Climate and Energy Targets of Selected U.S. Cities: Progress Toward Their Achievement and Related Implementation Lessons Learned

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ABSTRACT

Various factors—including increasing concern about climate change, improved understanding of the local economic impacts of energy use, and support from non-governmental organizations and federal and state governments—have led a significant number of local governments to adopt goals to improve energy efficiency, decrease greenhouse gas emissions, and/or adapt to climate change. Many localities have also created related implementation strategies to achieve those goals. Developing these goals and strategies alone demonstrates leadership, but many cities are struggling to achieve their objectives regarding carbon reduction and energy savings.

This research reviews current and historical energy and greenhouse gas targets and inventories from a sample of U.S. and Canadian cities, identifying which communities have met or made significant progress toward their targets and which have not. In the process, we propose standard metrics to qualitatively measure advancement toward goals of various types that can be used in future research to compare progress between diverse communities. Based on the results, we present an analysis of selected U.S. communities to identify factors, both policy related and exogenous, that enabled communities to hit their targets or hampered their efforts. Using experiences from communities assessed, we highlight lessons learned and pitfalls to avoid that may inform the efforts of other communities looking to improve progress toward their climate and energy goals.

Introduction

Energy and climate change commitments made by cities vary in size and scope, as do program implementation efforts and progress achieved toward goals. Municipal leaders in 1,060 communities demonstrated their commitment to reducing emissions by signing on to the U.S. Conference of Mayors Climate Protection Agreement, while other communities have undergone rigorous energy and climate planning that included the formation of long-term energy-related goals. However, documented, verifiable progress toward goals is more difficult and rarer than establishing commitments of any sort.

One of the initial frameworks for creating community-wide energy or climate goals in the United States by municipal governments was the Mayors Climate Protection Agreement of 2005, which committed signatories to several actions, including seeking to achieve the Kyoto Protocol greenhouse gas (GHG) reduction targets of 7% from 1990 levels by 2012. Several supporting organizations and sustainability networks developed to assist communities in achieving their goals. ICLEI–Local Governments for Sustainability USA (ICLEI-USA), which spearheaded the Mayors Climate Protection Agreement, provides technical assistance and tools to communities that allow them to track progress on climate goals. Also, the Urban Sustainability Directors Network (USDN) facilitates peer-to-peer connections between nationwide sustainability leaders, offering members the opportunity to collaborate. While many resources are climate focused, there are also efforts that are more specifically energy related. The American Recovery and Reinvestment Act of 2009 (ARRA) included $17 billion for energy efficiency, with much of the funding going directly to states and municipalities through the Weatherization Assistance Program, State Energy Program, or Energy Efficiency and Conservation Block Grant (EECBG) Program (Committee of Conference 2009). Those communities accepting EECBG funding were required to formulate energy conservation plans that either established or added additional goals for energy efficiency and conservation. A spinoff of the ARRA funding, DOE's Better Buildings Challenge, provides technical assistance to those communities seeking to reduce building energy consumption in the commercial and industrial sectors.

Many communities have leveraged these frameworks and resources to develop climate and energy goals or strategies, but communities are at varying stages of implementation and many are struggling to achieve their goals. Therefore, this paper seeks to answer two fundamental questions: While many communities have set energy and/or climate goals, how exactly has this group been progressing toward their stated goals? For those who have demonstrated some success toward achieving their goals, what lessons do they have for other cities that have not?

Methodology

To identify potential communities for our analysis, we first consulted resources for which ACEEE had already gathered information regarding community-wide energy-related goals in a sample of cities, namely the *2013 City Energy Efficiency Scorecard* and the *Local Energy Efficiency Self-Scoring Tool, Version 1.0 Beta* (Mackres et al. 2013; Ribeiro and Mackres 2013). We also included all member communities of the USDN in our candidate list because USDN membership self-identifies sustainability directors, and by extension municipal government leadership, as potential leaders in energy efficiency. Finally, we conducted web searches for Canadian communities who released publicly available climate or energy plans because our previous data sources did not encompass Canadian jurisdictions. Taken together, we gathered a candidate list of 124 communities for our analysis. In our study, we only reviewed data and information for 79 of the 124 candidates due to the time constraints in collecting the research and developing our analysis.

After finalizing the candidate list, we developed the criteria for communities to satisfy to be deemed "on track" for community-wide goals. Communities must have:

- At least one stated community-wide energy-related goal, such as an energy savings or GHG reduction goal, articulated in an energy or climate plan that is quantifiable and measurable. Community-wide goals are only those that spur energy consumption reductions across all sectors of local economies; secondary goals applicable to specific sectors, such as the buildings sectors, or fuel sources, such as renewable energy, were not considered.
- At least two publicly available energy consumption or GHG emissions inventories, whether standalone inventories or incorporated as portions of larger climate/sustainability plans, with one providing baseline data and the other measuring progress in a subsequent year

In order to validate whether communities fit our criteria, we conducted additional web searches to determine if communities had a stated energy or climate goal and at least two publicly available inventories. For those who satisfied the criteria, we used the quantitative evidence presented in inventories to calculate a community's projected energy consumption or emissions level for the stated goal's target year. This calculation was a two-step process. First, we converted the difference between a community's energy use or emissions level in their most recent inventory year and their original baseline level into average annualized reduction values, as illustrated in Equation 1.

$$\frac{\text{Baseline Level} - \text{Level in Inventory Year}}{\text{Inventory Year} - \text{Baseline Year}}$$

Equation 1. Equation for annualized reduction

The resulting value was the average amount of energy or GHG savings a community achieved each year since its baseline. Using the annualized community progress to date, we then projected the impact of the continuation of the achieved rate of annual energy or emissions savings until the stated goal's target year, as illustrated in Figure 1. Equation 2 describes the equation we used to calculate community projections.

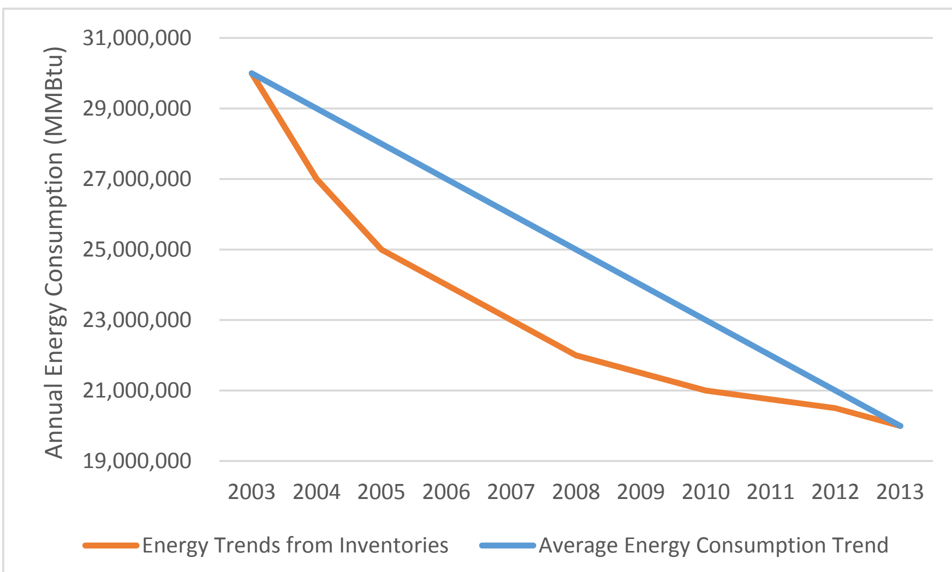

Figure 1. Hypothetical example for projecting community energy consumption.

$$(\text{Baseline Level} - (\text{Annualized Reduction} * (\text{Target Year} - \text{Baseline Year})))$$

Equation 2. Equation for emissions and energy-use projections in target year

A community's projected energy consumption or emissions level was then converted into a percentage reduction below its baseline level. Finally, we compared this projected percentage reduction against the target percentage reduction to determine whether communities were on track for goals. While this method cannot estimate future performance, it allows us to determine if communities have already demonstrated the annual savings levels needed to meet targets they have established for further into the future. Also, by evaluating communities against the goals community leaders established through their own local planning process, this method evaluates communities based upon what is deemed feasible for the community. There are limitations to our methodology for measuring community progress. Due to annual variations in energy use and the ebb and flow of energy savings over time as government and utility policies and programs change, savings will not necessarily occur linearly over time. If communities have more difficulty achieving savings as time goes on, our extrapolated projections for their future savings may not properly reflect future annual savings. Also, this methodology does not evaluate the stringency or efficacy of the goals themselves in relation to a community's capability to achieve energy or emissions savings.

Progress of Sample Communities

We reviewed publicly available information for 79 communities and found that 25 communities, slightly over 30%, had both stated community-wide energy or climate goals and at least two energy-related inventories. Based upon our calculated projections for the 25 communities, 9 communities, 11% of the overall sample, are on track for at least one community-wide goal, and only 4 communities, 5%, are on track for all community-wide goals. Table 1 details the community-wide goals that communities are on track to achieve. The four communities on track to achieve all their community-wide goals are Guelph, New York, Minneapolis, and Austin. However, these four communities have not set a post-2031 goal and communities who have adopted a post-2031 goal are not on track to achieve them. Boston is by far the closest to being on track for its long-term goal, as it is projected to reduce emissions 79% under its baseline by 2050, which puts it 1% short of its 80% goal. The next closest is Tacoma, who is projected to reduce emissions 65% under baseline, 15% short of its 80% goal.

Table 1. Communities on track for community-wide goals

City	Reduction Type	Target Year	Target Reduction	Projected Reduction
Austin, TX	MW	2020	800 MW	800 MW
Boston, MA	mtCO2e	2020	25%	26%
	mtCO2e	2012	7%	12%
Fort Collins, CO	mtCO2e	2012	3%	9%
Guelph, ON	GJ/capita	2031	50%	73%
	mtCO2e/capita	2031	60%	100%
Minneapolis, MN	mtCO2e	2025	30%	47%
	mtCO2e	2015	15%	22%
New York, NY	mtCO2e	2030	30%	68%
Tacoma, WA	mtCO2e	2012	15%	24%
Toronto, ON	mtCO2e	2012	6%	16%
Vancouver, BC	mtCO2e	2012	6%	8%

Sources: The projected reductions were calculated from data in city energy consumption and greenhouse gas inventories as reported in Austin 2011, Fort Collins 2012, Guelph 2013, New York 2013, Tacoma 2013a, Toronto 2013, Minneapolis 2014a, Boston 2013a, and Vancouver 2013.

Beyond determining which communities were on track for goals, our aim with this study was also to better understand the factors present in communities that met their goals and in those that did not. To do so, we chose 11 communities within our 25-community subset to further analyze after we completed the preliminary evaluation of the 79 communities in our original sample. With these 11 cities, we chose to focus on U.S. communities and communities with climate-based goals since climate goals outnumbered energy goals in our original sample. Furthermore, we chose some communities who were on track for their goals and some who were not in order to identify lessons learned from both leaders and laggards. Table 2 presents the 11 communities chosen for this additional analysis along with their progress toward their nearest- and longest-term goals.

Table 2. Status of community-wide goals in 11 communities selected for further analysis

City	Nearest-Term GHG Target			Longest-Term GHG Target		
	Target Year	Target Reduction	Projected Reduction	Target Year	Target Reduction	Projected Reduction
New York	2030	30%	68%			
Tacoma	2012	15%	24%	2050	80%	65%
Minneapolis	2015	15%	22%	2025	30%	47%
Boston	2012	7%	12%	2050	80%	79%
Fort Collins	2012	3%	9%	2050	80%	56%
San Francisco	2012	20%	19%	2050	80%	53%
Portland	2030	40%	12%	2050	80%	19%
Salt Lake City	2020	20%	4%	2050	80%	12%
Seattle	2012	7%	0%	2050	100%	0%
Chicago	2020	20%	–6%	2050	80%	–12%
Boulder	2012	7%	–24%			

Sources: The projected reductions were calculated from data in city greenhouse gas inventories as reported in Fort Collins 2012, New York 2013, Tacoma 2013a, Minneapolis 2014a, SEI 2014, Boston 2013a, San Francisco 2013, Portland 2012, Salt Lake City 2010, ICF International 2012, and Boulder 2011.

Factors in City Progress Toward Goals

To identify the drivers of communities' success or missteps in their progress toward their goals, we sought to understand both exogenous factors and endogenous policy-related actions that could have impacted their performance. For example, progress to reduce GHG emissions in a community could be driven by programs run by the local government to inform residents about how to use less electricity (endogenous) or it could be driven by a decline in population (exogenous). In the section that follows, we first explore exogenous trends for each of our communities to understand the context in which energy savings and emissions reductions were pursued and then assess the contributions made by locally implemented policies.

Exogenous Factors

All else being equal, accelerating population and economic growth has historically led to increased energy consumption and GHG emissions. To identify trends in the local community and its economy that might impact energy consumption and emissions, we gathered information from the U.S. Census on employment, population, and the number of business establishments for the county in which each of our 11 jurisdictions is located for both the baseline year of each city's goals and for 2011 and calculated the change over time in these factors. In order to determine the change over time of three measures of GHG intensity for each jurisdiction—emissions per capita, per employee, and per establishment—the change in these economic factors was compared to the change in GHG emissions between their baseline years and the year of their most recent community GHG inventory.[1]

While our analysis of exogenous factors does not establish causal relationships between any one factor and GHG emissions, it can be indicative of whether economic and population factors had a role in emissions reductions, including any major economic changes in the community that might not have been anticipated when the targets were set. Communities that exhibit both high growth in these economic factors and a significant decrease in emissions likely are not achieving emissions reductions through changes in local economic activity. For example, as Figure 2 shows, Fort Collins and Tacoma are achieving reductions in emissions even with significant economic growth as illustrated by a decrease in emissions per employee. That is to say that the emissions reductions there cannot be attributed to a shrinking local economy. Conversely, the Portland area experienced a lower growth rate for population and establishments and achieved a significant but lower emissions reduction in emissions, but was not on track to achieve their emission goals.

Importantly, all but one of the communities in our sample (Chicago being the exception) experienced a decrease in GHG intensity according to all three of our measures. While this evidence indicates economic growth is generally not a significant barrier to these communities' achievement of their GHG reduction goals, it does not rule out the possibility of other exogenous factors at work, including general improvements in efficiency across the economy, which may be influencing the progress of these communities toward their goals.

[1] If a community's inventory was for 2011 or earlier, we compared the change in GHG emissions to the change in exogenous factors over the same time period. If the inventory was for 2012 or later, we compared the change in GHG emissions to the change in exogenous factors between the community's baseline year and 2011 because standardized county-level data is not available post-2011.

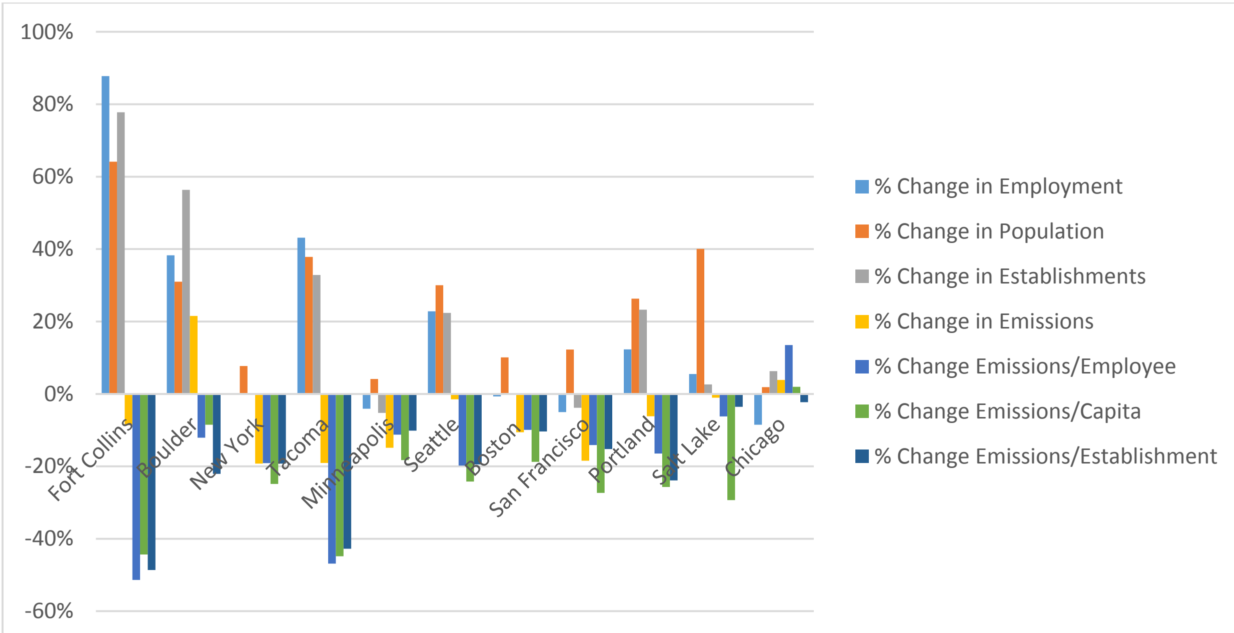

Figure 2. Comparison of exogenous factors to climate goals. *Sources*: The exogenous growth rates displayed were calculated from data from United States Census 2012a, 2012b, and 2013. The emissions data displayed are from data in city greenhouse gas inventories as reported in Fort Collins 2012, New York 2013, Tacoma 2013a, Minneapolis 2014a, SEI 2014, Boston 2013a, San Francisco 2013, Portland 2012, Salt Lake City 2010, ICF International 2012, and Boulder 2011.

Policy-Related Factors

Communities have used a wide variety of policy strategies across different sectors of their local economies to spur energy savings or GHG emissions reductions. For example, increased recycling and composting can reduce emissions from landfills, bicycling and pedestrian infrastructure can reduce cars on the road, home retrofit programs can reduce building energy consumption, and elimination of fugitive emissions from landfills can prevent direct emissions. Communities looking to reduce emissions have also purchased clean electricity or GHG offsets for emissions from outside of their community. Data on GHG emission impacts of specific communities' policies and programs are tracked too infrequently and are sparsely available in public documents, but Table 3 summarizes the impacts of five programs or policies for which specific emissions impacts were available, as reported in inventories and sustainability reports. These programs represent only a fraction of the initiatives being undertaken by communities, highlighting the difficulty of evaluating savings on a portfolio-wide basis.

Table 3. Policy and program-related GHG emissions reductions

City/Baseline Year	Inventory Year	Enacted Policy/Program	GHG Emissions Reductions (mtCO2e)	
			Attributed to Policy/Program (mtCO2e)	Attributed to Policy/Program as % of Overall Reductions
New York City; 2005	2012	Utility program to plug sulfur hexafluoride (SF6) leaks	1,980,000	17.6%
Fort Collins; 2005	2012	Community-wide recycling	149,626	≈ 41.1%
Boston; 2005	2011/2012	C&I Efficiency Programs	> 100,000	≈ 12.5%
Chicago; 2000	2010	Energy Efficient Buildings Strategy	≈ 100,000	≈ 9.7%
Fort Collins; 2005	2012	Electric Efficiency Programs	94,708	≈ 26.0%

Notes: Boston's program-related emissions reductions are attributed to 2012, but the program-related emissions reductions as a percentage of overall reductions are calculated in relation to 2011 emissions, as the most recent community-wide inventory found was for 2011. The contribution of Fort Collins's programs to its overall reductions is estimated because it is unclear how the community calculated avoided emissions and hence which baseline to measure against. Chicago's program-related emissions reductions as a percentage of overall reductions are estimates because changes in Chicago's inventory methodology make it difficult to precisely gauge changes in emissions over time. Sources: The table contains data from city greenhouse gas inventories as reported in Fort Collins 2012, New York 2013, Boston 2013a, ICF International 2012, and Swett, 2013.

As the dearth of research available on impacts of local programs in all but a few cities makes it very difficult to draw direct relationships between policies and emissions reductions, we sought to gauge the influence of policy-related factors by instead focusing on the sectors in each community that achieved the greatest emissions reductions and exploring the policy- and program-related efforts undertaken in those sectors. Table 4 shows the sectors with the greatest emissions reductions in a given community, based both upon the total GHG avoided and in comparison to the baseline emissions for the sector. In the section that follows, we explore specific policies and programs that were implemented by these communities in some of these sectors.

Table 4. Sectors/Sources with largest GHG emissions reductions

City	Largest GHG Reduction as % of Total Community Baseline		Largest GHG Reduction as % of Community's Sector Baselines	
	Sector/Source	% Reduction	Sector/Source	% Reduction
Fort Collins	Waste	10.0	Waste	49.0
New York	Buildings	13.8	Waste and fugitive emissions	50.2
Tacoma	Transportation	9.2	Waste	16.7
Minneapolis	Electricity usage	6.7	Wastewater	31.0
Seattle	Buildings	3.2	Waste	21.0
Boston	Commercial/industrial	7.6	Water and sewer	28.0
San Francisco	Electricity in commercial buildings	10.6	Municipal electricity usage	75.0
Portland	Industrial	4.2	Waste	58.0
Salt Lake City	Transportation (aviation)	1.3	Transportation (aviation)	16.0
Chicago	Natural gas usage	6.0	Stationary and industrial processes	87.5
Boulder	Transportation	3.0	Purchase of GHG offsets	15.0

Sources: According to Chicago GHG Inventory authors, this reduction was due to vastly different methodologies used to calculate emissions in the 2010 inventory as compared to earlier inventories. The percentages displayed were calculated from data in city greenhouse gas inventories as reported in Fort Collins 2012, New York 2013, Tacoma 2013a, Minneapolis 2014a, SEI 2014, Boston 2013a, San Francisco 2013, Portland 2012, Salt Lake City 2010, ICF International 2012, and Boulder 2011.

Waste and Fugitive Emissions

In 5 of the 11 communities in our sample, the sector with the largest percentage GHG emissions reductions as compared to sector baselines was the waste and fugitive emissions sector. Most notably, Portland reduced its emissions by 58% in the waste sector between 1990 and 2010 and tripled the community recycling rate (Portland 2012). The community's Portland Recycles! Plan, originally developed in 2006 and updated in 2008, laid out a comprehensive vision for reducing the community's waste generation and increasing recycling through both voluntary measures and regulatory requirements. Since the plan's release, Portland has taken several steps to reduce solid waste emissions, including requiring commercial food waste collection for some business and instituting weekly curbside food waste and compostable materials collection and recycling for residential homes (Portland 2012). While the wastewater sector in Minneapolis saw the largest reduction compared to its baseline emissions, Minneapolis's solid waste emissions saw the second largest reductions, with a 21% reduction compared to its baseline. The city credits its switch from multisort curbside recycling to one-sort recycling for a 60% increase in recycling volume (Minneapolis 2014b). Furthermore, the switch to one-sort recycling allowed the city to reduce its recycling fleet from 14 trucks to 6 trucks (J. Jenks, Business Application Manager, City of Minneapolis, pers. comm., May 19, 2014). A possible factor in several communities' success in this sector is that action can be required by few outside actors beyond municipal government, providing municipal government with more direct control over the policies and management of these emissions. Other communities, such as New York City, relied on reducing fugitive emissions to bring down emissions. An electricity utility program to plug leaks of sulfur hexafluoride (SF_6) in the electricity distribution system was responsible for decreasing emissions by nearly two million $mtCO_2e$ (J. Khan, Program Manager, City of New York, pers. comm., February 20, 2014; New York 2013).[2] Overall, this program was responsible for more than half of the emissions reductions in New York's waste and fugitive emissions sector.

Electricity Supply

When looking at the sectors contributing to the largest total GHG emissions reductions, there is more diversity in the jurisdictions included. Electricity usage, whether community-wide or within specific end-use sectors such as buildings, is responsible for the largest overall GHG emissions reductions in five communities, namely New York, Minneapolis, Boston, San Francisco, and Seattle. One of the major trends impacting both residential buildings and commercial/industrial buildings, which is cited by multiple jurisdictions as being a reason for their success in achieving GHG savings, is a reduction in the emissions factors of the electricity being supplied. For example, in San Francisco, the community electricity emissions factor decreased from 957.4 pounds/MWh in 1990 to 521.10 pounds/MWh in 2010, which is a reduction of 46% (San Francisco 2013). San Francisco credits the closure of two inefficient power plants for reducing the carbon intensity of the electricity supply and the California Renewables Portfolio Standard for increasing the amount of renewable energy in the electricity supply. Nationally, it is challenging to point to one specific driver responsible for emissions factor changes because the interplay of various factors, including economic growth, energy price fluctuations, weather, and the availability of alternative fuel sources, influence emissions from the combustion of fossil fuels.[3] It is even more challenging to determine the mix of drivers influencing emissions factor changes in municipalities; market forces could be the leading factor in utility fuel switching or state- or locally enacted policies, such as energy efficiency resource standards, renewables portfolio standards, or cap and trade programs, could be responsible for the growth in cleaner fuel sources.

Energy Efficiency

In addition to the role played by the changing electricity supply landscape, energy efficiency also contributed to reduced GHG emissions in several communities. Between 2005 and 2011, Boston's largest emissions reductions occurred in its commercial and industrial building sector. While reduced emissions factors for electricity was a significant driver, Boston's efficiency programs, most notably the Renew Boston Initiative, were also responsible for avoiding over 100,000 $mtCO_2e$ within the sector in 2012 (C. Spector, Director of Climate and Environmental Planning, City of Boston, pers. comm., May 16, 2014; Swett 2013). In partnership with Boston's energy utilities, Renew Boston provides technical assistance and

[2] SF_6 has a 100-year global warming potential of 23,900, meaning that each molecule of SF_6 is equivalent to 23,900 molecules of carbon. Because of its high GWP, reducing SF_6 emissions can be low-hanging fruit for communities to reduce their emissions.

[3] For further discussion of the factors influencing emissions from fossil fuel combustion, see the "Trends in Greenhouse Gas Emissions" chapter of the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2012*.

financial incentives to business and industrial consumers, including free energy analysis and incentives to cover a portion of the costs of efficiency upgrades. While Chicago has not fared well with reducing its overall GHG emissions, the city's efforts to increase energy efficiency as part of the Energy Efficient Buildings Strategy of its Climate Action Plan has been a bright spot. There have been approximately 73,000 residential retrofit projects and 3,500 commercial and industrial retrofit projects that when taken together are estimated to avoid 100,000 mtCO2e in emissions annually (ICF International 2012). Energy efficiency is also being broadly pursued by other communities, including Seattle, where the municipal utility offers various energy efficiency rebates for homes and businesses, and Portland, who partially attributes decreases in energy use per employee by 13% to investments in increased efficiency in commercial and industrial buildings (Portland 2012).

Lessons Learned from Communities

The lack of data regarding the emissions reduction impacts of specific programs and policies prevent us from making the causal linkages that would allow us to devise specific program and policy recommendations. Therefore, the lessons learned we have identified are not program or policy based, but rather more broadly based, structural strategies to facilitate the proper environment for success. While cities that have met their goals or are on track to do so have lessons to share, so do the cities that have not hit their goals, but have put significant effort into their pursuit.

Strategy Development

As our examination of endogenous policy-related factors demonstrated, communities have achieved reductions in different sectors of their local economies. Tacoma's transportation sector experienced the largest reductions in community-wide emissions; furthermore, emissions from on-road vehicles were reduced by 15% between 2012 and 2000 (Tacoma 2013a). Tacoma actively took steps to achieve these reductions by installing metered parking to discourage single-occupancy vehicles and reducing parking minimums in the downtown area (Tacoma 2013b). Boston, on the other hand, focused much of its efforts on its energy efficiency program for buildings, Renew Boston. This highlights the different routes taken by communities pursuing energy or GHG savings. While all of the above approaches may encompass all avenues to achieve savings, communities with limited resources who are looking to prioritize policies or programs may not have the capacity to pursue such a course of action. Therefore, communities would be well served by developing policy-related strategies tailored to the energy consumption or emissions profile of their given community. An exception may be pursing energy-saving or GHG-reducing initiatives in the waste sector as communities universally achieved savings due to their waste management initiatives. In fact, communities may be able to leverage the opportunities in the waste sector to reduce emissions relatively quickly and build momentum for subsequent activities.

City Leadership with Community-Wide Initiatives

Municipal governments in several communities on track to achieving their goals have shown an outward commitment to reducing emissions by creating community-facing initiatives to engage residents regarding their energy-related behavior. Fort Collins created the voluntary

ClimateWise program for local businesses to increase energy savings, reduce waste, and increase alternative transportation through free technical assistance, public recognition, and networking opportunities. In 2012, 163,663 mtCO2e in avoided emissions was attributed to its efforts (Fort Collins 2012). Other similar community-facing initiatives are the GreeNYC platform in New York City and Greenovate in Boston. As the successful Fort Collins example demonstrates, visible, community-wide initiatives not only advertise the municipal leadership's commitment toward goals, but also provide an opportunity to engage community residents in a dialog that can result in significant energy or GHG savings.

Partnering with Community Institutions

Some communities who achieved GHG savings partnered with community institutions to leverage their local government policy and program efforts. Boston regards its partnerships with both its electric and natural gas utilities as part of the key innovations of its Renew Boston Initiative. The electric utility, NSTAR, loans a full-time program manager to the initiative and both utilities provide funding to support outreach work (Boston 2013b). Representatives from both utilities also serve on the Renew Boston Strategy Board. In Portland, the city partners with community organizations to promote its reuse and waste prevention initiatives. For example, a coalition of reuse organizations called ReUse PDX partnered with Portland's Be Resourceful Campaign at several events to promote reuse initiatives (Portland 2012). These initiatives are particularly notable because Boston and Portland successful achieved GHG savings in each sector for which these programs were designed. The success of these partnerships points to the benefits of partnering with key community institutions to further municipal policy efforts.

Measurement and Monitoring

Chicago's 2010 GHG Inventory used a different methodology than the city's previous inventories. Because of the differing methodologies, it is difficult to establish trends in the emissions reductions for some sectors because the recently calculated emissions levels cannot accurately be compared against historical baselines (ICF International 2012). For example, a comparison of stationary and industrial processes' GHG emissions indicates an 87.5% reduction between 2010 and 2000, but the authors concede this reduction figure is due to vastly differently methodologies rather than actual reductions. This discrepancy prevents independent evaluators along with municipal staff from assessing community progress over time. On the other hand, New York City releases annual GHG inventories for both community-wide emissions and city operations emissions. Similarly, Salt Lake City's Sustainable City Dashboard and Minneapolis's Sustainability Indicators are online portals that provide data on a range of energy-related metrics for both communities. Such regular measurement and monitoring allow communities to access progress in certain sectors and inform future decision-making processes. However, all communities could benefit from expanded evaluations of specific policies and programs to gauge the resulting energy and GHG impacts.

Conclusion

Although many communities have demonstrated leadership by adopting energy or climate goals and some have achieved sizeable energy or climate savings in pursuit of these goals, only 11% of the communities we evaluated are on track for at least one community-wide goal and only 5% are on track for all their goals. The remaining communities were not on track for goals, did not have quantitative data that allowed us to evaluate goals, or simply did not have goals. Many exogenous and endogenous policy-related factors can impact energy or GHG savings and the role of these factors varies from community to community, so it is difficult to articulate broad trends regarding the causes of missed targets. However, our detailed analysis of 11 communities who have pursued these types of goals has helped us identify lessons learned that can help prepare diverse communities for improved performance in the future. Also, while the majority of communities are not on track for goals, communities still have time to ramp up their energy savings or GHG emissions-reducing activities because the target dates for many goals are far in the future.

Future research on several topics could flesh out our analysis. A similar assessment with a larger sample size, such as all the communities in the USDN network or all signatory communities to the Mayors Climate Protection Agreement, may provide more comprehensive findings. A more detailed exploration of the policy/program and sector factors from the larger sample of communities could provide additional insights as well. Furthermore, both a reduction in the carbon intensity of the electricity supply and a reduction in the energy intensity of local economies played a role in allowing some communities to achieve energy or GHG savings. Additional research on the drivers of these changes could uncover exogenous or policy-based factors that could prove helpful to communities struggling with their goals. Finally, rather than only evaluating communities against goals they set for themselves, a deeper analysis of the efficacy of the goals themselves may highlight communities that are truly leaders in energy-related programs and policies.

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