strategy areas over which it has direct control, such as electricity generation and municipal operations. Its goals are not framed in the typical Kyoto-style percentage format that can make them difficult to compare to other plans, and progress reports so far have been inconsistent in their metrics and reporting. The city has initiated innovative programs and policy that show promise for replication by other cities or higher levels of government, though the city could help this effort by upping the available data on these programs and their progress. The matrix that follows (Figure 4.3) provides an overall evaluation of Austin's climate planning efforts.

Figure 4.3

Austin Plan Overall Evaluation

Are planning efforts serious and systematic?	
Evidence of commitment from leading elected officials?	
Yes	Plan created by city council resolution in 2007 with unanimous consent. Plan was championed by strong energy advocate Mayor Will Wynn. Current support for plan appears strong, city officials are following through on major commitments.
Lead agency with dedicated budget and staff responsible for plan?	
Yes	Plan is overseen by the Climate Protection Program in the wider Office of Sustainability within the city's municipal utility, Austin Energy. Staff include a chief sustainability officer, a full-time director for the Climate Protection Program, and about 8 other program staff in this office.
Significant public outreach/engagement in planning or implementation?	
Partially	While there was opportunity for public input during the process, the plan appears to have been initiated from higher levels city government. Many plan goals appear to be based on reports produced by Austin Energy, or emanate from a desire to be seen as a leading and innovative city, not necessarily from wide public demand for climate action. The city held a Climate Protection work session with the public in 2010 to develop actions residents and businesses can take to reduce community emissions.
Has significant progress been made toward CO_2 reduction goals?	
Goals consistent with best evidence-based policy recommendations?	
Yes/Unclear	Austin's aggressive goals (carbon neutral city operations, 35% of energy from renewable sources, 800 MW reduced demand by 2020, etc) put them on the path to achieving recommended targets, but Austin does not frame its target in a way that relates to typical Kyoto-style goals. Only with substantial digging is it clear that they intend for a 70 percent reduction overall by 2030.
City on track to meet overall goal?	
Unclear	Austin's lack of a publicized overall goal makes it difficult to assess progress toward its goal, though an overall goal does exist. Reports and progress measurements are not geared toward the evaluation of an overall goal. Another GHG inventory is planned for this year.
City on track to meet sub-goals?	
Yes/Unclear	City is on track to meet Municipal plan targets, with all city departments set to be Green Choice renewable energy subscribers by October 2012. Austin Energy also appears to be on schedule for installation and purchases of renewable energy that will help achieve its goals. Insufficient or non-existent data for some programs to measure, and community-oriented initiatives lack concrete and measurable sub-goals.

Is progress clearly measured and reported on a regular basis	
Are reports and information accessible to public and policy-makers?	
Partially	Austin has completed three yearly progress reports to date, and intends to continue this annual reporting. The reports are easily accessible through the city website. Reports, however, are inconsistent in what they measure to some degree, and the most recent one in particular is mostly anecdotal.
Do reports provide meaningful and consistent measurements?	
Lacking	Reports are not consistent in what they measure and report. The three available progress reports have dramatically different structures and vary in the level and quantity of data available. The first progress reports contains the most systematic reporting of reductions program by program, while the most recent provides more anecdotal evidence of progress at the expense of quantifiable measurements.
Are reports or updates issued regularly?	
Yes	Three progress reports have been issued at roughly yearly intervals (2009, 2010, 2012).
Are key measurements of program effectiveness used to assess and improve policy?	
Does plan or progress report estimate or measure cost per unit of CO_2 reductions?	
No	None of the plans or progress reports attempt to estimate or measure cost per unit of CO_2 reductions.
Are household, private firm and public investments broken out or accounted for in major programs?	
No	Plans and progress reports do not make program costs available, nor do they provide a breakdown of who bears the costs of these investments. Some information can be extrapolated from specific programs by digging through meeting minutes (e.g. for solar rebates) or other documents, but on the whole the information is not presented.
Is there evidence that per unit CO_2 cost differences are stimulating policy adjustment as plans progress?	
Unclear	There is no evidence from published progress reports that this metric is stimulating policy change, however Austin Energy's power generation report, which helped revise upwards some of the main goals certainly considered cost-efficiency of CO_2 reductions in creating its recommendations.
Does the plan create opportunities for innovation and learning?	
Are there unique policy or program elements that could be replicated by other cities or levels of government?	
Yes	Austin' s 2009 Energy Audit and Disclosure Ordinance is one unique policy that could be replicated elsewhere, and was mentioned by other cities' staff in personal communications. Austin's first-in-the-nation Green Building Program

	has inspired policy at higher levels of government and continues to provide an example for other communities.
Are there other elements that could provide learning opportunities for other cities or levels of government?	
Partially	Austin has well-documented reports for its Green Building program, and Austin Energy's Resource Generation Plan provides more data and foundation for planning goals than most of Austin's other plan documents. More comprehensive progress reporting and program analysis, or better documentation of plan implementation would be necessary to provide insight for other's to learn from in many cases.

Chapter 5: Boulder, Colorado

The City of Boulder, while much smaller than other municipalities selected for study, has demonstrated a pattern of innovative and precedent setting policies with its climate action plan and related programs. Just 30 miles north of Denver, Boulder is well known for its progressive culture and environmental bent. With a population of right around one hundred thousand (US Census 2010), Boulder's direct impact on global GHG emissions is insignificant, even when compared to many other US cities. Its own CAP expresses the city's knowledge that its efforts, taken by themselves, will be insignificant in reducing global GHG emissions but hopes its efforts will inspire other communities to implement strong emission reduction programs. And despite Boulder's size, the city's climate plan is worthy of study; it stands out not only for program content but also for the thorough GHG emissions estimates and detailed cost breakdown of each of the plan's component strategies.

In 2002 Boulder committed itself to achieving reductions in line with those set out in the 1997 Kyoto Protocol (seven percent below 1990 levels by 2012) and has been participating in GHG reduction efforts since that time. This goal represents a 25 percent reduction from 2005 levels by the year 2012, an ambitious undertaking to be certain. The city's first emissions inventory was conducted in 2004 and is updated on a yearly basis to reflect current energy and fuel consumption, VMT, and waste sent to the landfill (Boulder 2006). This is in contrast with many municipalities that conduct an inventory only every few years.

The current plan, adopted in 2006, is not as notable for its goals as it is for the level of detail with which it lays out the strategies for achieving them. While not as glossy or graphically enticing as some larger municipalities' climate plans, Boulder's follows a familiar framework of defining broad categories of strategies through which the city intends to pursue its goal. The CAP contains six categories of these strategies: (1) Energy Efficiency; (2) Renewable Energy and Emissions Offsets; (3) Transportation; (4) Waste Reduction and Recycling; (5) Water Conservation; and (6) Urban Forestry and Carbon Sequestration. The first two of these categories are further split into sub-strategies that are specific to Residential, Commercial, Industrial and City Facilities and Operations (Boulder 2006). Few cities identify either water conservation or carbon sequestration as directly as Boulder's plan, though these strategies can have high potential payoff; water treatment can consume a disproportionate amount of municipal energy use, while urban forestry can reduce cooling loads and improve local quality of life while removing carbon from the atmosphere, at least temporarily.

Taken on at face value, Boulder is a modest sized city setting out to achieve the relatively modest reductions set forth in Kyoto. But a deeper look at the city's climate policy shows some innovative approaches to local action. Boulder has set itself apart from other cities by imposing a tax on itself to fund its climate action plan. The city does not own its electric utility – customers purchase electricity from investor-owned utility Xcel Energy. In November of 2006, the citizens of Boulder voted to implement a small tax on energy consumption, with different rates for residential, commercial, and industrial customers. This tax was the first in the nation designed exclusively for climate change mitigation, successfully generating $1.8 million in revenue in 2010 (Boulder 2012). The tiered rate structure is highest for residential customers at about half of a cent per kWh, though absolute tax payments average less than two dollars on the customer's monthly utility bill. Figure 5.1 shows the tiered tax rate structure and average cost to customer by sector.

Figure 5.1

Boulder's CAP Tax Schedule

Electricity User Type	Tax Rate	Average Annual Tax
Residential	$0.0049 /kWh	$21
Commercial	$0.0009 /kWh	$94
Industrial	$0.0003 /kWh	$9,600

The logic of this consumption tax is difficult to assail as it adjusts prices to account for negative externalities by electric users and producers of carbon. But while residential and commercial customers' annual absolute tax payments are modest, the industrial average annual tax payment is more noticeable, nearly $10,000. The argument could be made that industry would seek to locate in areas with lower taxes on energy consumption – a problem Wiener identifies with attempts at local regulation and the mobile nature of at least some sources of emissions (2006). Indeed, the Chamber of Commerce initially opposed the initiative, fearing high costs for industrial and large commercial customers, but was eventually won over by arguments for the economic benefits of the plan to the community (Brouillard & Van Pelt 2007). As the climate plan's budgets demonstrate, Boulder anticipated a positive return on investment for the community from measures undertaken to reduce the city's GHG emissions. Furthermore, there may be less tangible economic benefits from taking action; the image of Boulder as an environmentally friendly city may attract certain types of businesses and workers, and Colorado maintains a significant cluster of jobs related to the renewable energy industry. Even with a potentially large absolute figure as shown in Figure 7.1, the tax rate is merely fractions of a cent per kWh, and any firm for whom energy use constituted a significant enough portion of its overall operating costs would be more likely to look at overall electricity rate than this individual tax.

Boulder is hindered, to some degree, by not owning its own electric utility. Even though it can levy a tax on consumers' utility bills within the city, Boulder lacks the capability to fully control its energy production mix that cities that own their electric utility enjoy. As can be seen in the case of Austin, owning a municipal utility can allow a city to set aggressive targets for renewable energy and exercise control in the amount of capacity added from different types of sources. Colorado does have an aggressive state renewable energy portfolio standard, voted in by ballot initiative in 2004 that requires 30 percent renewables by 2020. Notably, the state also requires that 3 percent of its energy come from distributed generation systems by that same year (Xcel Energy 2012). The requirement, which is particularly ambitious in its percentage and statewide scale, represents a victory for the home-power movement, which has fought to change regulations to allow for grid sell-back in many states. The state requirement should make future municipal emissions targets easier to achieve, but progress to date has been more dependent on the effectiveness of municipal planning initiatives since the current Colorado state renewable portfolio standards only required 5% in 2010, the most recent benchmark year.

Boulder's CAP targets areas with high potential for reduction with a low cost to the community. The plan has a strong focus on energy efficiency and conservation measures that allow the city to get the most bang for its buck. A report written by city staff in explanation of the carbon tax notes that "because energy efficiency is the most cost-effective strategy for reducing emissions, the majority of the annual budget will be directed toward energy efficiency programs, services and outreach." (Brouillard & Van Pelt 2007). Indeed, the language and organization of the plan reflects primacy of energy efficiency as a GHG reduction strategy. Much of the text of the document is dedicated to the explanation of various energy efficiency programs and requirements across residential, commercial, and industrial sectors. The heavy focus of Boulder's CAP document on efficiency measures represents not only the large role this will play in GHG reductions, but also the high program and transaction costs typically involved in the administration of these measures.

While Boulder's energy-efficiency programs are well-designed and receive their due focus, perhaps the most notable aspects of the plan are the detailed budgeting, cost estimates, and emission reduction forecasts found throughout the document. While a number of plans provide some idea of the cost each strategy and the anticipated GHG reductions that should result from it, few do so as thoroughly and transparently as Boulder's CAP. The publication of these numbers allows the public to more fully understand the costs and benefits of the climate action plan.

In contrast to the glossy and professionally designed CAPs put out by some larger municipalities, Boulder's document is notably managerial and mundane. This is not necessarily meant as a criticism, but rather as a meaningful observation that may tell us something about where the city's priorities and resources have been directed. While the plan contains some graphics that help illustrate the city's current and forecasted emissions in the introductory chapters, the bulk of the document is explanatory text and figures. Where other cities have filled out their planning documents with inspiring photographs of green roofs or solar arrays, Boulder has eschewed these elements and opted instead for dull budgetary tables and swaths of largely unbroken text. Similarly, this is not meant as a criticism of cities that have produced graphically pleasing climate planning documents. There is certainly something to be said for the importance of graphic quality to effective communication, especially when the need exists to engage the public on an important issue. Yet, as satisfying and approachable as a well-designed document may be, it is important that the graphic quality not interfere with a proper assessment of a given plan's content.

What Boulder's plan lacks in graphic quality it makes up for in clear quantitative estimates of the costs and benefits of its reduction strategies. Even where cities provide total reduction estimates for individual or cost per ton of CO_2 abated, it can remain unclear how these numbers have been arrived at, or who is bearing the cost. When speaking about the cost per ton of CO_2 abated, it is useful to understand the *total* cost per ton as well as the *public* cost per ton. For instance, in creating the GHG abatement cost curve McKinsey uses a total cost per ton approach, not delineating probable private and public costs but attempting to demonstrate the total potential reduction per dollar no matter where it comes from. Yet, in many programs, particularly in energy efficiency, funding may come from multiple public and private sources, making the overall cost of the program less than obvious. For instance, an individual building efficiency upgrade could include a free energy audit paid for by the local government, private investment from the building owner, rebates from an investor-owned utility, federal grant money. The program cost may look very different to the consumer and to the public.

Boulder's CAP does an admirable job of itemizing these costs and displaying them in useful tables. The city approaches its measurements of cost per ton of CO_2 not from a total cost perspective, but as the cost of only the public investment in each program. This simplifies information for the city itself or any tax paying citizen who wants to know what programs have the best value per dollar of local taxpayer investment. However, the lack of a total cost per ton figure makes it more difficult to assess the true cost of these reductions. Still, the public sector cost per ton (shown in the final column of Figure 5.2) is probably the most relevant piece of information from the citizen standpoint.

Figure 5.2

Summary of Boulder CAP Program Results and Costs

Actions Summary	GHG emissions reduction by 2012	% of target	Lifetime energy cost savings	Private sector investment by 2012	Public sector cost by 2012	Xcel Energy Rebates	Public sector cost per ton
Energy efficiency	76,222	22	$63,869,500	$35,634,600	$3,332,678	$10,352,400	-$463
Renewable energy	203,778	58	-	$893,976	$539,357	-	$7
Transportation	40,000	11	not estimated	not estimated	$528,848	-	$1
Education and Outreach	30,000	12	not estimated	-	$1,190,196	-	$20
Funding Source Administration	-	-	-	-	$42,000	-	-
Total	350,000	100	$63,869,500	$36,528,576	$5,633,079	$10,352,400	-$92

*Savings assume no increase in energy prices. The city cost for energy efficiency does not include $1.95 M for efficiency projects in city facilities, which will not come from the GHG budget. For cells marked "not estimated" estimates have not been developed for lack of reliable data. All costs factor in inflation.

The information available in the plan's tables speaks volumes about Boulder's CAP. First, in Figure 5.2 the "% of target" column easily distills where the city expects its emissions reductions to come from, and for those more familiar with climate figures the total expected reductions of tons of CO_2e are also provided. While it is immediately obvious that renewable energy will make up the bulk of expected reductions at 58 percent, the numbers in the energy efficiency row are perhaps more startling. Though EE measures get Boulder only 22 percent of the way to its reduction target, the cost per ton of CO_2 reduced (-$463 per ton) and lifetime energy savings (~ $64 million) are astronomical and perhaps a little misleading. It is somewhat unclear how the public sector cost per ton figure is calculated, as the figures in the chart do not bear an obvious mathematical relationship to one another. It might be fairer, particularly in energy efficiency, to include all costs and investments (not just public) into the calculation; doing so with data from this table still nets a cost of -$190 per ton.

In either case, the city ought to do whatever it can to communicate the cost savings created through CAP programs; if there are definitive numbers that show local climate action does not have to be a financial drain on cities and can even provide economic benefits. The positive net benefits of energy conservation measures suggests that local action does not have to be justified by purely moral arguments, but can in fact be seen as promoting economic development..

In addition to cost and reduction estimates by action, Boulder's CAP provides a sectoral breakdown its measures as well. Figure 5.3 shows a further breakdown of cost and reduction estimates within the city's energy efficiency category, splitting the estimates among commercial & industrial, residential, and city operations to provide another useful layer of detail.

Figure 5.3

Summary of Estimated Benefits and Costs of Recommended Energy Efficiency Actions

Program	GHG emissions reduction by 2012	Private sector cost by 2012	Lifetime energy savings	Xcel Energy Rebates	Public sector cost by 2012	Cost per ton
Energy Efficiency:						
Commercial & Industrial	41,749	$28,874,600	$44,264,100	$9,474,235	$1,578,472	-$558
Residential	30,227	$6,760,000	$15,557,900	$228,165	$1,754,207	-$241
City Operations**	4,246	x	$4,047,500	$650,000	$1,950,000	-$647
Total	**76,222**	**$35,634,600**	**$63,869,500**	**$10,352,400**	**$3,332,679**	**-$437**

*Savings assume no increase in energy prices. All costs factor in inflation.

** Total cost to public sector does not include city operations energy efficiency costs ($1.95M).

Finally, out of the plans surveyed for this study, Boulder is the only one to publish its annual costs for climate programs. Figure 5.4 provides a year-by-year budget, with breakdown of costs by program area. This transparency and forthrightness is unusual among the documents that have been reviewed. Perhaps other cities see the inclusion of similar tables as unnecessary in their documents, which may serve to function as public relations devices or community outreach tools. Nonetheless, it is quickly apparent from these tables that most of the public investment will be in energy efficiency and most of the reductions will come from renewable energy, information that is difficult to glean from text alone. It is also notable that the amount budgeted for education and marketing alone is more than has been budgeted for renewable energy and transportation combined – roughly one fifth of the total budget. This speaks to the high proportion of program costs and outreach that are generally needed get high participation and overcome barriers to implementation such as market failures in information.

Figure 5.4

Summary of City of Boulder Annual Costs

Annual City Costs	2007	2008	2009	2010	2011	2012	TOTAL
Energy efficiency	$488,828	$499,992	$545,941	$575,031	$598,888	$623,999	$3,332,678
Renewable energy	$56,438	$69,292	$81,712	$96,050	$110,385	$125,481	$539,357
Transportation	$70,875	$77,910	$83,813	$91,413	$98,559	$106,278	$528,848
Education and Marketing	$202,125	$177,194	$185,878	$197,773	$208,110	$219,116	$1,190,196
Admin	$42,000	$0	$0	$0	$0	$0	$42,000
Total	$860,265	$824,389	$897,344	$960,267	$1,015,941	$1,074,873	$5,633,080

*Costs do not include funds for city operation projects. Costs include city renewable energy purchases. Costs are calculated with inflation.

Boulder conducted and published its first progress report in 2011, for which data up through 2010 was available. The document produced is certainly better designed and more colorful than Boulder's 2006 climate action plan, and maintains a fair degree the earlier plan's transparency and focus on costs and emissions figures. The same categories of reduction strategies have been maintained, but bear new titles; "Build Better" for green building programs and "Grow Green" for forestry initiatives, for example. This no doubt represents an effort on the part of Boulder to better market its efforts and get more community participation in its plan. In the document Boulder is forthright about its progress toward reduction targets, noting both setbacks and accomplishments. Boulder saw a 2.5% upswing in emissions from 2009 to 2010, which it attributes to increased economic activity after the recession, more carbon intensive electricity production, and more vehicles with poor fuel economy on the roads (Boulder 2011). Figure 5.5 shows total emissions for each year since the plan's inception, as well as a breakdown of these emission by sector.

Figure 5.5

Boulder Community Emissions by Sector 2006-2010

Total Emissions (in Metric Tons CO2e)						
Year	Electricity	Natural Gas	Transportation	Solid Waste	Offsets	Total
2006	1,191,656	269,224	444,896	53,398	-72,021	1,887,152
2007	1,104,482	330,095	432,269	61,500	-44,604	1,883,742
2008	1,109,544	336,596	416,533	56,164	-47,839	1,871,017
2009	1,120,822	319,570	413,602	55,540	-60,206	1,849,329
2010	1,166,533	325,870	416,234	48,368	-60,938	1,896,068

As noted earlier, Boulder does not own its electric utility and purchases electricity from investor owned Xcel Energy. And while the state has mandated renewable energy standards, the vast majority of current electricity generation is from carbon intensive coal burning power plants (57.1 percent), and less intensive but still significant natural gas (31.6 percent). So while the city can implement well-crafted strategies in other sectors, the inability to control the sources of its electricity generation has partially prevented it from meeting its targets. This is a potential shortcoming for any local climate plan; relying on factors beyond the direct control of the city for a large portion of emission reductions could make goals unattainable if other actors fall short of expectations.

One of the more notable statistics to come out of the progress report is in the area of energy efficiency in existing buildings. While only 15 percent of consumers who participate in energy audits nationwide go on to make upgrades to their properties, the rate in Boulder is 55 percent (Boulder 2011). The city attributes this high number to its EnergySmart program, a collaboration with the county to create a "one stop shop" for energy efficiency services that has taken some of the hassle out of a sometimes cumbersome process. Funded by a 25 million dollar grant from the Department of Energy, as well as Boulder's CAP tax, the program has served 5000 homes and 1600 businesses, distributing rebates totaling nearly 2 million dollars (EnergySmart 2012). As many scholars have noted, high transaction costs can be on source of a market failure and act as a large impediment to realizing truly efficient outcomes in this area. Consumers, lacking good information or straightforward access to it may not be aware of the savings they could achieve through upgrades, or may be dissuaded from making improvements because of the real or perceived inconvenience of the process. Policymakers hoping to expand program uptake in this notoriously difficult area may look to Boulder for potential solutions.

The section-by-section review of Boulder's strategies in its progress report offers a qualitative assessment of progress in each program category, but it is not until the appendix that one can get a more complete picture of the city's progress toward reduction goals. As the document goes through each strategy it focuses on program highlights, and does provide some specific numbers on individual program successes. But the main text of the document does not systematically assess progress strategy by strategy, favoring anecdotal accomplishments and highlights (such as number of buildings participating in a program) and not dealing with more telling numbers such as budget, total C02 reduction by strategy and program, or cost per ton of CO_2 concurrently with the narrative progress description. While the descriptive and anecdotal representation of Boulder's progress is informative, the document might benefit from presenting a more detailed and systematic breakdown of program data alongside the existing narrative progress description.

Still, in keeping with the original plan, Boulder provides many of the desired numbers in an appendix, which breaks down funding sources for 2011 and 2012, shows CAP dollars per $mtCO_2e$ for each program category as well as sub-programs within each category, (Figure 5.6). The appendix also provides the percent of Boulder's total GHG reduction goal met by each program category, but this number is difficult to find and could easily accompany program category headings, along with other numbers found in the appendix to make the progress report more understandable and transparent.

Figure 5.6

Reduction Estimates and Cost Breakdown by Strategy and Action

Active Programs as of September 2011	Estimated GHGs Avoided in 2011 and 2012 ($mtCO_2e$)	CAP Funding 2011 and 2012	CAP $ per $mtCO_2e$	Non-CAP City Funding 2011 and 2012	City of Boulder ARRA Funding	Estimated Private Investment 2011 and 2012
1. Reduce Use						
Commercial EnergySmart						
Discover – Outreach	*	$102,574	**	$31,989	$0	*
Discover – Quick Installs	86	$1,165	$14	$6,250	$36,850	***
Optimize	5,142	$789,015	$153	$104,043	$48,950	$735,000
Upgrade	6,960	$254,502	$37	$57,734	$132,000	$356,607
Residential EnergySmart						
EnergySmart Assessments & Quick Installs	2,947	$40,412	$14	$31,224	$104,500	*
EnergySmart Upgrades (Beyond Quick Installs)	3,338	$161,059	$48	$31,224	$0	$1,939,648
Residential SmartRegs						
SmartRegs Assessments & Quick Installs (Primarily Administration)	2,136	$208,254	$98	$31,224	$0	*
SmartRegs Upgrades (Beyond Quick Installs)	4,101	$311,294	$76	$31,224	$41,822	$3,448,158
Other						
10 for Change	7,527	$124,738	$17	$74,807	$0	*
Public Utilities Commission (Demand)	*	$75,451	*	$25,000	$0	***
Xcel Energy DSM Programs	26,000	*	***	***	$0	*
Total Reduce Use	**58,237**	**$1,993,013**	**$34**	**$424,720**	**$364,122**	**$6,479,413**
Percent of Goal Met	11.2%					
2. Build Better						
New/Remodel Commercial Building Energy Code	2,200	$1,165	$1	$5,000	$0	*
Existing Commercial Building Code	*	$51,165	*	$47,992	$0	***
New/Remodel Residential Building Energy Code	7,800	$10,971	$1	$5,000	$0	*
Total Build Better	**10,000**	**$63,301**	**$6**	**$57,992**	***	*
Percent of Goal Met	1.9%					

Overall, Boulder's plan is extremely thorough and transparent, providing detailed breakdowns of costs and estimates of cost efficiency across programs. While its goals are somewhat modest, it's willingness to levy a tax on energy consumption to fund GHG reduction efforts speaks volumes about the seriousness with which it is addressing the issue. The evaluative matrix that follows (Figure 5.7) provides an overall assessment of Boulder's efforts.

Figure 5.7

Boulder Climate Plan - Overall Evaluation

Are planning efforts serious and systematic?	
Commitment from leading elected officials?	
Yes	The plan has strong support from officials and community.The initiation of a CAP tax on energy consumption to fund programs is solid evidence that boulder's elected officials and residents are taking its climate planning effort seriously.
Lead agency with dedicated budget and staff responsible for plan?	
Yes	Boulder's Office of Environmental Affairs is responsible for the plan with a dedicated budget funded by an tax on electricity consumption. The plan indicated 3 full-time staff dedicated to plan implementation and outreach, with proposals for additional staff pending.
Significant public outreach/engagement in planning or implementation?	
Yes	Outreach is a main component of many of Boulder's implementation strategies. The city has allocated a significant budget percentage to outreach, education, and marketing programs.
Has significant progress been made toward CO_2 reduction goals?	
Goals consistent with best evidence-based policy recommendations?	
No	Boulder adopted the Kyoto goal of 7% below 1990 levels by 2012 as its own target, a number now out of line with reductions levels thought to be necessary to avoid the worst effects of global climate change. Also has no long-term goal beyond the present.
City on track to meet overall goal?	
Yes/Unclear	Boulder's GHG emissions rose in their 2010 inventory due to an economic rebound but are likely to drop due to Colorado state renewable energy portfolio standards as is seen in Denver's more up-to-date data.
City on track to meet sub-goals?	
Partially	Solid waste emissions are down 13% and energy consumption figures are stable despite population and housing increases and are expected to decrease with new city regulations coming on line. VMT related emissions have increased putting that goal off-track.
Is progress clearly measured and reported on a regular basis	
Are reports and information accessible to public and policy-makers?	
Yes	The Boulder CAP and progress report are easily accessible online and provide necessary information for citizens and a rich data set policy-makers.

Do reports provide meaningful and consistent measurements?	
Yes	Boulder's progress report provides more numbers than most plans, including detailed breakdowns of program costs, reductions catalogued program-by-program and year-by-year, and estimates of cost per ton of CO_2 reductions. There is only one progress report available but measurements are consistent within the document from strategy to strategy.
Are reports or updates issued regularly?	
No	Boulder's First and only progress report issued in 2011, five years after the plan was adopted.
Are key measurements of program effectiveness used to assess and improve policy?	
Does plan or progress report estimate or measure cost per unit of CO_2 reductions?	
Yes	Both the plan and progress report consider this metric. Boulder breaks down its major strategies and provides cost per unit estimates and measurements for each of them broadly and for the plan as a whole.
Are household, private firm and public investments broken out or accounted for in major programs?	
Yes	Boulder's plan provides a detailed year-by-year cost breakdown for each major strategy, separating out public and private investments and expected household costs where applicable.
Is there evidence that per unit CO_2 cost differences are stimulating policy adjustment as plans progress?	
Unclear	While boulder has done a better job of tracking this metric than many other cities, there is no clear evidence of policy adjusting as a result of this measurement. With limited resources and a concerted effort to track it, it seems likely, however, that Boulder would take this into consideration.
Does the plan create opportunities for innovation and learning?	
Are there unique policy or program elements that could be replicated by other cities or levels of government?	
Yes	Boulder has demonstrated a substantially higher percentage of building energy efficiency upgrades after a consultation than other cities. Their bundling of services in this area and high participation could be examined for best practices and hopefully replicated elsewhere.
Are there other elements that could provide learning opportunities for other cities or levels of government?	
Yes	Boulder's overall transparency and presentation of budgets, investments, total emissions by program for many years of the plan provides a good deal to learn from. If nothing else it shows a very real and detailed picture of a smaller city attempting local climate action and the successes and failures of its process.

Chapter 6: Chicago, Illinois

Chicago is by far the largest city selected for study, both in terms of population and total GHG emissions. Its reductions goal would eliminate 15.1 million mtCO_2e per year by 2020, a figure roughly equivalent to the total yearly emissions of Austin and Travis County. This goal translates to a 25 percent reduction below 1990 levels by 2020 and an 80 percent reduction below 1990 levels by 2050, placing Chicago among the most ambitious plans in the U.S. The city has garnered attention for its high-profile support for green roofs, having completed the installation of one atop its city hall in 2001 (ASLA, 2012) and had 7 million square feet of green roofs installed or under construction by 2010 (City of Chicago 2010b). Chicago has drawn further attention for its climate adaptation measures. An article in the New York Times highlighted described changes in Chicago's tree planting list that reflect the city's recognition of the likelihood of dramatic climate change over the next century. Chicago has it eliminated the white oak (Illinois' state tree) from its planting list and replaced it with species more suited to southern climes like swamp oaks and sweet gum trees (Kaufman 2011).

In November of 2006, Mayor Richard Daley formed the Climate Task Force to develop a climate action plan for Chicago, which was adopted in September of 2008 (Parzen 2009). The plan itself is organized into five overarching strategies, four of which focus on mitigation efforts: (1) Energy

Efficient Buildings, (2) Clean and Renewable Energy, (3) Improved Transportation, (4) Reduced Waste, and (5) Adaptation (City of Chicago 2008). Energy efficiency in buildings and renewable energy make up the majority of reduction estimates (30% and 34% respectively), and transportation, although smaller (23% of total), is counted on for a higher percentage of reductions than any of the other plans examined. For each of these strategies, the plan estimates the gross GHG reduction in million mtCO_2e and the percentage of total to be achieved. Each of the individual actions under these strategies also comes with a reduction estimate, allowing a comparison of the relative importance of each individual action to the overall goal.

The process of developing the plan took nearly two years and involved a significant number of stakeholders, outside consultants, and grant support from partner organizations, producing a final plan in September 2008. The scale and depth of the planning effort undertaken in Chicago is reflected in a table of found in a "lessons learned" report prepared by City staff, that lists the products prepared during the climate planning process. The table catalogues 12 different reports, covering topics from the broad "Economic Costs of Action and Inaction," to specific areas like "Energy Efficiency Retrofits Implementation Strategy,' (Parzen, 2009). The table lists the cost of each of these individual work products (which were funded largely by a handful of non-profit and philanthropic funds and pro-bono consulting, along with some City and State support) and the researchers, consultants, and policy think tanks involved in their creation. Including cost estimates for pro-bono work donated, roughly 2.8 million dollars went to funding only the reports prepared as Chicago undertook its climate planning process (Ibid). A snapshot from its initial progress report (Figure 6.1) helps demonstrate the extent of outside involvement with the plan and its implementation. According to this graphic, at least 30 different foundations, consulting firms, NGOs, and other groups have been involved. With the resources involved in Chicago's CAP, there appears to have been extensive upfront research and be substantial capacity for monitoring results and measuring progress.

Figure 6.1

Chicago's Many CAP Partner Organiztions

As a result of the planning process and a concerted effort on behalf of the City of Chicago and its Climate Action Plan, a wealth of resources is available regarding all aspects of the plan. This is not just done for the sake of disclosure or transparency, although those outcomes are admirable. Instead, Chicago has made a deliberate effort to create and share knowledge amongst the small but growing community of municipalities undertaking climate planning efforts of their own. Among the many documents available through its website, City staff have produced two "lessons learned" documents that chronicle the obstacles faced in developing Chicago's CAP and make suggestions for the planning process, implementation of programs and monitoring results.

Considering the wealth of information made available regarding the planning process and initial reports that were undertaken to develop Chicago's Plan, the level of depth in Chicago's progress report is somewhat disappointing. The progress report is very anecdotal, and focuses on media-friendly items or areas where success is easy to demonstrate. In particular, Chicago frames much of its progress under the "leading by example" category and pays most of the attention in this document to individual efforts that, while admirable, do not necessarily constitute substantial reductions on their own. These "leading by example" efforts include alternative fuel vehicles in Chicago's municipal fleet, specific buildings that have received energy efficient retrofits, and a web-based bus-tracking program (City of Chicago 2010a). This is not to argue that highlighting these efforts is frivolous or counterproductive, but rather that it is not a substitute for more systematic and rigorous reporting on the success and efficiency of all actions undertaken under the climate plan.

On the whole, there is little information available regarding GHG reduction numbers and program costs / benefits. Where that information does exist, it is only for select programs or actions, and does not provide a satisfactory assessment of the plan as a whole. Documents associated with Chicago's climate plan have highlighted a dedication to monitoring progress, yet its progress report notably lacks detailed data and instead demonstrates progress mostly anecdotally. The progress report states that, "[the] CCAP is embarking on an ambitious program to measure and track progress. This program will track emissions reductions and will be an important component of the continuous improvement process to ensure that CCAP meets its target," (City of Chicago 2010a, 13). Still, its communication of the results of this measurement and tracking is lacking at the moment.

The reduction numbers for the first progress report are not found in the actual progress report itself, and are only available in a separate "Dashboard" document available through the Chicago CAP website. Data from this document show that Chicago reduced citywide emissions by 900,000 mtCO_2e during the first two years of its climate plan, getting the city 8 percent toward its 2020 goal (City of Chicago 2010b). The emission reductions are broken down by strategy and presented in gross figures. Figure 6.2 below lays out goals by strategy area following the original plan and calculates percentage progress toward the goal using numbers from the "dashboard" progress report.

Figure 6.2

Chicago's Reduction Goals and Progress by Strategy

Strategy	Million $mtCO_2$ Estimated reduction	2010 actual $mmtCO_2$ reduced	Percentage Complete
Energy Efficient Buildings	4.6	.33	7%
Clean & Renewable Energy	5.33	.11	2%
Improved Transportation	3.61	.20	5.5%
Reduced Waste	2.03	.26	13%

When Mayor Rahm Emanuel took office in May 2011, during his transition into office he pledged to refocus the Chicago Climate Action Plan on economic impact and jobs (Civic Consulting Alliance, 2011). As part of this re-framing of the CAP, he commissioned an economic impact report from two consulting groups to show potential job growth and savings that could be achieved through the plan's strategies. Among its findings, the study concluded that Chicago could create 10,000 to 17,000 new jobs by 2020 by achieving the goals set out in its plan and save between $400 million and $1.2 billion on resources annually by that same year, depending on the level of investment (Ibid). The highest potential economic benefit appears to be in the energy efficient buildings strategy, which, under the CAP, is forecast to create 7,000 to 12,000 jobs alone.

Using data from a summary table provided in the economic impact study (Ibid), estimates of cost savings per ton of CO_2e mitigated was calculated and compiled in Figure 6.3. These estimates do not include up front investments in each area, but instead show the savings per year, per ton of CO_2e mitigated.

Figure 6.3

Potential Cost Savings through CCAP CO_2 mitigation

Strategy	Savings per Year ($B) 2011-2020	mmtCO_2e Mitigated per Year	Savings per mtCO_2e
Energy Efficient Buildings	0.2-0.6	4.6	$43-130
Clean & Renewable Energy	N/A	5.33	N/A
Improved Transportation	0.04-0.2	3.61	$11-55
Reduced Waste	0.2-0.4	2.03	$100-200

Still, these are only estimates. In order to properly evaluate program effectiveness performance metrics must be in place to measure actual reductions and cost per ton of achieving these reductions. According to the CCAP website,

> CCAP is unique in that it has an associated greenhouse gas reduction goal per action for each of the 26 greenhouse gas mitigation actions in the plan. The data for each of these actions is compiled in a web-based platform … which allows CCAP stakeholders to enter metrics for their work that contributes to CCAP progress. This allows us to monitor progress more closely (City of Chicago 2012).

Yet, the progress report does not provide specific mitigation data action by action, which is a lost opportunity if the monitoring is being done.

Chicago has also acknowledged the importance of measuring cost efficiency of reduction strategies in a *Performance Measurement Lessons Learned* document, but it is not totally clear if the city has implemented its own recommendations as of yet. In this short guide, the very first performance measurement recommendation is to measure cost per ton of GHG mitigated (City of Chicago 2012); yet figures like this seem to be absent from Chicago's own progress reports and many other cities as well. Interestingly, the report also cautions against prioritizing the cost per ton measurement over other factors, saying that doing so could obscure other important issues that should be considered when actions are prioritized. Some of the other 35 recommendations made in this report include allocating resources to actions with highest payback, weighting other benefits related to mitigation actions in decision-making.

Chicago has been part of a high profile group of cities committed to greenhouse gas emissions known as C40 Cities, a program that is part of the Clinton Global Initiative. Some efforts through C40 Cities (Outlined in Chapter 2), including an aggressive building retrofit program, initiated actions that predate the existence of Chicago's CAP. As a part of Chicago's this strategy, the Sears Tower will undergo a retrofit coordinated and financed through the Clinton Climate Initiative. The C40 program appears to target large property owners in particular, but the building strategy is much broader than that. A report prepared for the city by Katzenbach Partners to outlines how Chicago plans to mitigate 2.7 million $mtCO_2e$ per year by 2020. The report estimates cost efficiency of various retrofit strategies (large commercial & industrial vs. low income weatherization, residential lighting etc.) and produces scenarios designed for highest mitigation potential, most low-income coverage etc., and then produces an optimized funding scenario to balance the multiple goals of the program (Katzenbach 2010). While it is important to seek high returns of GHG reduction per dollar spent, Chicago's attention to equity here is important to note for other cities designing reduction strategies.

Overall, Chicago has shown that it is taking the threat of climate change seriously by undertaking concerted and well-researched efforts to achieve aggressive GHG reduction goals. The city's own work, along with its partnerships with consultants, think-tanks and philanthropic institutions have produced many useful reports on its efforts that may help other cities and levels of government learn from their approach to climate mitigation. Chicago could further this effort by altering the narrative approach of its progress report to more clearly report the progress of individual strategies through data it is tracking but not systematically including in these documents. The evaluative matrix that follows (Figure 6.4) provides an overall summary of Chicago's efforts.

Figure 6.4

Chicago Overall Plan Evaluation

Are planning efforts serious and systematic?	
Commitment from leading elected officials?	
Yes	Plan was initiated by executive order of Mayor Richard Daly. He established a Climate Action Task Force of city officials, policy experts, and business and community leaders to identify top priorities for Chicago's plan. New mayor Rahm Emmanuel has lent support to the plan as well with more of a focus on economy and job creation.
Lead agency with dedicated budget and staff responsible for plan?	
Yes	Chicago's plan is headed up by the Department of Environment. It is unclear exactly how what amount of staff / budget is dedicated to the plan, but information on resources used in planning stages suggest it is well-funded.
Significant public outreach/engagement in planning or implementation?	
Partially	The planning phases engaged many stakeholders, though it seems to have relied more heavily on foundations, policy think tanks, and consultants than the general public in developing its plan. Efforts are made to engage citizens in implementation of carbon reduction actions, though many of Chicago's programs appear to be targeted at larger/institutional actors. More top-down feel than other plans.
Has significant progress been made toward CO_2 reduction goals?	
Goals consistent with best evidence-based policy recommendations?	
Yes	Chicago's short and long-term goals (25% below 1990 levels by 2020 and 80% below 1990 levels by 2050) meet recommendations.

City on track to meet overall goal?	
No/Unclear	Chicago was just over 8% towards its 2020 goal as of March 2011, two and a half years after adopting its plan. If the city were to make linear progress towards its goal, it would need to achieve just over 8% each year. It is possible that the city expected some lag in implementation or has staged renewable energy purchases for later dates, in which case progress would ramp up in later years.
City on track to meet sub-goals?	
Partially	Information available through Chicago's progress "dashboard" indicates that some strategies are making significant progress (solid waste at 13% of its goal as of 2010) while others have barely gotten off the ground (renewables, only 2% of its goal by that same year. As stated above, however, renewable purchases / installations may be staged for later dates as they require significant planning horizons.
Is progress clearly measured and reported on a regular basis	
Are reports and information accessible to public and policy-makers?	
Yes	The Chicago Climate Action Plan maintains a website with information useful to citizens and policy-makers. It includes all planning and progress report documents and many supporting documents hat were created for and because of the planning process..
Do reports provide meaningful and consistent measurements?	
Partially	The 2010 progress report and progress "dashboard" provide some meaningful reduction measures but lack many other potentially useful metrics as well. Progress report provided much anecdotal evidence without consistency. Percent progress towards individual goals had to be extrapolated from total reduction numbers. Chicago appears to track useful info that it does not disseminate through its reports or web platform
Are reports or updates issued regularly?	
Yes	First progress report and "dashboard" were issued in 2010, two years in. Emissions inventory for year 2011 data is planned.
Are key measurements of program effectiveness used to assess and improve policy?	
Does plan or progress report estimate or measure cost per unit of CO_2 reductions?	
Yes	Although not immediately evident in the plan or progress report, supporting documents show the city measuring cost efficiency of program options and optimizing investments accordingly, and advising other cities to assess their programs by this measurement as well.
Are household, private firm and public investments broken out or accounted for in major programs?	
Partially	The plan itself does not provide cost breakdowns, but supporting documents, particularly the implementation plan for the building energy retrofit strategy provides a good breakdown of expected costs/investments along these lines.

Is there evidence that per unit CO_2 cost differences are stimulating policy adjustment as plans progress?	
Yes	In a "lessons learned" document on performance measurement the first recommendation is to measure cost per unit of CO_2 reductions and use this to prioritize resource allocation. However, the document also cautions against relying too heavily on this metric at the expense of other important considerations.
Does the plan create opportunities for innovation and learning?	
Are there unique policy or program elements that could be replicated by other cities or levels of government?	
Yes	The level of collaboration with foundations, think tanks, advocacy groups appears higher in Chicago than many other cities. Chicago has taken adaptation initiatives more seriously than other plans examined and has implemented an aggressive and highly visible green roof program.
Are there other elements that could provide learning opportunities for other cities or levels of government?	
Yes	Chicago's inclusion of extensive process documents – including up-front studies, implementation plans for major strategies, an extensive lesson's learned document dealing with the process, and another document that makes recommendations for performance measurements – provide ample material, some of it explicitly created, for other cities and levels of governments to examine and learn from.

Chapter 7: Denver, Colorado

Denver initiated its plan in October of 2007 under the umbrella of its wider sustainability effort known as Greenprint Denver. The plan aims to reduce per capita GHG emissions by 10% of 1990 levels by 2012, and achieve an absolute reduction of 25 percent of 2005 levels (the date of the plan and initial GHG inventory) by 2020 (City of Denver 2007a). The city's emissions grew substantially from 1990 to 2005, from 11.8 million $mtCO_2e$ to 14.6 million $mtCO_2e$. Denver's population as of the 2010 census was 600,158, up 28 percent since 1990 (US Census 2010). With per capita emissions having remained nearly constant from 1990 to 2005 and overall emissions rising almost in direct proportion to population, Denver's near-term per capita emission goal de-couples the achievement or failure of this goal from population growth. The absolute reduction of 25 percent by 2020 would bring Denver's total emissions in line with 1990 levels (City of Denver 2007a). Unlike other plans that attempt to reduce emissions by some percentage below 1990 levels, with Denver's past and projected population growth the city is aiming for hitting a target just below that number.

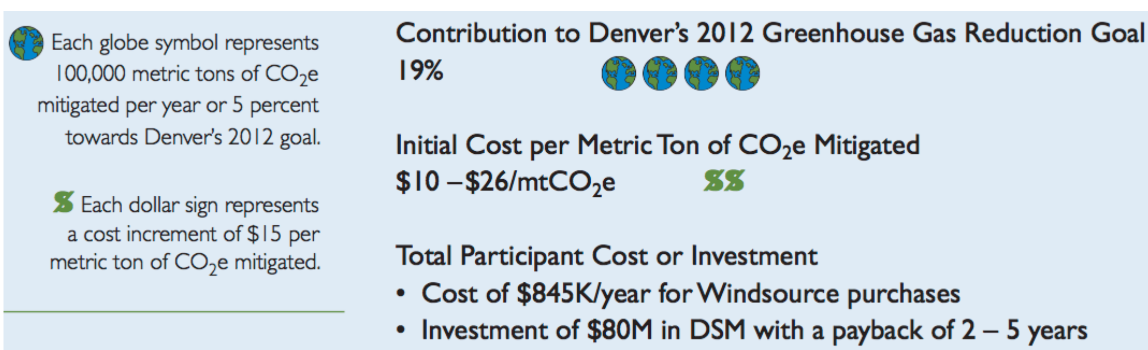
The city outlines ten major strategy areas in its 2007 plan through which it intends to achieve these reductions. These strategies include familiar areas like energy efficiency in new and existing homes and major energy conservation incentives, but also include a green concrete policy and a compact growth boundary with incentives for density.

While Denver employs a mix of strategies familiar from the discussion of previous cities' plans, it stands out for its reliance on voluntary initiatives. Where climate plans like Austin's stick to strategies the city can most directly control (and therefore bear the responsibility for success or failure), Denver places faith in private companies and citizens to buy into its programs and voluntarily participate in reductions. The city's voluntary travel offset program alone is expected to comprise a full 20 percent of its 2012 reduction goal; by providing the opportunity for people to pay small voluntary fees at airport kiosks or when registering a vehicle, the city plans to purchase carbon credits or implement carbon mitigation projects within the Denver community (City of Denver 2007). Denver expects to induce 7 percent of vehicles and 10 percent of air passengers to pay these fees (Ibid), though it is unclear if there is any evidence on which to base this expectation of high participation levels in a voluntary and purely altruistic program. Another of Denver's major strategy areas – the Corporate and Residential Climate Challenges – relies on a substantial voluntary commitment on the part of residents and businesses to conserve energy, reduce waste, and make renewable energy purchases. This other largely voluntary area is meant to get Denver another 28 percent of the way to its 2012 goal (Ibid). This leaves nearly half of the 2012 goal reliant on measures that are at least partially voluntary.

As Denver's Climate Action Plan presents each of its ten strategies and their component programs, it gives the expected contribution of the strategy to the city's reductions goal as well as an estimated initial cost per $mtCO_2e$ mitigated for that strategy. The mitigation numbers are provided in percentage terms (rather than absolute reductions) and cost per $mtCO_2e$ is presented as a range, which can show a substantial uncertainty in the expected cost of certain strategies. These numbers are also presented graphically, using symbols that represent the reduction potential and relative cost. Figure 7.1 shows the presentation of these figures for the Corporate Climate Challenge strategy.

Figure 7.1

Denver Corporate Climate Challenge Estimated Costs and Reductions



While cost numbers are less clear than is desirable, the range may account for the variations in cost of different programs within the strategy.

The plan also tries to give the overall cost of individual programs, show who is making the investment (the city or the consumer) and what the payback period is for the investment if applicable. Figure 7.2 demonstrates the cost breakdown for the Residential Climate Challenge strategy. It is one of Denver's more complex strategies for which to determine costs inasmuch as it contains a variety of programs that share costs between the city and consumers (and while it is unclear from the planning document, almost certainly shares costs with the utility and/or federal funds as well). The breakdown in figure 7.2, while helpful for getting a sense of overall program cost and scope, is still somewhat ambiguous as far as who is making investments in each program. The short payback periods on investments for many of the programs in this category, as evidenced below, represent Denver's emphasis on measures with net economic benefit, from the left side of the McKinsey cost curve.

Figure 7.2

Denver Residential Climate Challenge Investment Breakdown

Total Participant Cost or Investment

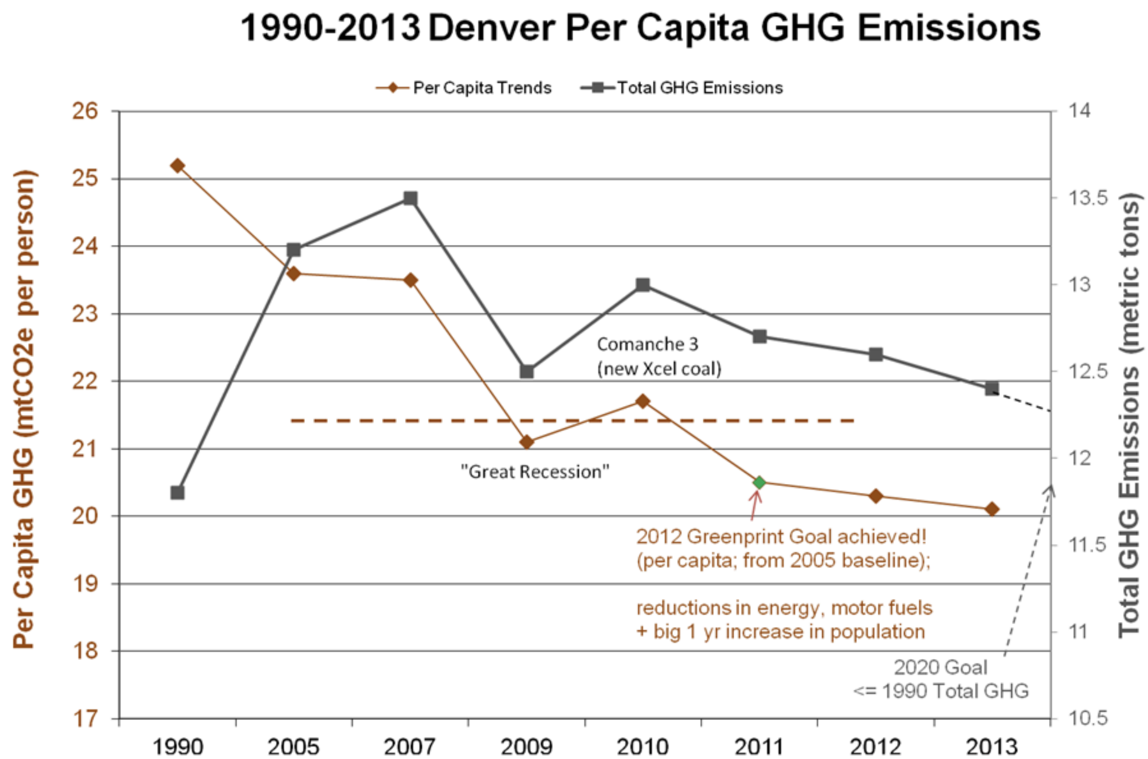
- Cost of $900K/year for Windsource; investment of $150/home for smart meters with a payback of 2 – 4 years
- CFL program: Cost to City of $1.4M; investment of $800K with a payback of 1 – 2 years
- Energy audits: Cost to City of $800K; investment of $3.5M with a payback of 4 – 5 years
- Energy blitz: Cost to City of $1.4M

Denver, like its smaller neighbor to the north in Boulder, purchases its energy from investor owned utility (IOU) Xcel energy, and its emissions are therefore also largely dependent on the carbon intensity of the mix it is provided with. As noted earlier, the state of Colorado has instated renewable portfolio standards that will require all IOUs to produce 30 percent of their energy from renewable sources by 2020 (Xcel 2012), so the success of both of these cities plans will hinge, to some extent, on the ability of Xcel to meet these state imposed standards. But Denver's CAP differs from Boulder's in terms of funding. Where Boulder has imposed a tax on energy use to fund its CAP, Denver does not dedicate line item funding for implementing its strategies, aside from funding staff for the wider Greenprint Denver office and a handful of select departmental initiatives (Peterson et al. 2011). Though city departments have provided some funding and staff for CAP programs, and energy initiatives in municipal buildings have been implemented through the city's capital improvement fund, Greenprint Denver makes use of outside resources wherever possible as it pursues the strategies in its plan (Ibid).

Denver is in the process of drafting its first comprehensive progresses report since its CAP was implemented. There is a year one progress report available on the Greenprint Denver website, but it contains only two pages worth of information and assesses only first year goals. While the city originally intended to release progress reports on a yearly basis, as stated on its website (Greenprint Denver 2012), the Greenprint staff were not able to fulfill this intention, citing a lack of resources given its small staff of five and other duties that took priority in some of the intervening years (Thomas personal communication 2012). Neither have they put out more “dashboard” type reports that might give consistent, though more limited, information on annual progress in the intervening years. The current progress report, (which was scheduled for publication in July of 2012 but has since been pushed back and is expected at the end of 2012), will coincide with and provide evaluation of the city’s intermediate goal of reducing per capita emissions by ten percent by 2012.

Though the progress report was not yet available at the time of writing, conversations with City of Denver staff associated with the climate program were able to provide some indicators of how the city is progressing towards meeting its goals. The 2012 goal of reducing per capita emissions by 10 percent was achieved 3 years early in 2009, although that number rose in 2010 putting them briefly back above that goal (Weingarden personal communication 2012), as shown in Figure 7.3 below. Staff also attribute successfully reaching the goal to state of Colorado renewable portfolio standards that went into effect during this time period, requiring that the investor owned utilities move towards 30 percent renewable generation by 2020 (Thomas 2012).

Figure 7.3



Communication with Greenprint Denver staff also revealed interesting findings regarding the implementation of the strategies found in the original document. In particular, the voluntary offset purchase strategy, which was forecast to get the city 20 percent towards its 2012 goal, proved not to be feasible and was never implemented (Ibid). While this could have significantly derailed the effort to meet emissions targets, other strategies proved more effective than originally anticipated. In Denver's "Leading by Example" category that addresses municipal buildings and operations, the city realized deeper reductions than they had forecast. The city identified no-cost retrofit opportunities and made a series of investments in energy-efficient upgrades that would have a payback period of 5 years or less. These actions allowed the city to achieve a 23 percent reduction in energy consumption compared to its initial goal of 5 percent (Ibid).

Denver's community-focused strategies (the residential and corporate climate challenge) also did better than expected, an observation that one interviewee attributed to an aggressive outreach and community engagement program. City staff and volunteers heavily canvassed low-income neighborhoods with a porch light initiative, exchanging incandescent outdoor bulbs for free CFLs, and then engaging them in conversations about further energy efficient upgrades they can make and connecting them to federal weatherization programs point of contact to put residents (Ibid). In other neighborhoods where residents were not income qualified for programs, the City trained "green teams" of residents to talk to their neighbors about energy efficiency and other sustainability-focused improvements they could make in their homes. Looking forward to Denver's 2020 absolute reduction goal of 25 percent (to 1990 levels), interviewees acknowledged the need for more mandatory policy and regulation in order to meet the target, specifically citing the need for an energy disclosure ordinance similar to the one in place now in Austin (Thomas personal interview 2012).

Like Chicago, Denver has explicitly stated its intention to make monitoring an essential part of its climate plan. According to the city's website, “Greenprint Denver is a pragmatic approach to determine city objectives that can be tracked, measured, refined and reported,” (City of Denver 2012). . Information gathered from city employees affiliated with the CAP showed good tracking of information in some cases (particularly in the Denver Energy Challenge building efficiency program) but failure to make this information available through a regular progress report hinders its usefulness to all but City of Denver staff. The Greenprint Denver website claims that it will put out a yearly progress report (Ibid), yet the city appears to have abandoned this intention. Only one progress report exists to date, a brief “dashboard” style document that was created the first year of the plan’ was adoption (City of Denver 2007b).

There is evidence, at least in the case of the Denver Energy Challenge (the commercial and residential retrofit strategy), that cost-efficiency is being tracked and used to evaluate programs. Denver collects monthly data on number of retrofits performed, total kWh and therms saved, and total CO_2 reductions, split out for commercial and residential categories (City of Denver 2012b). Data from the Denver Energy Challenge July monthly report and personal communication with city staff revealed that the most substantial reductions and cost-effective results came from its commercial energy program due to economies of scale in terms of the higher average space per retrofit, lower number of site visits necessary, etc. (City of Denver 2012, Thomas 2012).

Overall, Denver is on track to achieve its CAP goals, has largely failed to show consistency in progress reporting and provide what meaningful data it is tracking to the public. Innovative strategies like its green concrete program have apparently been successful (according to personal communication), but information on them does not appear to be available. The matrix that follows (Figure 7.4) shows how Denver's efforts measure up using the standardized evaluative framework.

Figure 7.4

Denver Climate Plan Overall Evaluation

Are planning efforts serious and systematic?	
Commitment from leading elected officials?	
Yes	Plan was initiated by executive order of Mayor Hickenlooper (now Colorado Governor).
Lead agency with dedicated budget and staff responsible for plan?	
Yes	Greenprint Denver with 5 permanent staff and one intern oversees plan, but administers a more broad sustainability agenda in addition to the climate action plan.
Significant public outreach/engagement in planning or implementation?	
Yes	In implementation Denver has engaged citizens volunteers in energy efficiency sweeps in income qualifying neighborhoods and in canvassing competitions within non-qualifying neighborhoods.
Has significant progress been made toward CO_2 reduction goals?	
Goals consistent with best evidence-based policy recommendations?	
No	Denver's short-term target (10% per capita reduction of 1990 levels by 2012), while substantial, is based on per capita emissions not total. The city has an absolute reduction goal of 25% by 2020, but has not set out a goal beyond this year.

City on track to meet overall goal?	
Yes	Denver indicates that it has surpassed its target of a 10% per capita reduction below 1990 by 2012.
City on track to meet sub-goals?	
Partially	Denver has abandoned some of its initial strategies which contained large reduction targets, such as its Voluntary Travel Offsets, which was slated to comprise 20% of the 2012 reduction goal. Largest reductions are due to economic recession and statewide renewable portfolio standards going into effect during the first five years of the plan.
Is progress clearly measured and reported on a regular basis	
Are reports and information accessible to public and policy-makers?	
Lacking	The Greenprint Denver website promises yearly progress reports but only one is available – for the first year of the plan. City staff made information available upon request dealing with the first substantial progress report due out this year (2012) and select programs that are a part of the climate action plan. Available documents and data were insufficient to fully evaluate program effectiveness.
Do reports provide meaningful and consistent measurements?	
Lacking	As noted, there is little consistency as Denver has failed to produce yearly progress reports so far. Data kept on individual programs, however, did provide useful measurements of CO_2 reductions and budget expenditures.
Are reports or updates issued regularly?	
No	Only one brief update issued, current progress report is coming 5 years after initiation of plan.
Are key measurements of program effectiveness used to assess and improve policy?	
Does plan or progress report estimate or measure cost per unit of CO_2 reductions?	
Partially	This data was available for at least one of Denver's larger programs that deals with building energy retrofits (Better Buildings).
Are household, private firm and public investments broken out or accounted for in major programs?	
Partially	The Better Buildings program provides a good cost break-out for public and private investment but lacks household costs. It remains to be seen if this will be the case in other programs.
Is there evidence that per unit CO_2 cost differences are stimulating policy adjustment as plans progress?	
Partially	Staff indicated that it was being measured for at least some programs and that they expected it to fall due to up front development costs being significantly less over time.

Does the plan create opportunities for innovation and learning?	
Are there unique policy or program elements that could be replicated by other cities or levels of government?	
Yes	In particular Denver's green concrete program is unique could provide a low cost or net benefit solution that could be replicated elsewhere. Citizen engagement in building energy retrofit sweeps was also unique and could easily be replicated..
Are there other elements that could provide learning opportunities for other cities or levels of government?	
Lacking	Denver largely lacks accessible documents or data that would be useful in informing policy learning for other cities or levels of governments. While it claims success of some unique programs, they are relatively unpublicized. Even the failure of the travel offsets program could be a learning point for other cities that are considering this type of policy if the lessons of its failure were communicated.

Chapter 8: Portland, Oregon

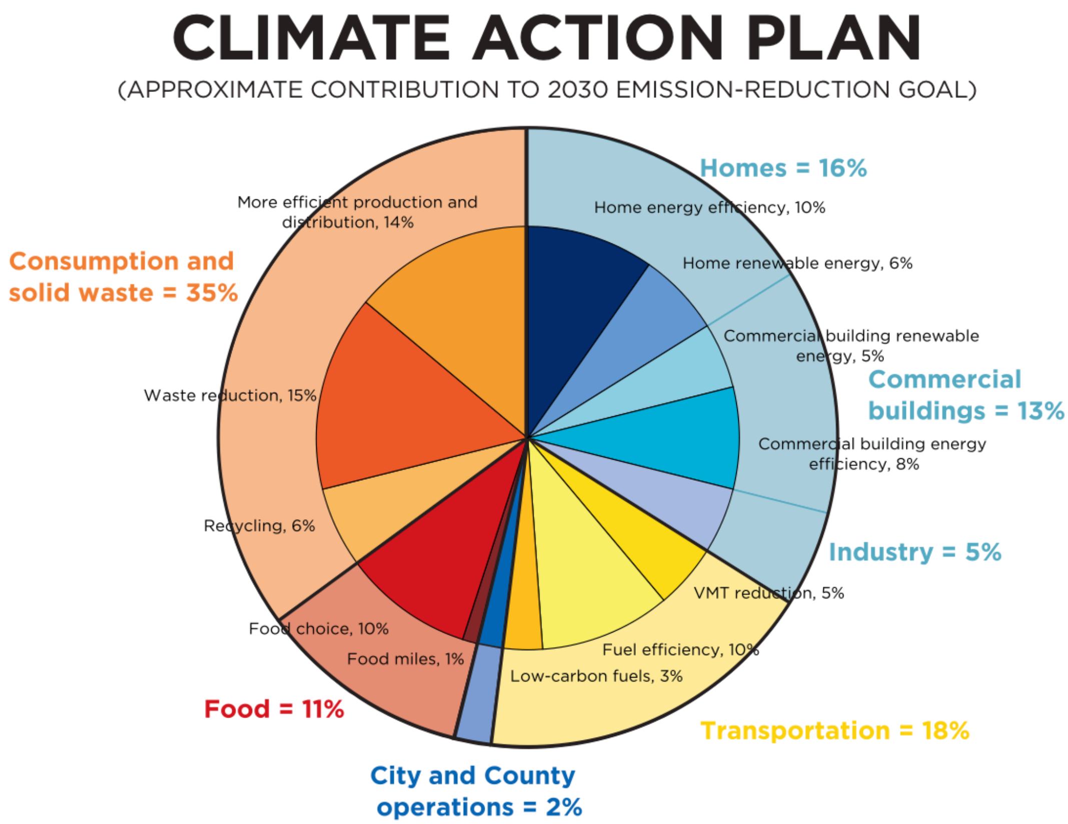
Portland was the first city in the United States to adopt a plan to reduce carbon emissions in 1993 (City of Portland 2012a). In this early local effort, entitled the Carbon Dioxide Reduction Strategy, the city described its intent to reduce CO_2 emissions by 20 percent below 1990 levels by the year 2010 (Rutland & Ayett 2008). Though Portland has fallen short of this initial goal, its early and aggressive action in collaboration with Multnomah County have allowed it to stabilize emissions as the carbon footprint of most U.S. cities has continued to grow. The City of Portland joined forces with Multnomah County in 2001 to create a joint local action plan on global warming that has resulted in substantial progress (City of Portland 2009). While population grew roughly 23 percent from 1990 to 2008, per capita emissions dropped by 19 percent over the same period, causing total carbon emissions to fall to one percent below 1990 levels (Ibid). The city attributes some of its success the state comprehensive planning requirements for cities and counties, and creates strong land-use planning control at the local level. The region's ability to guide investment in public and multi-modal transportation, mixed-use development, and create an urban growth boundary have all been fundamental to the progress made to date (Ibid).

Portland was an early mover on climate policy and is a veteran of local action. Few cities have had the benefit of nearly two decades of climate policy at the local level, and the city and county continue to set aggressive targets moving forward. In 2007 the Portland City Council and Multnomah County Board of Commissioners adopted resolutions compelling staff to formulate a plan to reduce emissions by 80 percent below 1990 levels by 2050 (City of Portland 2009). In 2009 the City and County adopted a new climate action plan adhering to this standard, with an additional interim goal of 40 percent below 1990 levels by 2030. It is one of only a handful of cities to reach for the 80 percent goal, keeping company with cities such as Berkeley, Boston, and Seattle, as well as California and Colorado (Wheeler 2008). Scientists and advocates have championed the 80 percent goal for U.S., and the Obama administration has thrown its support behind this goal as well.

Portland's current plan breaks down its plan into eight key strategies: (1) Buildings and Energy; (2) Urban form and mobility; (3) Consumption and solid waste; (4) Urban forestry and natural systems; (5) Food and agriculture; (6) Community engagement; (7) Climate change preparation; and (8) Local government operations (City of Portland 2009). In keeping with its 2001 plan format, each strategy has a number of objectives that fall underneath it, as well as specific actions to be taken within the next few years in order to meet each objective. The framework is reminiscent of the goal-objective-policy framework that many comprehensive planning documents follow and will be familiar to those in the planning profession. Figure 8.1 below shows the breakdown of objectives by their percent contribution to the interim 2030 goal.

Figure 8.1

Portland CAP Emission Reduction Breakdown



Out of plans surveyed for this study, Portland's was the only one to identify food and agriculture as a major strategy. Indeed, few cities have made food a primary objective or even included actions related to it. A 2012 report published by the Carbon Disclosure Project noted that out of 630 actions taken by the 73 cities in its study, only 7 of those actions were related to food – just over one percent (Carbon Disclosure Project 2012). Portland's intention to reach 11 percent of its 2030 emissions target through food strategies stands out, and speaks to the maturity of local carbon reduction efforts in Portland. The 2001

Local Action Plan on Global Warming did not address food-related emissions (except in food waste collection) while it factors heavily in current reduction strategies (City of Portland 2001). The city expects to be able to achieve GHG reductions related to the transportation-related emissions of foods (replacing foods that may come from thousands of miles away with locally grown foods) and facilitating a transition away from foods that are highly carbon-intensive in their production. Having spent the better part of two decades implementing aggressive energy efficiency programs, Portland now seems to be reaching for reductions in untapped areas, putting forward a broader climate plan that encompasses areas that might more conventionally be categorized under the umbrella of sustainability.

While the plan establishes a good number of specific actions under its main objectives, it is unclear how they translate to measurable, specific, and significant GHG reductions. Still, Portland's inclusion of food and agriculture as a main strategy represents the city's continued effort to create innovative policy at the local level. And while it remains unclear if and how the city will be able to meet its ambitious target of emission reductions ascribed to this area, this effort expands the typical boundaries drawn around what the city can and should measure and manage. Just as it did when it created its 1993 Carbon Dioxide Reduction Strategy, the city is expanding the boundaries of what is addressed by local environmental policy through its food and agriculture strategy. As Rutland and Ayett (2008) argue,

> From carbon footprint analysis to emissions inventories, there are multiple ways of understanding and drawing boundaries around the object of [local environmental governance], and they do not all yield the same results... In Portland's case, this policy work was especially important, as there existed no established way of representing local carbon dioxide emissions, and in fact major emissions that might be considered `local' were left unmeasured (and so ungoverned). (628).

The two main objectives that fall under the food and agriculture strategy aim to decrease consumption of carbon intensive foods (i.e. meat, and to a lesser extent dairy) and significantly increase the consumption of locally produced foods (City of Portland 2009). While the city plans community engagement efforts to influence consumer behavior away from high-carbon diets, it is unclear how this objective will be measured or if the city has the capacity to influence consumer behavior to an extent that would have significant impact. It seems that strategy's more implementable actions will be in encouraging local food production in order to reduce transportation-related emissions (or "food miles"). While Portland's food and agriculture category (and with it the forestry and natural systems objectives as well) may help achieve carbon reduction objectives, they also expand the more narrow GHG-centric focus of most plans and push for strategies that achieve multiple objectives.

Out of all the local plans examined for this study Portland is the only one to present community engagement as an objective in and of itself. This is not to say that it has been ignored by other cities, but its identification as a major objective, and with that the identification of specific actionable items to make this objective happen, may signify a more significant dedication to engagement than might normally be expected. As a result of this, the city has launched *Portland Climate Action Now!* - an outreach campaign that seeks to engage citizens in personal efforts that will get Portland toward its 2050 goal. The campaign has a useful and attractive website that puts citizens in touch with local resources to analyze energy use, get advice on retrofits, install solar, reduce construction waste, etc. (City of Portland 2012c)

Portland's climate action plan does not provide cost estimates for its strategies, either in terms of budget allocations or estimated cost per ton of CO_2 reduced. The goal–objective-action style framework (similar to what is often found in comprehensive planning documents) does force the plan to enumerate many specific actions to be taken in order to meet the plan's objectives, but it fails to tie these to expected costs or emissions reductions for each individual action. The action items read as specific tasks to accomplish (e.g. "Seek funding to accelerate remediation of brownfields in the city and county to accommodate growth within the current Urban Growth Boundary") and are very explicit in how the city plans to go about achieving each of its objectives, but it is difficult to asses the cost or cost efficiency of these actions from the available material.

Portland has initiated some innovative strategies in service of meeting its aggressive targets. A program created for residential energy retrofits known as Clean Energy Works Portland has worked to address a common market failure when it comes to energy efficiency in terms of up front investments that may prevent homeowners from undertaking upgrades to their property. The program initiates energy audits, helps coordinate financing and rebates for improvements, and puts consumers in touch with certified contractors to complete the work. The program was the first in the nation to enable on-bill financing for home-energy upgrades (ICLEI 2010). By creating an agreement between the lending institution, the utility, and the consumer, the loan for the energy retrofits is paid back on the monthly utility bill in an amount that is similar to the cost savings from reduced energy use in the home. From the lender's standpoint, loans can be bundled and administered by the program, making the loan more appealing removing transaction costs dealing with a large number of small loans for a low-risk low-yield investment. From the consumer standpoint, the upgrade becomes much more appealing if it does not have to be done out of pocket and instead rolled into a monthly bill; and when the loan is paid down the consumer enjoys the full benefit of reduced utility bills (Green for All 2010). Clean Energy Works' success in consumer participation, energy reduction, and job creation was notable and led quickly to statewide expansion of the program.

While Portland, has had a number of progress reports associated with its earlier efforts, only the two most recent documents will be addressed here. These reports are the yearly progress reports for the first two years of the current plan - 2010 and 2011. These reports follow the same format, moving systematically through the eight strategy areas in a manner consistent with the original climate action plan. The progress reports, however, mostly provide program highlights in each area, emphasizing areas in which there has been some development or notable achievement. Much of the evidence of progress is anecdotal and given in narrative format. Data are provided on some of the actions and programs, but there are also many that do not receive attention.

Portland's progress reports each give a full GHG inventory each year broken down by sector (commercial, residential, industrial, transportation etc) and provide summary information in a table with comparable data points for five year periods since 1990 as shown in Figure 8.2. Percentage change from 1990 and 2000 levels (when Portland's emissions peaked) are also given, both in terms of absolute percentage change and per capita percentage change. This table demonstrates well the stunning absolute and per capita decreases in Portland's emissions since the turn of the century, 19% and 27% respectively (City of Portland 2012a).

Figure 8.2:

GHG Emissions in Multnomah County by Sector, 1990 – 2010

Table 1. Greenhouse Gas Emissions in Multnomah County by Sector, 1990 - 2010

Total emissions (metric tons CO_2-equivalent)							Percent Change by Sector from 1990
Year	1990	1995	2000	2005	2009	2010	
Residential	1,725,000	1,756,000	2,008,000	1,655,000	1,734,000	1,611,000	-7%
Commercial	1,857,000	2,041,000	2,392,000	1,997,000	1,994,000	1,912,000	3%
Industrial	1,507,000	1,738,000	1,944,000	1,288,000	1,139,000	1,163,000	-23%
Transportation	2,968,000	3,118,000	3,054,000	3,091,000	2,910,000	2,931,000	-1%
Waste disposal	113,000	108,000	90,000	78,000	49,000	48,000	-57%
Total	8,170,000	8,761,000	9,488,000	8,109,000	7,825,000	7,665,000	
Percent change from 1990	0%	7%	16%	-1%	-4%	-6%	
Percent change from 2000			0%	-15%	-18%	-19%	
Per capita emissions (metric tons CO_2-equivalent)							**Percent Change by Sector from 1990**
Year	1990	1995	2000	2005	2009	2010	
Residential	3.0	2.8	3.0	2.5	2.4	2.2	-26%
Commercial	3.2	3.3	3.6	3.0	2.7	2.6	-18%
Industrial	2.6	2.8	2.9	1.9	1.6	1.6	-39%
Transportation	5.1	5.0	4.6	4.6	4.0	4.0	-22%
Waste disposal	0.2	0.2	0.1	0.1	0.1	0.1	-66%
Total	14.0	14.0	14.4	12.1	10.8	10.4	
Percent change from 1990		0%	3%	-14%	-23%	-26%	
Percent change from 2000			0%	-16%	-25%	-27%	

Note: Figures have been revised from previous years to incorporate updated data from the U.S. Energy Information Administration and updated electricity emission coefficients.

The appendices of each of Portland's two progress reports contain an action-by-action snapshot of climate plan progress. The city employs a color coding system akin to a stoplight: red for little progress, yellow for underway but facing obstacles, green for on track, and a checkmark for completed (City of Portland 2011). This system is immediately understandable because of its symbology, and gives an indication of how well an action is going but still fails to give as complete a picture as is desired. A column for notes next to each action gives a narrative description of the progress, which, at times contains numbers on program funding secured or number of households involved in an action, for example. There is little that would help demonstrate cost effectiveness of, or even the amount of reduction achieved through a particular action or strategy.

Overall, Portland has long taken aggressive action to reduce its GHG emissions and has already shown dramatic results. While the progress reports could be improved by providing more data associated with each strategy, the action by action approach breaks down all the component parts of the plan and describes successes and obstacles. Portland has also shown promise in developing innovative and scalable programs, and expanding the boundaries of what local plans seek to measure and influence. The evaluative matrix that follows (Figure 8.3) summarizes Portland's efforts.

Figure 8.3

Portland Climate Plan Overall Evaluation

Are planning efforts serious and systematic?	
Commitment from leading elected officials?	
Yes	2009 plan initiated by City Council and Multnomah County Board with the creation of a "Peak Oil Task Force" to provide recommendations for plan to reduce emissions 80% by 2050. Wide support from elected officials and public more generally.
Lead agency with dedicated budget and staff responsible for plan?	
Yes	Newly created Planning and Sustainability Commission tasked with implementing and monitoring the plan, which is also responsible for Portland's comprehensive plan and zoning code. This may allow more integration of climate goals into the broader planning agenda.
Significant public outreach/engagement in planning or implementation?	
Yes	Portland has a serious community engagement component to its plan – it is one of its 8 main strategies, and has 6 specific actions to be completed by 2012, including expanding outreach to historically underserved populations, establishing a business leadership council, and publicizing climate action metrics by neighborhood. Launched new public outreach effort *Portland Climate Action Now!* in 2010 to involve citizens in climate reduction efforts.
Has significant progress been made toward CO_2 reduction goals?	
Goals consistent with best evidence-based policy recommendations?	
Yes	Current plan 40% below 1990 levels by 2030 and 80% by 2050. Earlier plans also very aggressive.
City on track to meet overall goal?	
Yes/Unclear	Portland's most recent progress report was the second yearly report, meaning it had only data from the first year of the plan. Emissions dropped during that year from 4% below 1990 to 6% below 1990 and has seen large declines since 2000; the city appears to be on track but there is not much in the way of data since its new targets were set.
City on track to meet sub-goals?	
Partially/ Unclear	Commercial and Residential and Waste related emissions declined during the first year, while industrial and transportation grew very slightly. Portland also tracks each one of its actions with a coded response; the action is either complete, on track, facing obstacles, or delayed. In its second year, out of almost 100 individual actions, 70% were either complete or on track, while 30% were either facing obstacles or delayed.

Is progress clearly measured and reported on a regular basis	
Are reports and information accessible to public and policy-makers?	
Yes	Reports are done yearly and available through the CAP website. Good summary information for the general public, notes in the appendix on the progress of each individual action are useful for policy-makers.
Do reports provide meaningful and consistent measurements?	
Partially	Portland's progress reports provide a full inventory each year broken down by sector (commercial, residential, industrial, transportation etc) and provide summary information in a table with comparable data points for many years since 1990. Updates on the status of individual actions are useful (as noted above) but the reports fail to assess each broad strategy area (i.e. buildings and energy, urban form and mobility, food) and report its progress.
Are reports or updates issued regularly?	
Yes	Reports are issued yearly with full inventory (for the first two years of the current plan so far).
Are key measurements of program effectiveness used to assess and improve policy?	
Does plan or progress report estimate or measure cost per unit of CO_2 reductions?	
No	Portland makes some references to economic benefits of its climate strategies (particularly in terms of average savings to consumers or businesses in its building energy retrofit programs) but does not explicitly estimate or measure this cost per unit of CO_2 reductions.
Are household, private firm and public investments broken out or accounted for in major programs?	
No	Little information available in plan / progress report, though better information and accounting is available for select programs, such as Clean Energy Works Portland (residential retrofit program) report.
Is there evidence that per unit CO_2 cost differences are stimulating policy adjustment as plans progress?	
Unclear	No evidence that Portland is measuring or estimating cost per unit of CO_2 reductions or that it is taking this into account as it adjusts policy moving forward.
Does the plan create opportunities for innovation and learning?	
Are there unique policy or program elements that could be replicated by other cities or levels of government?	
Yes	Portland continues to expand the boundaries of what local climate action intends to measure and address, most notably with its food and agriculture strategy. Its Clean Energy Works program is highly replicable; this residential retrofit / jobs program has been expanded statewide with great success.
Are there other elements that could provide learning opportunities for other cities or levels of government?	

Yes	The appendices to Portland's progress reports go into great depth on specific actions taken to achieve goals. There are many ideas in these pages that could transfer to other cities.

Chapter 9: Findings, Analysis, and Discussion

The plans and progress reports examined represent only a small selection of an expanding effort to address climate change through local policy. In examining the efforts of this small handful of cities it is clear that while there are common elements in many plans and progress reports, the scope and nature of these plans can vary substantially and measuring progress, particularly the efficacy and cost of individual strategies, is not done uniformly. There are ongoing efforts led by ICLEI, the U.S. and World Conferences of Mayors, C40 Cities, and the Carbon Disclosure Project to create benchmarks for local climate plans, particularly to make carbon accounting and reporting more standardized and transparent. But it remains difficult in many circumstances to assess the success and efficiency of individual strategies and programs.

Despite the sometimes-substantial differences between plans, a number of generalizations can be drawn from the five case studies selected. One key area of inquiry was whether cities are pursing reductions from areas with high potential for reduction and have low costs or net-benefits. Figure 9.1 below gives a comparison of reduction strategies for the five cities, showing the percentage of each city's reduction goal sought through broad strategy categories. Generally, the highest percentage of the overall goal for these cities (with the notable exception of Portland) is anticipated to come from renewable energy/offsets, strategies that comes in on the McKinsey cost curve roughly between $15-$20 per mtCO_2e (high and low penetration wind, solar PV).

Figure 9.1

Comparison of Reduction Strategies by City (% of Total Goal)

	Energy Efficiency & Conservation	Renewables/ Offsets	Waste / Materials	Transportation/ Density	Other
Austin[1]	800 MW	912 MW	Zero Waste By 2040	-	200,000 mtCO_2e
Boulder	22%	58%	0%	12%	11%[2]
Chicago	30%	34%	13%	23%	-
Denver	28-32%[3]	50%[4]	5%	4%	9%
Portland	23%	11%	35%	18%	13%[5]

Energy Efficiency and Conservation strategies made up the next-highest percentage, roughly 25%-30% of the total goal on average for a category whose

[1] Austin's plan does not present numbers as a percentage of its total goal or in terms of gross mtCO2e. The best available numbers are shown in MW for demand reduction and renewable generation capacity. The 200,000 mtCO2e in the other category represents municipal operations

[2] Boulder's "other" reductions are forecast to come from Education and Outreach, for which the city has budgeted a substantial amount.

[3] Denver's own estimates contain a range for some strategies, and some strategies contain actions that could fall under multiple categories above. Percentages should be treated as estimates (as they are in the plan as well), not precise figures.

[4] 20% of the overall goal was intended to be reached through voluntary offsets, a much higher figure than other municipalities studied. The other 30% is intended to come from renewable energy purchases.

[5] Category includes 11% from Food and Agriculture, and 2% from municipal operations.

strategies generally fall on the far left end of McKinsey's curve and end up providing net economic benefits. It is more difficult to draw conclusions about waste and transportation categories; Portland estimates 35% of its goal from the waste category while Boulder provides no estimate from this area, Chicago and Portland look for significant reductions from transportation/density strategies while Austin largely ignores this area.

While these five cities do generally seem to be pursuing emissions in areas with low costs or net benefits, they vary in the aggressiveness of their targets and their ability implement programs that substantially reduce emissions. As others have noted, the context within which any city must operate will influence its ability to implement certain types of actions, and regulation beyond the control of the city can help or hurt its efforts to reduce GHG emissions. As we have seen in the cases of Denver and Boulder, Colorado's renewable portfolio standards control the energy mix and carbon intensity of the electricity they purchase, and therefore has a large impact on their ability to meet targets. Austin's municipal utility, on the other hand, has an incentive to reduce energy consumption and avoid the large capital expense of building new a new power plant. At the same time, under Texas state law, Austin lacks broader land use planning tools that might help it better plan density and transportation, while Portland has the ability to control development through state mandated comprehensive planning and its creation of an urban growth boundary.

Looking at the evaluative matrices for the five case studies, there is evidence of serious commitment to the climate planning effort in in all cases. Leading elected officials tended to initiate plans and provide ongoing support, though information on the amount financial resources committed to the efforts in was not easy to ascertain in many cases. Specifically, Boulder's ability to levy a CAP tax on energy consumption and the cost breakdown of its CAP process work products give an indication of the seriousness of their efforts. Three of the five cities had goals that aligned with the best practice emissions reduction target of 60-80% of 1990 levels by 2050, but these cities are the exception rather than the rule as Wheeler (2008) noted. If local climate action is to produce significant results, more cities will have to set aggressive targets and dedicate serious resources toward reaching them.

This research also sought to examine how cities are measuring and reporting their progress. Looking at the case studies it seems evident that even where cities are making progress towards emissions goals, progress reports lack appropriate metrics and depth of analysis. This may hinder the ability of cities to learn from each other's policies and Progress reports vary substantially in their form, content, and metrics. The progress reports of these five cities have shown numerous approaches to measuring climate plan progress, though they tend to share some common elements. Where Boulder has arguably provided the most detailed data on GHG reductions and program costs, Austin and Chicago have chosen to present their progress in a more narrative form, highlighting individual program successes but lacking comprehensive data for all programs. Most progress reports, especially ones that were more recent or were at least the second attempt by city, communicated information on plan progress in a format that was easy to understand, if lacking somewhat in truly robust information and metrics. The reports seem to function simultaneously as a documentation of emissions reduction progress and as a tool for engagement and public relations. Personal interviews revealed a certain amount of difficulty on the part of climate program staff in creating documents for public consumption that meet multiple objectives, and that can be useful to citizens and the policy community simultaneously.

In this same vein, information on program costs and cost efficiency is generally inadequate in both plans and progress reports. Boulder provided the most comprehensive cost figures and has set an example other cities should strive to achieve. Even where cities purport to measure cost efficiency and consider it in program design, this information is rarely passed on in sufficient detail to support policy learning and transfer or transparency for the taxpaying public. While it takes resources to compile and disseminate this information and may have a somewhat limited audience (compared to how many people might only be interested in press-ready program highlights and success stories), providing this information would give a much better understanding of whether local climate action and specific strategies are successful.

In the cases examined there is evidence that policy developed at the local level is transferable to other cities and levels of government, and could be supported by more detailed and purposeful reporting. All cities had at least one example of an innovative program that had potential for transfer, or produced other policy learning opportunities (through progress reports, planning process work products, or explicit "lessons learned" documents). Portland's Clean Energy Works Program home energy retrofit program was quickly expanded statewide and Denver has looked to Austin's Energy Audit and Disclosure Ordinance in hopes of creating a similar law. Efforts to publicize and share local approaches should continue to be supported by NGO policy networks. Chicago's efforts to share process documents and create its own "lessons learned" reports are the best example of intentional policy learning and transfer advocacy encountered during this study. Better communication of information on highly effective programs could make them more easily replicable and could help scale up efforts to other cities and higher levels of government.

Ultimately, while local climate action will not be sufficient to address the global climate crisis, aggressive and well-designed local policy could serve as an important arrow in the quiver of a comprehensive approach to GHG mitigation while we wait for the serious action this crisis demands at the national and international level. Though some have argued that local action on climate change is not the correct approach, the number of cities now committed to taking voluntary action is too large to ignore. Cities are well positioned to create policy in areas where large amounts of GHG reductions are possible at low-costs or with net benefits; some have demonstrated real progress achieving reductions, but the widespread capacity of local action is not yet clear. The usefulness in local action will hinge, to some degree, on its ability to measure and assess the effectiveness of specific actions and use this information to disseminate best practice approaches among a growing network of committed cities.

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Vita

Paul Ward was born and raised in Eau Claire, Wisconsin and graduated from Eau Claire Memorial High School in 2002. He went on to earn a B.A. in Geography with distinction and Phi Beta Kappa honors from the University of Wisconsin-Madison, where a truly great tradition of environmental thought exists. Prior to studying at the University of Texas at Austin, he worked in environmental advocacy and outdoor leadership, spending as much time as possible carrying a backpack or paddling a canoe in our continent's precious wild areas.

During his time at UT Austin, Paul worked as a Research Assistant to Dr. Kent Butler, who was a true champion of conservation in Austin. He also worked as a Teaching Assistant in the School of Architecture for an Urban Design Studio and in information technology. He co-authored an article on climate change adaptation in the U.S. and Latin America for the 2011 publication of *Portal,* the journal of the Tereza Lozano Institute of Latin American Studies. He is currently working with the City of Austin Wildlands Conservation Division at the Balcones Canyonlands Preserve.

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