

# LOCAL POLICIES FOR GREENHOUSE GAS REDUCTION



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## INTRODUCTION

President Donald Trump's announced withdrawal of the U.S. from the Paris Climate Agreement is a clear shirking of responsibility on behalf of the federal government, but across the country, organizers, activists, mayors, governors and others are only increasing their commitment to the principles of the agreement. Mayors and their cities have many ways to contribute to sound climate policy and carbon reduction. Here we introduce some of the key ways that cities can make a difference in the face of federal inaction.

Local governments have jurisdiction over or significant influence on a number of greenhouse gas emission sources, including building energy use, transportation, water infrastructure, sewer treatment, and waste management. Buildings, for example, account for almost 40 percent of US emissions, and their energy use is subject to municipal regulation in the form of building codes, benchmarking requirements, zoning, and more. Transportation produces 30 percent of US GHG emissions, and is heavily influenced by local planning and investment. Most transit systems are run by local or regional authorities. The waste sector alone is responsible for 2.3 percent of US GHG emissions, and is almost entirely under local control.

One significant role local governments play is to implement and enforce state policy. For example, many states set building codes, but they are almost always enforced by local building inspectors. Local governments decide how many inspectors to hire, how to train them, and where they should spend their time. This can have a significant impact on how well (or not) building energy codes are followed. Local governments also plan and design (and fund, in turns out) the majority of our transportation system, so their street design guidelines have a big impact on the ways that people get around in a given area. And some energy generation is subject to local zoning codes, which can facilitate or impede the construction of solar arrays and wind farms.

Local governments are responsible for designing and building the majority of our infrastructure, and can have significant input even when projects are state- or federally-funded. Our entire water supply, our entire stormwater and sewer systems, are managed at the local level. These use a tremendous amount of energy, and their design and efficiency – which is under the jurisdiction of local governments – can greatly impact GHG emissions. Local governments fund and finance any number of programs, often in the realms of economic development or human services, but can and do use their financial powers to fund projects and programs that reduce GHG emissions. Making sure that various GHG reduction measures, such as energy efficiency, are required when receiving local government funding is an obvious policy tool. One of the most innovative new financing methods for energy efficiency and renewable energy - PACE (property assessed clean energy) relies entirely on the ability of local government to assess infrastructure improvements to properties in their jurisdiction.

Finally, one of the most important powers of local government with regards to GHG emissions is the ability to write and enforce a zoning code, which governs land use and building form – and thus land use density. Local codes and the permits that flow from them can significantly promote or hinder GHG emissions reductions. Local governments issue permits for all sorts of activity, including construction and business

### Important Local Government Roles

In the policy and program examples that follow, these tools come up again and again, in different ways.

Design and build infrastructure, including:

- Streets
- Transit
- Water supply and delivery
- Sewer
- Stormwater
- Urban forest
- Energy supply (in some cases)

Enforce and implement state policy, including:

- Building codes
- Land use planning
- Transportation infrastructure and planning

Zoning and Permitting

Funding and Financing, including:

- PACE
- Loans
- Grants
- Other incentives

operation. For example, installing solar panels or starting a farmer’s market are both likely to require multiple local permits – which can be costly and difficult to get, or not, depending on the attitude of the local government to these activities. In general, city regulations and permits should be designed to make the sustainable thing the easy thing, but this is often not the case.

Despite the many commitments cities, counties and states around the country have made and continue to make, reducing emissions is rarely the central concern in local government decision-making. Even in cities with climate action or sustainability plans, implementation of these plans may be patchy or not connected to other work. It is important to recognize this for at least two reasons: First, it lets us know that one focus of our work with local government is integrating a climate analysis into their decision making processes. Second, it points out the importance of working on specific policies or programs (as opposed to general plans that may not be implemented), and being sure to emphasize the co-benefits of these. For example, improving a city’s transit system and increasing ridership will reduce emissions, but it will also reduce traffic congestion, improve quality of life, and possibly spur development. Energy efficiency efforts will save money and improve comfort in buildings. Building more distributed renewable generation can create local jobs and will keep money in the local economy rather than exporting it to utility headquarters. Local government leaders will often be more motivated by the co-benefits than they are by GHG emissions reductions.

There are also many ways to organize potential polices. One “politician-friendly” list is in Table One. Another, more carbon-focused list better suited to advocates is in Table Two. While this provides a comprehensive view of emissions reductions, some of the initiatives suggested would require or be bolstered by state or federal action.

To implement any one of these requires much more detailed policy information, obviously. Below we present a sampling of that information. We chose policies that address the largest sources of GHG emissions, that are easier to implement, or that are unique to local government. This list is not comprehensive, and we should note in particular that we do not cover programs run by the private sector or actions taken at the grassroots level, which can be an important source of change.

We hope that this report will be a starting place for discussions about what GHG reduction strategies are possible at the local level, and not as an endpoint to those discussions.

**Table 1**  
**To Reduce GHG Emission in your Community**

1	Facilitate and fund energy and water efficiency in government buildings (including joint projects with overlapping/neighborhood jurisdictions) and private residential, multifamily and commercial buildings.
2	Facilitate and fund distributed renewable generation in government buildings and private residential, multifamily and commercial buildings.
3	Reduce your fleet size and convert it to renewable and less polluting fuels.
4	Make transit, biking and walking viable transportation options in your city by improving land use and zoning practices, improving infrastructure, and providing funding for transit operations.
5	Get to zero waste for your own operations, and get as close as possible for the residential and commercial sectors by providing comprehensive recycling and organics collection and processing.
6	Take advantage of all biodigestion and co-generation possibilities in your wastewater management.
7	Protect, preserve and expand the urban forest.
8	If you have a municipal electric utility, or in partnership with an IOU or co-op: incentivize deep and wide energy efficiency; transition your source of power to renewable energy; and incentivize distributed renewable generation.
	<i>Source: COWS</i>

**Table 2  
Carbon Neutral Cities**

<b>Carbon Reduction Strategy</b>	<b>Key Initiatives</b>
Achieve net zero emissions in 100 percent of new buildings by 2030	Net Zero building codes Mandatory building benchmarking Mandatory building commissioning Geothermal heat pumps
Achieve 30-50 percent reductions in 100 percent of existing buildings	Mandatory building retro-commissioning Required retrofitting upgrades at transaction Reduce appliance/equipment energy demand by 30 percent
Achieve 3 percent or more annual improvements in energy efficiency of industrial processes, and reduce building energy use by at least 15 percent	Energy efficiency achieved through equipment upgrades and industrial process/product redesign Building energy use reduction achieved by mandatory retro-commissioning and mandatory retrofitting
Achieve annual net decreases in total Vehicle Miles Traveled (VMT)	To achieve "mode splits" of at least 10 percent bicycles and walking; 30 percent transit and no more than 60 percent individual vehicles: Bike and pedestrian friendly streets Bike sharing and car sharing Increased access to transit Performance based tolling and parking fees Parking restrictions in high density areas Employer-based demand management Transit-Oriented Development
Decrease emissions per VMT by 50-75 percent	Increased vehicle mileage standards Alternative low-carbon fuels (electric vehicles; bio-fuels; hybrids; fuel cells)
Eliminate 100 percent of solid waste disposed of via landfill or incinerator	Mandatory consumer and commercial recycling Single or no-stream recycling (100 percent sorting of all waste) Construction/demolition recycling & reuse Organics composting and waste-to-energy
Achieve 80-90 percent decarbonization of electricity and heating supply	Replace 100 percent of coal fired electricity generation with natural gas or renewables Implement on-site energy generation in 100 percent of eligible structures Development of district energy/heating/cooling in 100 percent eligible densely built areas Implementation of 50+ percent renewable portfolio standards Implementation of shared renewable power purchasing programs Implementation of carbon capture and sequestration methods
Implement efficient land-use planning	Increase residential density through urban growth boundaries and promotion of infill development Ensure availability of at least 6+ acres of open space per 1000 residents
Design municipal infrastructure for low-carbon performance	Deploy smart grids across 100 percent of the municipality Deploy high-efficiency transmission lines across 100 percent of the municipality Use smart infrastructure for 100 percent of city needs Use green infrastructure to reduce the need for gray infrastructure Implement vegetation planting programs

Source: "The Road to 2050: "80 by 50" Strategy Maps for Carbon-Neutral Cities", The Carbon-Neutral Communities Project (March 2013)

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## GOVERNMENT LEADING BY EXAMPLE

We start with policies that will reduce local government's own GHG emissions. While these are usually a relatively small portion of overall emissions, it is politically important for a local government to have taken meaningful, visible steps to reduce its own footprint. Without having done so, it is difficult to ask residents and the private sector to reduce theirs. Actions taken by local government are an excellent education opportunity as well, for both employees and residents. Governments should be sure to publically tell their stories with respect to these policies and programs. Most of these actions also have the benefit of positive lifecycle costs – that is, they will pay for themselves over a timeframe relevant to local government. However, some communities will still struggle to cover up-front costs, in which case they may need to look to federal funds; grants; or financial instruments like qualified energy conservation bonds, municipal leases, or energy service contracts.

### GHG REDUCTION TARGETS

Successful programs are the result of political leadership—little at scale is likely to happen without it. Setting goals for greenhouse gas reduction, such as, “Our city will be powered with 50 percent clean energy by 2020” or “We will reduce GHG emissions 80 percent by 2050” provides a clear direction for utilities, residents, and local businesses to follow. Mapping out the steps necessary to achieve that goal is also important. Many cities have climate action plans or have signed climate protection agreements, but these plans must have some muscle behind them. Far too often they remain entirely aspirational.

New York City's "30x17" plan aims to achieve the ambitious goal set forth in PlaNYC to reduce municipal GHG emissions 30 percent by 2017. The 30x17 effort is managed by Department of Citywide Administrative Services Energy Management group and is expected to reduce municipal GHG emissions 1.05 million metric tons from the base year of 2006. The plan sets specific emission reductions goals for various aspects of municipal operations, including fleet, solid waste management, street lighting and wastewater treatment plants, and improvements to the City's existing building stock through the retrofitting of inefficient building systems and the implementation of best practices around operations and maintenance. Additional GHG emissions reductions will come from the installation of clean energy solutions, such as distributed generation and solar photovoltaic.<sup>1</sup>

The City of Eden Prairie, MN adopted the 20-40-15 initiative in 2006. The initiative commits the city to improving energy efficiency in all facilities by 20 percent and increasing the fuel efficiency of its fleet by 40 percent by 2015. The city is using performance contracting to improve the efficiency of its building stock, and has moved to LED lighting for its traffic signals. There is a public education component to the campaign as well, encouraging residents and business to follow the lead of the city.<sup>2</sup>

Goal setting and planning can have significant results. Bellingham, Washington, set a goal in 2007 of reducing greenhouse gas emissions 64 percent by 2012 and 70 percent by 2020, relative to consumption in 2000.<sup>3</sup> It currently buys 100 percent renewable power for all city facilities and has installed rooftop generation on some city buildings. Local university students agreed to raise tuition slightly so that the Western Washington University campus would be powered entirely by renewable energy.<sup>4</sup> The city government also sponsored a community green power challenge, resulting in the purchase of enough green power to meet 11 percent of the community's total energy use. The additional cost of this generation is partially offset by the comprehensive energy retrofit and new construction—Leadership in Energy and Environmental Design, or LEED only—programs the city runs.<sup>5</sup> Additionally, since so many community members signed up for clean energy, the utility was able to negotiate bulk purchase rates, lowering the premium paid by consumers for clean generation by 40 percent.<sup>6</sup> A preferential loan program for solar-energy installation has been created for local businesses.<sup>7</sup> The city additionally supports energy efficiency in a variety of ways, including energy-efficiency challenges, energy-efficient land-use planning, and technical assistance to the public on how to construct green buildings.<sup>8</sup>

## ENERGY EFFICIENCY

Publicly controlled buildings—the city halls, transit centers, schools, universities, sewage treatment plants, and all other government buildings controlled by state, county, or local governments—waste a lot of energy. Potential savings are vast: There are almost 140,000 entities in this sector in the United States, including state and local governments, school districts, colleges and universities, and medical institutions. We estimate that these entities control about 16.5 billion square feet of floor space and use about 3.87 quadrillion BTUs a year at a cost of about \$40.7 billion.<sup>9</sup> In Minnesota alone, public buildings that have been benchmarked through the State’s B3 system could save 2,406,786 MMBTU/yr or \$31.2 million annually with just a 15 percent improvement over the 2004 ASHRAE standard.<sup>10</sup>

Cities control many buildings directly and should make them the starting point for an energy-efficiency program. They are an important way for governments to save money to support critical programs in a tough economy. And they are particularly accessible: there is a single point of control for many buildings; elected officials are the relevant decision makers and thus public pressure can be a driver; there is a developed market with firms ready to do the work; and there is usually low-cost public financing available.

### Benchmarking and Disclosure, Audits and Retrofits

Before cities can take steps to reduce energy consumption in their own facilities, they need to know where and how energy consumption is taking place. As a first step, all public buildings should benchmark and disclose their energy use via a system like EPA’s Portfolio Manager. Cities can use this information to inventory current energy and water use and identify where potential savings exist. Moreover, leading by example, cities that adopt policies can demonstrate their effectiveness and value in their use and create structures that facilitate retrofits in the institutional and commercial space. Once the necessary changes to government buildings and facilities are known, cities should prioritize retrofitting and upgrades based on the outcomes of the audit. To pay for the audits and retrofits, cities can generally access relatively cheap capital through bonding, grants, or other sources. Finally, to ensure all new buildings used by cities are maximizing energy use, cities should implement green building requirements for all buildings owned, funded, or rented by the city, giving preference to net zero buildings.

### Green Building Policy

Cities should require that publicly owned, used, or funded buildings meet certain LEED ratings under the U.S. Green Building Council’s Green Building Rating System. LEED ratings “assess the environmental performance of built projects across a spectrum of key criteria. From water and energy use efficiency to location, the impact of materials used, and more, LEED is intentionally designed to recognize buildings that go beyond minimum code compliance.”<sup>11</sup>

The District of Columbia, for example, requires that all non-residential public buildings meet the LEED Silver certification standard for environmental performance.<sup>12</sup> Saint Paul, Minnesota’s sustainable building policy lays out clear

### Energy Efficiency in Public Facilities

Consider the following policies:

- Benchmarking
- Disclosure
- Investment-grade audits
- Building upgrades
- Retrocommissioning
- Green Building requirements
- Lighting improvements

Don’t neglect water efficiency:

- Fix infrastructure leaks
- Reduce building and landscape water use

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*Minnesota public buildings  
could save 2,406,786  
MMBTU/yr or \$31.2 million  
annually*

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requirements that any municipally-owned building, and any building receiving substantial municipal funds for construction, must comply with.<sup>13</sup>

Going one step further, where possible, cities should exceed code requirements by setting net zero targets for public buildings. In December 2013, Cambridge, Massachusetts established the “Getting to Net Zero Task Force.”<sup>14</sup> To provide guidance for the process, a committee of “residents, community advocates, business and property owners, developers and representatives of local universities” will work collaboratively with technical consultants to develop recommendations.<sup>15</sup>

### Upgrade Lighting

In addition to upgrading their building stock, cities can also save a good deal of both energy and money by upgrading public lighting on streets and parking lots. Street lighting on average is 26 percent of municipal energy consumption in smaller communities<sup>16</sup> and can consume between 20 and 40 percent of public road budgets.<sup>17</sup> Nationwide, approximately 44.9 million street lights currently use 52 TWh/year of electricity and represent 7 percent of all lighting energy use.<sup>18</sup> If all of these street lights were converted to LED technology, the estimated energy savings would be 17.2 TWh/year.<sup>19</sup> In addition to the monetary and energy/emissions impacts, an outdoor lighting project is one of the most visible energy efficiency projects a community can undertake and can have significant PR and educational value.

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*Street lighting on average is 26 percent of municipal energy consumption in smaller communities*

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Cities should consider streetlights, traffic lights, and all outdoor lighting (parking lots, playing fields, building exteriors, etc.) that are under their control. One note – street lights may be controlled by local utilities rather than the municipality, and thus upgrading them may require that utilities cooperation. Effective energy-efficient lighting design integrates efficient lamp technologies, optimum pole placement, efficient fixture light distribution, and aesthetics while using the least amount of energy and meeting various requirements for visibility and appropriate light levels. In addition to energy savings, upgrading outdoor lighting has a surprisingly wide range of benefits, including:

**Capital cost savings:** using the proper spacing and placement can reduce the capital costs because more efficient systems can use fewer poles and lights

**Maintenance cost savings:** using modern lamps with longer lives and layouts with proper spacing and placement means reduced costs for fixing burnouts and painting or replacing damaged poles, resulting in lower annualized costs even when initial capital costs are more expensive.

**Improved sense of security:** election of efficient equipment and incorporating proper design can make an area appear safer and more secure, and in some cases can assist in reducing crime without increasing light levels.<sup>20</sup> In fact, light levels that are too high will not make an area seem safer. Direct glare and high light levels can reduce perceptions of safety by making visibility more difficult.<sup>21</sup>

**Reduced glare and improved visibility:** overly high light levels often create unwanted glare that decreases visibility. Good lighting design can improve visibility by avoiding overly bright and dark patches on roads and walkways, enhance detection of pedestrians by drivers and increase seeing distances beyond those provided by automotive headlights alone.<sup>22</sup>

**Economic development:** Street lighting can be an important part of economic development efforts, particularly in downtown business districts.

On this last point, projects in urban commercial areas allow lighting systems that can help increase business attracting customers and providing a sense of safety, in addition to meeting motorists' needs. Lighting should illuminate storefronts, points of interest, building facades and make people feel comfortable and secure. City planners and engineers should work with local businesses and residents to evaluate the existing lighting and the needs for new lighting.

In addition, upgrading lighting allows cities to address the problem of excessive light, including unwanted light that shines on property beyond the intended target and light pollution that contributes to sky glow. Both light trespass and light pollution should be carefully addressed, which may mean limiting pole height and placement, and luminaire and lamp selection. The International Dark Sky Association offers general guidelines for urban communities,<sup>23</sup> and links to a number of communities that have passed dark-sky compliant lighting ordinances.<sup>24</sup> Laguna Beach, CA for example passed a "Good Neighbor Outdoor Lighting" ordinance that includes comprehensive specifications for all outdoor lighting.<sup>25</sup>

Another innovation just making its way onto the market is networked lights. Without a network, there's no way to tell whether lights are still working or have broken down, resulting in certain lights being inadvertently left on all day. Connecting lights to a network can offer real-time control of whatever functionality the light itself offers. For LEDs, which can instantly dim themselves to various mid-points to save energy, brighten, or blink on and off to guide police and paramedics to the scene of an accident or a crime (many city LED streetlight projects have been centered around public safety)<sup>26</sup> this can contribute significantly to energy savings. Some analysts estimate that networked lighting can cut 30 percent out of energy use of existing streetlight systems, as well as drive a 20 percent reduction in operations and maintenance costs through more visibility into the assets and how they're operating.<sup>27</sup> Having sensors connected to your streetlights also allows you to collect data on energy use over time, both for operations and budgeting purposes and for preventative maintenance and predictive replacement. That's an important longer-term benefit that adds up over the decades-long lifespan of each new luminaire, both in reduced costs and reduced employee-hours spent and fuel burned on emergency truck rolls.

Larger cities can often pay for lighting upgrades out of existing capital budgets. The City of Los Angeles, for instance, installed more than 141,000 LED streetlights – cutting energy use by 63 percent and saving the city \$7 million a year in electricity costs.<sup>28</sup> For smaller communities, utility financing is a good option. The City of Algona, Iowa installed 447 LED lights. Algona Municipal Utilities provided up front funding via a 0 percent interest loan, labor, and project management. The City of Algona will pay back the project cost over six years. The project is expected to result in annual energy savings of approximately 234,254 kWh (42 percent savings), and extend the life expectancy of municipal street lights to greater than 20 years. The city expects to realize a simple payback well within the life of the fixture based on energy savings alone. In addition, the new luminaires are expected to yield significant annual operation and maintenance savings for the participating communities.<sup>29</sup>

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*25 hybrid street lights will save an estimated 500,000 KW of electricity and reduce carbon dioxide emissions by almost 350 tons*

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As with other energy efficiency measures with relatively short payback times, ESCOs or vendor financing are other options. Note that when considering payback and financing, cities should conduct a full life cycle economic analysis to identify capital, operations, and maintenance costs. Lifetime energy savings and total costs should be highlighted to make sure initial cost is not the only determining financial factor.

Lighting installations can also be good candidates for renewable energy projects. The city of Downers Gove, IL installed a hybrid solar and wind powered street lighting system in its Prentiss Creek subdivision. Over a period of thirty years, the 25 hybrid street lights will save an estimated 500,000 KW of electricity and reduce carbon dioxide emissions by almost 350 tons, when compared to a conventional street light system.<sup>30</sup>

### Water Efficiency

Delivering water and wastewater services is an energy-intensive effort, as the water is treated, pumped to our homes and businesses, then pumped to wastewater facilities to be treated again. With pumps, motors, and other equipment operating 24 hours a day, seven days a week, water and wastewater facilities can be among the largest consumers of energy in a community, and thus among the largest contributors to the community's total GHG emissions. Nationally, the energy used by water and wastewater utilities accounts for 35 percent of typical U.S. municipal energy budgets.<sup>31</sup> And drinking water and wastewater systems account for approximately 3–4 percent of energy use in the United States, resulting in the emissions of more than 45 million tons of GHGs annually.<sup>32</sup> Overall, the treatment, transportation, heating and cooling of water accounts for about 13 percent (12.3 quadrillion BTUs) of the United States' annual energy consumption.<sup>33</sup> Pursuing efficiency in our water systems can both reduce emissions and significantly reduce operating costs.

### System Efficiency

There are a variety of steps that municipalities can take with regard to their own facilities. Nationally, average system water loss – water that is leaking out of the distribution system before reaching end users - is 16 percent,<sup>34</sup> and it can be as high as 30 percent.<sup>35</sup> Municipal water facilities should begin by detecting and fixing leaks in the distribution system, reducing the amount of water that needs to be treated and distributed. Wastewater facilities should improve efficiency of aeration equipment, which typically accounts for about half of a wastewater treatment plant's energy use. The use of improved system controls, energy-efficient blowers, and energy-efficient diffuser technologies can reduce costs in this area. The Green Bay, Wisconsin Metropolitan Sewerage District installed new energy-efficient blowers in its first-stage aeration system, reducing electricity consumption by 50 percent and saving 2,144,000 kWh/year—enough energy to power 126 homes—and avoiding nearly 1,480 metric tons of carbon dioxide equivalent, roughly the amount emitted annually by 290 cars.<sup>36</sup>

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*Nationally, the energy used by water and wastewater utilities accounts for 35 percent of typical U.S. municipal energy budgets*

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All water facilities should maximize pumping efficiency by ensuring that pumps are sized appropriately and installing technology that allows pump speed to vary to match flow conditions. Installing energy use monitoring—or Supervisory Control and Data Acquisition (SCADA)—software can allow more efficient process monitoring and operating control. And of course, all municipal facilities should undertake general energy efficient retrofits as discussed above. Water and wastewater facilities that construct or renovate to green building standards can achieve energy efficiency improvements in lighting, heating, and air conditioning, complementing the improvements achieved through upgrades to the facility's operating equipment.

In general, the same strategies that apply generally to energy efficiency improvements also pertain to municipal water facilities.<sup>37</sup> These include benchmarking and conducting an energy audit; prioritizing upgrades based on the result; setting targets; careful planning; implementation; monitoring; and

reevaluation and continuation of the programs. The most effective way for communities to improve energy efficiency in their water and wastewater facilities is to use a systematic, portfolio-wide approach that considers all of the facilities within their jurisdiction. This approach allows communities to prioritize resources, benchmark and track performance across all facilities, and establish cross-facility energy management strategies. A portfolio-wide approach not only results in larger total reductions in energy costs and GHG emissions, but enables communities to offset the upfront costs of more substantial energy efficiency projects with the savings from other projects.

As municipally-owned or -influenced facilities that usually have a large physical footprint, water treatment plants are also good candidates for

installation of renewable energy facilities. In particular, wastewater treatment plants offer an excellent opportunity for implementing anaerobic digestion, heat recovery and/or combined heat and power systems. In Sheboygan, Wisconsin, the Regional Wastewater Treatment Plant produces nearly all of its energy on-site through a combination of efficiency, cogeneration, and biodigestion, in a project that paid for itself through savings in seven-and-a-half years.

These facilities are often good candidates for large solar installations as well. For instance, the Western Branch Wastewater Treatment Plant in Upper Marlboro, Maryland and the Seneca Wastewater Treatment Plant in Germantown, Maryland each installed 2 MW ground-mounted PV installations to power the two facilities. Together, the solar arrays at the two plants are expected to generate approximately 6.6 million kWh of solar energy each year, providing 12 to 21 percent of the electricity required to operate the two plants and saving ratepayers approximately \$3.5 million over the life of the agreement. The systems are also expected to help reduce carbon dioxide emissions equal to avoiding the use of approximately 358,680 gallons of gasoline each year. Both projects are the result of a public-private partnership with Washington Gas Energy Systems and Standard Solar, Inc. Washington Gas Energy Systems will own and operate the solar installations under a 20-year power purchasing agreement.<sup>38</sup>

In addition, as with many such improvements, the projects that make a water or wastewater treatment facility more energy efficient often require significant up-front investment. Cities should consider the financing tools discussed earlier, including energy performance contracts and ESCOs; municipal leases; revenue and general obligation bonds; and revolving loan funds. Municipal utilities can also consider increasing rates to end users in order to fund energy-efficient upgrades to the plant, perhaps in conjunction with conservation pricing, discussed below. Note that in some states (e.g., Wisconsin), municipal water utilities must get approval from the state Public Service Commission or equivalent in order to change rates.

### Reduce Water Use and Runoff

Cities should lead by example by minimizing water-intensive landscaping on public property and in parks. Cities can start by making someone on staff responsible for landscape issues and provide training opportunities relating to natural landscaping; developing a multi-year program for retrofitting

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*The Green Bay, Wisconsin Metropolitan Sewerage District installed new energy-efficient blowers in its first-stage aeration system, reducing electricity consumption by 50 percent and saving 2,144,000 kWh/year—enough energy to power 126 homes—and avoiding nearly 1,480 metric tons of carbon dioxide equivalent.*

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natural/low-water landscaping on existing sites; using in-house landscape staff or outside professionals to develop plans for new and existing sites; developing policies and specifications for new site planning to encourage the use of low-water landscaping; and utilizing natural landscaping, especially to remedy situations where traditional turf landscaping is causing difficulties (e.g., eroding gullies or stream channels).<sup>39</sup>

Cities should prioritize investments in green infrastructure that reduces water consumption and uses natural processes to deal with water, such as greywater recycling, green roofs, porous pavement, tree planting, bioswales, rain gardens, water capture, and reducing infiltration and inflow to existing water systems. For instance, local governments should consider employing the following approaches on their own properties and in their maintenance of existing public facilities:

*Green roofs:* Covering roofs with plants that process precipitation on-site has a host of benefits. Most immediately, green roofs can process a significant proportion of precipitation on-site, reducing runoff and demand on traditional storm water management systems. For low-intensity periods of rainfall—half an inch or less—green roofs can completely absorb the precipitation. For more intense rainfall, green roofs diminish flow rates and retain water, slowing runoff.<sup>40</sup> Green roofs also reduce building heating and cooling costs by absorbing heat— or, reducing thermal absorption by nearly 100 percent—and insulating the building by making the structure more energy efficient. They increase air quality, absorb carbon dioxide, provide habitat for fauna, and can frequently provide quality public spaces. Maintenance can be more expensive, though this may be offset by the possibly longer lifespan of a green roof compared to a traditional one. In many areas of the country, energy savings can also be a significant offset.<sup>41</sup> Chicago's city hall green roof is a pioneer example of green roof technology. It significantly reduced the urban-heat island effect, staying as much as an astonishing 100 degrees cooler than an adjacent conventional roof and saving \$5,000 annually in energy costs.<sup>42</sup>

*Permeable pavement:* Replacing existing pavement with permeable pavement and using it in new construction immediately reduces one of the largest sources of runoff. An area equivalent to the size of Ohio is covered in nonporous surfaces in the United States—primarily infrastructure devoted to cars.<sup>43</sup> Every nonporous paved surface drains nearly every drop of precipitation that lands on it directly into a city's storm-water system. By addressing at least some of this on-site through porous pavement, storm water processing can be reduced, existing infrastructure is more effective, groundwater is recharged, and surface water is protected. Middleton, WI is using permeable pavement for trails and street terraces.<sup>44</sup>

*Rain Gardens and Bioswales:* Bioswales are depressions filled with vegetation that allow precipitation to pool, gradually be absorbed, or slowly discharged into storm water systems if they become overwhelmed. They are highly effective ways of dealing with runoff from large paved or impervious areas. Rain gardens are similarly designed in areas where rainwater will collect, using deep-rooted plants to absorb and process rainwater on-site. Both recharge the water table, process silt, increase air quality, provide habitat, and capture carbon dioxide.

As described earlier, cities should audit all municipal buildings for energy and water use on a regular cycle and prioritize upgrades and/or retrocommissioning, then require and support water upgrades based on that prioritized list. Cities should also move toward implementing green building requirements for all

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*Chicago's city hall green roof significantly reduced the urban-heat island effect, staying as much as an astonishing 100 degrees cooler than an adjacent conventional roof and saving \$5,000 annually in energy costs.*

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buildings the city owns, funds or rents, including water-efficient appliances and equipment as well as low-water landscaping.

## RENEWABLE ENERGY AND FUELS

GHG emissions from power generation are one of the most significant sources at the local level. While local governments represent only a portion of the energy consumption of their communities, it is important that they lead by example and reduce their GHG footprint by reducing the amount of energy they use from conventional sources.

### Fleets

Cities can reduce the GHG emissions associated with their fleets by right-sizing the fleet, improving vehicle fuel efficiency, and transitioning to lower-emission fuels. They may also implement a no-idling policy for city vehicles (or for all commercial vehicles). Each of these strategies should be considered, as they are compatible with each other.

Right-sizing a fleet simply means choosing the vehicle with the lowest environmental impact that can still perform as needed, and only providing as many vehicles as are critical to do the job. For example, cities may want to consider if it is necessary for managers to have a city-owned vehicle available to them, and if passenger vehicles can be replaced with the most fuel-efficient models available. One way to decrease demand for fleet vehicles is to encourage employees to walk, bicycle, or take transit in the course of their work. Another is to contract with car or bike sharing companies to replace some of the fleet. Cities should also implement transportation demand management (TDM, see below) policies for employee commuting. In 2006, Eden Prairie, Minnesota set a goal of increasing fuel efficiency of its fleet 40 percent by 2015. By 2012 they had employed an array of strategies and were 2/3 of the way to that goal.<sup>45</sup>

Automotive electrification has considerable long-term potential to reduce GHG emissions. When transitioning to electric or clean fuel vehicles, a city should review its electric grid and identify ways it can be made cleaner (see the renewable energy sections of this memo). Cities can re-write procurement policies to encourage the purchase of electric and/or plug in hybrid vehicles as municipal fleet turns over and new purchases are made. These efforts can be expanded to include installation of charging stations that can be available to both city staff and the public. Alternatively, cities may consider standard hybrids, or vehicles that run on natural gas or ethanol. Practically, most fleets will contain multiple types of vehicles running on a diversity of fuels.

### Distributed Renewable Generation

Local government can leverage the real estate it owns by installing renewable energy generating capacity to reduce its electric and heating bills. Because government generally owns buildings for decades, the pay back on such an investment is clear. Local leaders should consider all types of land and buildings as candidates for renewable energy generation sites. Parking garages and lots are obvious locations for solar PV arrays. Facilities that use a lot of hot water, such as fire stations or pools, are good candidates for solar thermal. Larger parks may be able to accommodate wind turbines. New construction or significant renovation of buildings is the perfect opportunity to consider geothermal heating. Wastewater treatment plants are a natural fit for biodigesters (as discussed above). Landfills can capture and use methane

### Low Carbon Energy

Local governments can power their operations using low carbon energy sources that they generate or purchase.

Transportation:

- Municipal fleets should be right-sized
- Vehicle purchases should consider efficiency and low-carbon fuels in addition to function
- Cities should implement transportation demand management policies for employees to encourage alternative modes of commuting

Renewable Energy:

- Consider solar PV for buildings, parking garages and lots
- Consider solar thermal for pools and fire stations
- Consider geothermal for new construction
- Capture methane from landfills
- Install biodigesters and CHP in wastewater treatment plants

emissions. In short, each facility should be examined for its potential to host a range of renewable generation, and a cost-benefit analysis should be conducted.

In general, legislative policy is not needed to implement this strategy. However, a budgetary appropriation is essential unless some third-party private financing or leasing deal is possible, and direction from the executive office or the legislative body is useful. Local governments may want to include renewable generation in their asset management, facilities and/or sustainability planning. It may be difficult to convince some lawmakers to make an up-front investment, so good data about payback times and utility bill savings is essential. Leaders may also want to consider alternative financing structures like power purchase agreements, or dedicated funding sources like QECBs, where allowed and available. If the municipality has invested in energy efficiency, savings from those projects can be re-directed to renewable energy investments. Leaders should consider bundling efficiency and renewables projects to improve payback times and potentially reduce the size of the renewable installation as well. In some places, basic education about how renewable technologies work, their reliability, and cost-effectiveness may be needed. In general, state pre-emption will not be an issue, although some financing methods may not be available in some states. The City of Reno, Nevada combined energy efficiency with solar and wind generation into a \$20 million project that will save them \$1.3 million a year, and has retained or created 279 jobs.

## LAND USE - SITING PUBLIC FACILITIES

Due to the traffic they generate and their outsized impact on local transportation systems and community development, the location of schools and other public facilities significantly impacts greenhouse gas emissions. Although all buildings, public and private, help to shape their communities, those that draw the most people with the greatest frequency have the greatest impact. Local governments should site facilities used by the public in places that are easily accessible by multiple modes, especially transit, and in a way that reinforces their land use policies and goals.

### Land Use

Consider transportation issues when siting public facilities.

Schools are one of the most important drivers of local traffic congestion. Schools have much greater impacts on their communities today than they did in the past due to changes in school size, student transportation, and residential development that occurred throughout the twentieth century. Today's larger, dispersed schools tend to be out of walking and biking range for most students. In 1969, 87 percent of students lived within one mile of their school; by 2001 only 21 percent of students were within a mile of school.<sup>46</sup> Remote locations for new schools contributed to the increase, as did lower-density residential development.

Along with their more distant locations, many new schools lack bicycle and pedestrian infrastructure for students, are accessible exclusively by major roadways, or are separated from the communities they serve by busy streets, large setbacks, or other impediments. All of these factors limit the ability of students to get to school by foot or by bike. In 1969, 48 percent of students in the U.S. walked or biked to and from school,<sup>47</sup> today the portion of students walking and biking to and from school has fallen to just 8 percent.<sup>48</sup> Currently among all students, 62 percent ride in a car to school and 26 percent take the bus.<sup>49</sup> Even among students (age 5 to 15) living within one mile of school, only 31 percent walk or ride a bicycle to school, while 13 percent ride the school bus, and 55 percent travel by car.<sup>50</sup> Because students are usually driven to and from school by their parents, transportation for each student often requires two full round trips each day, exacerbating congestion and emissions.

Locating schools and other public buildings in locations that are accessible by foot, transit, and bike reduces GHG emissions while spurring physical activity and lowering public infrastructure costs. Renovation and reuse of existing facilities is often the lowest cost option for schools and other public buildings when transportation costs and property values are taken into account. At the very least, ensuring that the locations of new schools and public buildings are in keeping with local comprehensive plans can help communities avoid the unexpected costs associated with poorly planned development.

States vary widely in whether they require school districts to consult with other levels of government or abide by local zoning ordinances when choosing sites for new school buildings. However, policies at the state, county, or local levels that mandate coordination between school districts and other levels of government prior to school construction and promote student transportation by bus, bike, and foot can be helpful. Making school districts take responsibility for, or explicitly consider, new costs resulting from their siting decisions, such as off-site roadway and pedestrian improvements required to support new schools, is another way to incentivize smarter school site selection.

## FORESTRY

Local government can help to remove carbon dioxide from the atmosphere by maintaining a healthy and expanding urban forest. According to EPA estimates, urban forests sequester 88.5 million tons of carbon a year, and are currently storing 700 million tons of carbon.<sup>51</sup> Over 50 years, an acre of urban forest can sequester 55-65 metric tons of carbon.<sup>52</sup> GHG reductions are only achievable over the long run when a population of trees remains stable or increases; if trees are removed and not replaced, any reductions will be fleeting.<sup>53</sup> Local policies should be directed to planting and maintaining healthy and long-living public trees, and to promoting tree planting on private property.

### Tree Protection

For an urban forest to draw carbon dioxide out of the atmosphere, its trees must be healthy, long living, and increasing in number. ICLEI has produced an Urban Forestry Toolkit for Local Governments that provides helpful management guidelines.<sup>54</sup> Local governments should select planting locations that provide ample access to soil nutrients, and choose species that are diverse, low-maintenance, and well-adapted to local conditions. Trees need adequate soil volume to thrive, particularly when planted in areas that are otherwise paved. To ensure this, cities like Denver, Chicago and Baltimore have passed soil volume requirements.<sup>55</sup> Another common threat to the urban forest is construction. Toronto has fairly extensive tree protection requirements that regulate construction activities.<sup>56</sup> ICLEI also recommends developing a database to help define, detect, and predict the health and status of an urban forest.

### Tree Planting

In order to address the logistical challenges of tree planting and maintenance, cities can engage in public-private partnerships. In Chicago, the Treekeepers program, run by the Openlands nonprofit, teaches residents how to plant and care for trees. Certified volunteers may then take part in workdays in the city's parks and county forest preserves.<sup>57</sup> In Hennepin County, Minnesota, the parks system has teamed up with the nonprofit Tree Trust to host a job-training program in exchange for help with maintenance and planting. Young adults in the program spend spring and summer months planting trees and shrubs, while also receiving stipends and personalized training in life skills.<sup>58</sup>

Local government can also take steps to promote tree planting by private parties. A tree preservation ordinance for new developments and redevelopments can require the preservation of existing trees, tree replacement, or payment of a fee for each tree removed. The International Society of Arboriculture has produced a helpful set of guidelines for developing and evaluating tree ordinances.<sup>59</sup> Local government can also reduce the cost of planting trees on private property, or even provide incentives for doing so. The New York City Million Trees initiative, in addition to planting hundreds of thousands of trees along streets and in parks, gives away free trees to people who agree to plant them in the ground, but *not* in a park or along a street.<sup>60</sup> In San Antonio, the municipal electric utility offers customers rebates for planting trees that will shade their houses, and thus reduce electric demand in the hottest times of year.<sup>61</sup>

### Urban Forests

Trees help sequester carbon and reduce energy use in adjacent buildings.

- Protect and nurture trees on public land
- Set soil volume standards
- Include tree protection in construction contracts
- Plant trees on public lands
- Encourage or require private sector tree planting

## PURCHASING

In addition to owning and regulating buildings, cities purchase numerous products for day-to-day operations, building functions, and more. These products represent a significant portion of city energy consumption. For example, lighting systems account for approximately 15 percent of energy use in government buildings,<sup>62</sup> everyday office equipment can consume up to four percent of a government building's electricity use, and data centers account for approximately three percent of the total electricity consumption in the U.S. Specifying energy efficient or other climate-friendly purchasing requirements can have a large impact.

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*Lighting systems account for approximately 15 percent of energy use in government buildings*

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When considering whether to adopt this policy cities should be aware that they may face obstacles and push-back. Purchases may be made by a variety of departments or individuals, necessitating broad education on the new policy. Purchasing departments may be reluctant to embrace the policy because, despite many energy efficient products being offered at equivalent prices, there may be higher first-cost for some products.<sup>63</sup> Moreover, one of the most difficult obstacles facing cities wishing to adopt an energy efficient procurement is the long-held tradition of allowing vendors and manufacturers to be chosen through a bidding process focused on the bidder with the lowest purchase price. However, cities can argue that, though this may reduce the initial cost of the product, on ongoing direct and indirect product costs will increase because of decreased efficiency.<sup>64</sup> In fact, it rarely serves cities to purchase on price alone, and the procurement process should include information about quality, operations and maintenance costs, and lifecycle costs.

### Energy Efficient Products

By requiring that products purchased by the city are energy efficient, such as ENERGY STAR labeled products, cities can reduce energy consumption and emissions. Using energy efficient products can reduce facility energy costs by at least 5-10 percent.<sup>65</sup> For example, using 100 energy-efficient light bulbs in place of conventional light bulbs can result in a reduction of 31.5 metric tons of carbon dioxide emissions over the life of products.<sup>66</sup> This can lower overall maintenance costs<sup>67</sup> - on average, LED lighting last 35 to 50 times longer than conventional incandescent bulbs.<sup>68</sup> In addition to adopting internal department policies, cities can adopt an overall energy efficient procurement policy through council resolution or through executive order or initiative. For example, the mayor of Lansing, Michigan implemented an energy efficiency procurement policy through the issuance of a 2007 executive order requiring agencies to purchase ENERGY STAR products.<sup>69</sup>

## Low-Carbon Energy

Another way cities can use and leverage their procurement powers is through the purchasing or creation of low carbon energy from utilities for local government use. Electricity production using fossil fuel combustion accounts for 40 percent of all the carbon dioxide emissions in the U.S.<sup>70</sup>

Not only will using green power help reduce emissions, but it also allows cities to demonstrate their leadership in an area of ongoing concern by raising public awareness about the importance and benefits of green power, as well as providing some insulation for cities

against the volatile fossil fuel market.<sup>71</sup> Additionally, using green power may lead to increased employment for cities because facilities generating renewable energy may be located closer to the end user.<sup>72</sup> Cities can purchase directly from a utility using a green pricing or green marketing program.<sup>73</sup> These allow a city to pay a small fee in exchange for purchasing electricity generated solely from green power resources.<sup>74</sup>

In 2007 the mayor of Lansing, Michigan issued an order to require 10 percent of city government's energy demand be met with renewable energy.<sup>75</sup> Also, in 1999, Austin, Texas passed a resolution establishing a renewable energy goal for the city electric utility of providing 5 percent of the energy it supplies from renewable sources.<sup>76</sup> Another option cities may consider is the EPA's Green Power Partnership or Green Power Communities program.<sup>77</sup> Although not exclusively focused on procurement, the program encourages the use of green energy. Under the program, local governments partner with the EPA to establish policy and practices in renewable energy use. The goal of program is to encourage cities to work with businesses and residents to collectively meet or exceed green power use amounts under the EPA's Green Power Community purchase requirements.<sup>78</sup>

## Recycled Content

Cities can also lead by example in procurement by integrating a recycled content requirement into the city purchasing policy for paper and other materials. A policy of this kind should require city departments to purchase recycled products whenever practicable. As part of the policy, the appropriate city official should be directed to compile a list of recycled products or products that include recycled materials that, whenever practicable, should be purchased by the city, with a particular focus on products that include post-consumer recycled material. Not only will this policy encourage the use of recycled products by city governments, but, by leveraging the purchasing power of cities, it likely stimulate the market for recycled products. This may have a much more significant and widely felt effect in reducing overall emissions than the simple use of more recycled products.

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*In 2007 the mayor of Lansing, Michigan issued an order to require 10 percent of city government's energy demand be met with renewable energy*

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## MUNICIPAL POLICY

While it may be easiest to impact municipal operations, changing municipal policy will have a bigger GHG reduction impact because policy covers the entire city, not just government operations. However, municipal governments only have jurisdiction in certain areas. For example, local governments generally can't regulate air or water quality, although they may implement federal and state policy. While they generally have jurisdiction over land use, planning and zoning, they may or may not be able to set building codes. Unfortunately, the landscape of what cities can and can't control varies by state, and sometimes by city within a state. We present here a series of policies and programs that most cities can enact, and that will have a substantial impact on GHG emissions. Anyone working in a particular city should of course make sure the policy they are interested in is possible. Of course, this list is not comprehensive, and there are other actions cities can take.

### LAND USE, PLANNING AND ZONING

Local land use is often governed by a series of plans and codes. Many communities have comprehensive plans that, at a very high level, lay out the goals of the community, including those around land use – what types of uses (residential, commercial, industrial, mixed use, etc.) will be where. Such plans can – and should – include goals around climate and emissions reductions. Neighborhood or area plans drill down to a specific geography within the community, and can be much more specific about desired land uses, sometimes on a parcel by parcel basis. These plans are implemented via the zoning code, a section of a city's ordinances that governs what uses are allowed by right on each parcel, and what uses need a special permit, or require a complete rezoning. Essentially, uses that are allowed “by right,” or without a permit, are easy, and thus should be the things a city wants to see; things that require permits or re-zoning become more complicated and expensive for a property owner to accomplish, and are things that the code discourages.

Land use decisions can play an important role in reducing greenhouse gas emissions. Conventional zoning codes that separate different types of uses, limit multifamily housing, set minimum parking requirements, and require large setbacks on individual pieces of property encourage freestanding buildings that use more energy and are often only accessible by automobile. By using smart growth policies, local governments can promote a future vision of mixed use development with housing and transportation choices near jobs, shops, and schools, reducing reliance on single occupancy vehicles. These policies can achieve roughly 20 to 60 percent reductions in transportation-related GHG emissions alone, according to many studies.<sup>79</sup>

#### Zoning Codes

Zoning codes regulate both the form of buildings (how tall they are, how far back from the street they must be, etc.) and the use of land (residential, industrial, etc.). Traditionally, zoning has focused on separating “incompatible” uses. In general, this has meant separating residential land from everything else, and zoning contributed significantly to the rise of the suburb. Form-based codes use physical form, rather than separation of uses, as an organizing principle. Cities can use form-based codes to regulate building size and types of streets and blocks to promote denser, mixed use development. Specifically, cities can require a

#### Land Use

Every decision a city makes on land use – through zoning codes, individual development decisions, or transportation infrastructure investments – impacts the transportation decisions of those who live, work and play in the city. Accordingly, these decisions have a big impact on transportation-related GHG emissions. Cities should:

- Consider GHG emissions in their planning processes
- Use smart growth principles
- Use form based zoning codes
- Follow TOD principles for large developments

maximum setback distance for building entrances, ensuring shorter trips through parking lots for cyclists and pedestrians. Setting a maximum block length to ensure a high intersection density and greater connectivity for multiple modes of transportation is another form-based strategy for cities. Cities can also set standards to eliminate cul-de-sacs in housing developments to create more connectivity in street patterns resulting in shorter travel distances.

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*These policies can achieve roughly 20 to 60 percent reductions in transportation-related GHG emissions alone*

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Zoning also governs a host of specific activities, or ways that people use their properties, in addition to the larger categories like residential and commercial. Some zoning codes govern renewable energy installations, gardening and composting, even things like clotheslines and rain barrels. Cities should examine their zoning codes, and also their building and property maintenance codes, and remove any provisions that restrict common sense sustainable practices. Another way that sustainable practices are often limited is through homeowners' associations. These are set up for planned neighborhoods, and may require property owners to follow quite restrictive rules via legal agreements. Cities should prevent homeowners' associations from prohibiting sustainable practices whenever possible, both through their initial establishment, and by placing limitations on their jurisdiction.

### Transit-Oriented Development

Local governments can promote the use of transit oriented development (TOD) which integrates transportation – typically rail or bus rapid transit – with surrounding land uses. This integration is achieved through policies encouraging mixed-use, dense urban design, and complementary infrastructure investments, resulting in neighborhoods where residents and workers can get around without a car.<sup>80</sup> Successful TODs benefit from a mix of uses meeting minimum densities, in addition to fostering a core community of transit riders that supports robust transit ridership. However, the very attractiveness of being close to transit may raise the value of property enough to push out those who have fewer alternatives to transit.<sup>81</sup> Successful TODs provide robust transit service, foster local commercial development, and successfully preserve housing opportunities across the socio-economic spectrum.<sup>82</sup> Inclusionary zoning requires developers to make a percentage of housing units in new residential developments available to low- and moderate-income households and is a tool that can be used to ensure that transit-dependent people benefit from TOD. Density bonuses are another tool to ensure affordable housing near transit centers allowing developers to build more housing units, taller buildings and provide more floor space than normally allowed in exchange for the number of affordable housing units included in development.<sup>83</sup>

Accommodation of all modes of transportation when planning for new commercial developments or major renovations is important to achieving GHG reductions. Municipal governments can use zoning and land use codes to ensure that new commercial, industrial, and residential developments provide accessibility for multiple modes just as they do on public roadways. By using consistent zoning standards that promote multi modal travel, local policy makers can communicate their expectations and yield consistent results from developers. Specifically, cities can, in their zoning and building codes, require the construction of continuous sidewalks adjacent to large developments and ensure connectivity to building entrances for safe pedestrian access to businesses. Additionally, policy makers can create minimum standards for bicycle parking accommodations at commercial and workplace destinations.

The comprehensive plan of El Paso, *Plan El Paso*<sup>84</sup>, which was approved in 2012, is considered a comprehensive guide to smart growth design and implementation.<sup>85</sup> This plan is a reaction to the traditional sprawling development patterns and high rates of land consumption and carbon pollution. The

plan gives priority to downtown reinvestment, transit-supportive infill development, revitalization of older neighborhoods, balanced transportation options, strategic suburban retrofits, sustainable economic development and much more. While the comprehensive plan is not itself a legal instrument, the city is creating zoning and other legally binding measures to put the plan into effect.

## TRANSPORTATION

Emissions from transportation are a substantial portion of total GHG emissions from a city. In general, local governments should fully integrate all modes of transportation into their land use and transportation plans, and make an effort to encourage mode-shifting by their residents. To that end, there are a number of specific policies cities can enact.

It's worth mentioning the importance of integrating transportation and land use planning. As discussed above, land use planning can impact transportation choices, but to fully realize the opportunities here, transportation planning must take into account both the existing and planned land uses around transportation infrastructure. In addition, transportation is a regional issue, and in many cities, regional transportation planning is conducted by Metropolitan Planning Organizations. MPOs can be very powerful and can influence GHG reductions in a transportation system, but many of them do not take an active role, or are actively hostile to such efforts. See the information gathered by the Alliance for Sustainability on Midwestern MPOs for more information.<sup>86</sup>

### Complete Streets

Cities should adopt a complete streets policy that requires all new roadways and any substantial reconstructions to accommodate all modes of transportation. This means sidewalks everywhere, including cul-de-sacs and other car-oriented development; bike lanes on all arterials and major collectors; transit pull-outs for buses where possible; transit stops—loading pads, signage, and shelters where appropriate; and other infrastructure to facilitate all modes of travel. Care should be taken to assure that pedestrians and bicyclists can not only travel along a corridor, but also across it. This means that crosswalks and appropriately-timed crossing signals are convenient and spaced so that crossing is not unduly burdensome. Every transit user must cross the street at least once per day—from one side of the street to the other to access routes—so it is especially important to have good pedestrian connections in major transit corridors to encourage and facilitate transit use. Limited-access highways should have pedestrian-bicycle crossings and/or grade-separated, low-speed local streets that cross the roadway without requiring navigating on- and off-ramps.

One of the most important infrastructure solutions that will facilitate walking and bicycling, and therefore reduce driving, is to assure that the city has a good grid of streets. Ideally, blocks should be no longer than 800 feet. If larger blocks are required for developments, a bicycle-pedestrian connection should be built mid-block. In areas of the city without a complete street grid, or where blocks already exceed ideal size, efforts should be made to build connections for pedestrians and bicyclists via cut-throughs, paths, and mid-block openings. New developments should feature a grid of local streets with frequent intersections. This allows multiple routes to the same destination, making traffic flow more smoothly during peak times and allowing pedestrians and bicyclists to choose lower-traffic routes. If cut-through traffic is a concern in residential areas, local streets can feature traffic-calming that discourages through traffic by motorists, but allows pedestrians and bicyclists to use smaller streets.

### Transportation

Transportation is one of the largest sources of GHG emissions in any city. Reducing these emissions will require shifting modes of transportation (from single occupancy autos to lower carbon alternatives like transit, bicycling and walking) and reducing emissions from vehicles. Local governments have the most influence on the former.

- Complete Streets policies
- Street design and layout
- Promote maintenance over expansion of streets
- Safe Routes to Schools
- Coordinate land use and transit planning
- Improve the transit experience
- Put a price on parking
- Use transportation demand management

Existing roadways and other transportation infrastructure should be kept in good repair, and routine maintenance should be prioritized over expansion of roadways. Cities should set a schedule for routine maintenance, and funding should be shifted to assure that maintenance is kept up, even at the expense of new projects. Cities can lobby state and federal agencies to also prioritize maintenance of infrastructure over expansion.

Every child should be able to walk or bike to school if they live within a reasonable distance. Cities and school districts can improve children's health and decrease injuries by developing a Safe Routes to School plan for each school, identifying walking and biking routes for each school and working on the gaps, improving infrastructure, and addressing safety problems. Additional programs can include education of local drivers and parents, assuring safe pick-up and drop-off zones at schools are both identified and enforced, and encouraging both children to walk and bike more and drivers to respect school zones. Police departments should be encouraged to strictly enforce traffic laws in the area of schools.<sup>87</sup>

## Transit

Improving transit service helps cities reach GHG reduction goals by reducing car trips. Changes in travel behavior over the last decade<sup>88</sup> offer an unprecedented opportunity for cities to focus efforts and resources on achieving mode shift and GHG reductions through improvements to transit, biking, and walking, rather than planning for continued highway expansion for single-occupancy vehicles. Policies that improve transit and reduce GHG fall into three categories: transportation planning, land use planning, and things that make it easier to ride. Good transportation planning requires coordination between highway/streets divisions and transit agencies to integrate transit-friendly improvements into roadway construction projects where transit lines exist. Identifying areas of concentrated employment, education, retail and entertainment and working to better link these destinations with residential areas can help guide capital and service investments appropriately. Coordinating transit service planning with land use planning helps sync up transit plans with the city GHG reduction goals.

Coordinating land use and transit planning results in numerous benefits for a city transit provider. Additionally, more efficient service moves the city closer to meeting goals related to equity and overall household travel expenses.<sup>89</sup> Cities can use land use scenario planning to target transit investments. Cities should coordinate with the transit agencies to partner on development of policies and plans related to transit, economic development, land use, and housing development. Each of these considerations affects the other, and it is best to integrate planning for all four areas as the region develops goals for future regional development. A city transit agency can develop confidence that proposed new transit service will succeed by employing new land use scenario modeling tools to better predict transit use or analyze the performance of existing transit system.<sup>90</sup> New scenario modeling tools represent emerging best practice<sup>91</sup> and are able to drill down to the tax parcel level, allowing a detailed look at trip generation under different land use scenarios.<sup>92</sup> New scenario analysis tools are available at no cost to the Metropolitan Planning Organizations (MPOs). Cities should partner with their MPOs to take advantage of this opportunity to take a fine-grained look at different land use alternatives and increase the viability of their transit system.<sup>93</sup>

Finally, local governments should consider anything that improves the rider experience – real time information, smart phone apps, better signs, more bus shelters, faster or more frequent service, etc. The easier and more pleasurable the transit experience is, the more likely people are to switch from driving to riding.

## Parking

Parking policies influence GHG emissions through their considerable influence on vehicle traffic. (Over-)Abundant supplies of parking encourage vehicle trips, despite other available travel options, and often fragment the built environment in ways that discourage walking, biking, and transit use. Underpriced, unregulated, or poorly managed parking can also lead to traffic congestion resulting from drivers cruising in search of an available spot. Local parking requirements rarely reflect actual demand in urban areas and

they tend to artificially inflate supplies, making it difficult to set prices accordingly. Local governments can reduce or eliminate parking requirements in order to encourage compact, walkable development styles and discourage excessive vehicle travel. In some cases, cities have even established parking caps.

Properly priced parking allows drivers to make more informed travel decisions, often by choosing to use other available modes, and encourages higher turnover rates for prime parking spots, which helps get drivers off of congested streets more quickly. Parking authorities can price on-street parking based on demand so that roughly one space stays open on each block at any given point in time. Municipalities can set policies and incentives that encourage local businesses to charge employees for parking or allow employees to cash out their parking space in order to use alternative modes. Municipalities can also require property owners to unbundle parking costs from rents and building prices, effectively selling parking spaces separately.

State law may limit a city's ability to charge higher fees for parking than those needed to cover administrative and operations costs. These limitations may be overcome by establishing parking benefit districts, which ensure that revenues go toward making infrastructure and streetscape improvements within the same district as priced parking. Higher meter fees can also sometimes be justified if the revenues are used to offset the costs of off-street facilities or committed to local projects through appropriations.

Cambridge, Mass., was one of the earliest small cities to reduce its minimum parking requirements, set maximums, and implement a parking management program involving all non-residential property owners. Since implementing these programs, the city has experienced a decrease in overall parking supply and a considerable decrease in the portion of commuters driving to work.<sup>94</sup>

The city of San Francisco is a national leader in the dynamic pricing of on-street parking. The city's program, called *SFpark* and sponsored by U.S. DOT, incorporates in-ground sensors to monitor and report occupancy. Prices vary by time of day according to demand with the goal of maintaining 60 to 80 percent occupancy on every block. After one year of initial price adjustments, blocks that were very empty or very full achieved between 65 and 70 percent occupancy, which presumably eased traffic flow and congestion on adjacent streets.<sup>95</sup>

### Transportation Demand Management

Municipalities can enact policies to encourage travel behavior that produces lower levels of GHG emissions. Most importantly, this means influencing a shift from single occupancy vehicle trips to carpooling, transit, biking, and walking. Transportation demand management (TDM) programs focused on citywide travel and employer-based programs aimed at commuters are two common types of local policies.

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*Employee-paid parking, alone,  
can reduce vehicle commute  
trips by 15 to 38 percent.*

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TDM strategies include a suite of measures aimed primarily at reducing vehicle travel. These include improved transit service, improved bicycle and pedestrian facilities, car-sharing programs, road or congestion pricing, priced parking, and other incentives. Employer-based programs are also effective and often the easiest to implement. These programs may include cash in lieu of parking, subsidized transit passes, carpool coordination, bicycle parking and showers, guaranteed rides home, flexible work schedules, and other measures. Employee-paid parking, alone, can reduce vehicle commute trips by 15 to 38 percent.<sup>96</sup> Local governments can take the lead by implementing these programs for municipal employees and they can work with local employers to set up citywide programs.

The city of Cambridge, Mass., adopted a parking and transportation demand management (PTDM) ordinance in 1998 to improve access and mobility while reducing congestion and GHG emissions. The

program requires any owner of non-residential property to develop and implement a PTDM plan if they add parking capacity. Property owners can incorporate a variety of TDM measures into their plans and owners of large projects must set a goal of reducing single occupancy vehicle trips below their 1990 levels. A TDM enforcement officer monitors progress and property owners face fines if they violate their plans.<sup>97</sup>

## COMMERCIAL BUILDINGS ENERGY EFFICIENCY

Commercial building energy consumption represents approximately 20 percent of the total energy consumption and greenhouse gas emissions in the U.S. Moreover, the design of the buildings in which we live, work, eat, shop, relax, and play greatly affects our quality of life, our environmental and carbon footprint, and the economic viability of our communities.

### Building Codes and Standards

Building codes can provide basic protection for all of these things. With ambitious codes, we can move beyond merely protecting consumers and firms to creating incentives for the social, health, environmental, and economic outcomes that we want. Building standards vary from state to state or even city to city. The impact that these codes will have depends on how stringent they are. There are international standards from the International Code Council, or ICC, which generates 14 different sets of regulations. These are revised on a near-continual basis. If technical capacity exists locally, these can be improved upon or modified to create incentives for particular attributes, but in many instances existing ICC codes can be adopted locally with minimal alteration. At a minimum, cities should encourage their states—or do it themselves in home rule states—to adopt the most recent ICC codes, especially the International Energy Conservation Code and ASHRAE standards, both of which are updated on a three-year cycle.

These should be exceeded, if possible, as California is doing with its Title 24, aiming for net-zero buildings by 2030.<sup>98</sup> Communities that wish to go beyond current building codes have several options at their disposal. If they are in a state where they are permitted to enact more stringent codes on their own, they can of course do so, and should. Many states, however, prohibit the local adoption of more stringent mandatory codes. Short of advocating for the repeal or modification of those laws, cities and towns can encourage and reward those who choose to meet more stringent requirements through tax incentives, density bonuses, rebates, expedited permitting, fee waivers, tax credits, and grants.<sup>99</sup>

Arlington County, Virginia, permits larger or taller buildings than zoning would otherwise allow for developers who achieve LEED certification. Developers who achieve LEED platinum—the highest designation—are allowed a bonus of 0.45 times the normal Floor Area Ratio, or 0.5 for residential, which will likely result in more than enough additional profit to offset the additional building costs.<sup>100</sup> Finally, code enforcement is key to ensuring the effectiveness of these policies, as there are many disincentives to complying with code. Reasons for lack of compliance include variation between a project's blueprint and its actual construction, use of noncompliant materials in construction, and a lack of compliance training and education for those doing the actual construction.<sup>101</sup>

Effective enforcement requires strong leadership and political support. A strong argument for increasing compliance is that it is highly cost effective. The Institute for Market Transformation estimates that for every dollar spent on enforcement, \$6 is saved on energy costs.<sup>102</sup>

### Energy Efficiency

Buildings are a significant contributor to any community's GHG Emissions. Policy options to reduce building-related emissions include:

- Adopt aggressive building codes
- Offer incentives to exceed code
- Invest in code enforcement
- Offer design assistance
- Create recognition programs
- Require benchmarking and disclosure of energy use
- Require sub-metering
- Offer financing for energy upgrades

To increase compliance, cities should implement a combination of education and outreach to the contractor community and building trades, advanced education for building inspectors, and increased inspection rates.

Parker, Colorado, a town of 50,000, is a success story in building-code compliance.

To facilitate broader understanding of how various aspects of code affect building performance, the town offered training—in some cases mandatory—on various aspects of building science. For each builder, they performed a free assessment of one building, demonstrating how code should influence the work. Developers were educated so they could insist on correct installation by their contractors. Inspectors pursuing different inspections were trained to watch for other violations—for example, electrical inspectors could easily notice gaps in insulation around wiring, a violation of energy code. They implemented the building code in phases, to correspond to educational opportunities. Parker’s model has been so successful that many of their building inspectors are now national experts on code compliance.<sup>103</sup>

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*For every dollar spent on enforcement, \$6 is saved on energy costs*

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### Design Assistance

In addition to placing energy efficiency requirements on existing commercial buildings and future construction, cities should encourage and support building owners who take seriously the task of becoming more energy efficient. To do this, cities should increase funding options for building owners looking to meet higher energy efficiency standards, as well as provide the technical assistance necessary for private buildings to fully comply with building retrocommissioning and green building standards for new construction.

Cities should require integrated energy design assistance starting at the conceptual phase of any new building project or major renovation. Integrated energy design assistance incorporates energy efficiency experts into the design process who offer technical assistance to allow for cost-effective evaluation of all design options results in the incorporation of the best efficiency strategy and design into the project. By incorporating energy efficiency strategy from the beginning of a project, a variety of efficiency components can be considered while the project itself is still fluid enough to incorporate necessary efficiency design changes. Cities should also connect developers to available utility incentive or assistance programs.

Fort Collins, Colorado offers the Integrated Design Assistance Program (IDAP) through the Fort Collins Utilities.<sup>104</sup> The IDAP promotes a whole building energy design approach by offering technical assistance to architects, engineers, and building owners during the design process of new buildings and major renovations in order to “optimize energy and demand savings and reduce operating costs.”<sup>105</sup> The IDAP sets energy consumption targets with the goal of achieving net zero performance by 2030.<sup>106</sup> The IDAP also provides a variety of financial incentives targeting design,<sup>107</sup> construction,<sup>108</sup> and performance.<sup>109</sup>

### Competitions and recognition programs

Of course, building codes only impact new construction and substantial renovations. One of the politically easiest and lowest-cost ways to spur commercial and other energy efficiency efforts in existing buildings is by launching a community-wide voluntary energy saving challenge, ideally in partnership with the local Chamber of Commerce and other business organizations. Minneapolis’ “Kilowatt Crackdown” is a real estate sector driven effort—in partnership with the City and the local utility provider—to encourage the real estate community to reduce energy with the stated intent of “deter[ing] federal and state government mandates to achieve conservation goals.”<sup>110</sup> It includes prizes for greatest savings in each of various

categories of building. However, voluntary efforts only reach those ready and willing to change – and often not those most in need of improvements. Their reach is limited – for example, the Kilowatt Crackdown recruited 80 buildings representing 25 million square feet, but once Minneapolis required benchmarking and disclosure, 625 buildings representing 110 million square feet were covered.<sup>111</sup>

### Benchmarking and Disclosure

Another relatively simple, low-cost way to bring market forces to bear to spur investment in existing building energy efficiency is through energy benchmarking and disclosure ordinances.

These are relatively simple, low-cost ways to bring market forces to bear to spur

investment in building energy efficiency. A city passes the law, requiring that on a fixed yearly schedule or when a building is put on the market, its energy consumption is disclosed either to prospective buyers or the entire public. Both options are valid, although annual disclosure is more likely to motivate improvements by current owners and is more likely to impact the rental market, while the compliance costs of a point-of-sale ordinance are lower. Similarly, full public disclosure can have a broader impact (by setting a positive or negative example), while disclosing only to potential buyers may not fully inform the market. Public building energy use should be disclosed on an ongoing basis, and easy-to-use web dashboards such as EnergyStar Portfolio manager enable this.<sup>112</sup> Seattle,<sup>113</sup> New York City,<sup>114</sup> Washington, D.C.,<sup>115</sup> San Francisco,<sup>116</sup> Austin, Texas,<sup>117</sup> Boston,<sup>118</sup> Chicago<sup>119</sup> and Minneapolis<sup>120</sup> have all adopted commercial benchmarking and disclosure laws and many other major cities are considering or currently implementing such policies.

Building owners may oppose this legislation as it represents a cost—albeit a small one—a hassle, and will make low-efficiency properties less desirable.<sup>121</sup> To avoid posing an undue burden on small business owners, most disclosure ordinances have size cutoffs: only buildings greater than a certain square footage must participate. The size of buildings required to participate varies from all commercial and public buildings in Austin to only those commercial and multifamily buildings over 50,000 square feet in New York City.

### Sub-metering

Another low-cost—and requiring a relatively modest political lift—policy a city can adopt to encourage lower energy consumption is a sub-metering requirement for large commercial buildings, including monthly energy consumption disclosures for building tenants. Using energy use data from traditional energy bills is often insufficient to pinpoint high energy consumption times and energy use per tenant within a commercial building. By collecting energy consumption data per tenant and in smaller time increments (often every 15 minutes), sub-metering allows for energy use data to be collected on a granular level. This more detailed data helps building tenants identify unnecessary energy consumption, e.g. equipment running at night; better manage their energy usage during peak pricing times; compare their usage to similarly situated buildings or spaces; and access energy use information quickly in order to analyze recently implemented energy saving policies. As of 2009, New York City has required large non-residential buildings to install electrical sub-meters for each large non-residential tenant space and provide monthly energy statements.<sup>122</sup>

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*The Kilowatt Crackdown recruited 80 buildings representing 25 million square feet, but once Minneapolis required benchmarking and disclosure, 625 buildings representing 110 million square feet were covered.*

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## Financing

Because commercial building owners are in many instances quite constrained in their ability to borrow to finance energy-efficiency improvements, programs that move energy upgrade costs off the balance sheet—such as a lease model, commercial PACE, or on-bill repayments—are likely to increase the appeal of energy-efficiency upgrades to commercial property owners. Local governments can facilitate commercial energy efficiency projects by providing funds themselves, stimulating private investment, and creating a more supportive policy environment. The most useful tool that governments have is their tax-exempt borrowing capacity—ready access to relatively cheap capital, subject to borrowing limits and credit ratings. Federally subsidized qualified energy-conservation bonds are available to many jurisdictions at very favorable terms and provide a great deal of flexibility in how they can be spent. Investments that pay for themselves over time are an excellent choice for public tax-exempt bonding—certainly better than many traditional infrastructure projects funded through this mechanism.

There are a number of different ways to structure public financing programs to support energy-efficiency retrofits—including issuing bonds to directly finance energy-efficiency programs, establishing “green banks” or revolving loan funds, and creating a loan-loss reserve to buffer private lenders from losses resulting from potential defaults on loans for energy-efficiency projects. Direct investment of bond proceeds in a large-scale energy-efficiency program is an excellent way to rapidly create a large number of jobs, while creating a loan loss reserve brings private capital to the table. The appropriate financing for a community will largely depend on the exact nature of the project and what partners are available.

Property-Assessed Clean Energy, or PACE, is a financing mechanism that has seen significant interest recently. A clean energy improvement, either renewable or energy efficiency, is treated by the city in the same way as a sidewalk improvement would be treated – it’s an assessment to be repaid via a municipal bill (usually the property tax) and is collateralized in the same way. In this way it stays with the property in the event of a sale, and bill-payment history can be considered as an underwriting criteria. The recently created CaliforniaFIRST public-private

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*In the Midwest, five states have authorized PACE (MN, WI, MI, IL and OH) and nearly 50 local governments have or are exploring programs.*

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partnership allows qualifying commercial-property owners in the participating 126 cities and 14 counties to tap into the municipal bond market—with its favorable rates—to finance energy-efficiency improvements.<sup>123</sup> In the Midwest, five states have authorized PACE (MN, WI, MI, IL and OH) and nearly 50 local governments have or are exploring programs. The Toledo-Lucas County Port Authority runs the BetterBuildings Northwest Ohio program, a PACE program available to building owners across Northwest Ohio.<sup>124</sup>

A promising new approach to energy efficiency for commercial properties is pay-for-performance. Existing efficiency subsidies, which are traditionally disbursed as reimbursements for installing certain efficiency upgrades, are replaced with payments pegged to certain levels of savings. This creates incentives for deeper retrofits—as rebates increase along with savings—and consistent building energy management, as well as encouraging innovative and cost-effective approaches. Seattle is currently piloting a program where participant businesses can combine retrofits, ongoing operations, and behavior change to achieve energy-reduction targets with rewards pegged to kWh saved.<sup>125</sup>

Bonding for energy efficiency does not work in cities where the borrowing cap has been reached or is close. It can also be politically difficult; councils are often unwilling to accept debt even for the promise of future savings. In this instance cities should look for alternate funding sources for their retrofit programs. Babylon, New York, has been able to fund its residential retrofit program by reclassifying carbon as a solid

waste and applying their solid waste fund of \$2 million to capitalize it. Other strategies include using general fund dollars or federal and state funding. Public benefit fund money may also be available.

Finally, it's worth noting that commercial and industrial buildings in particular can save both money and energy through water efficiency measures. The specific measures available are covered in more detail in the section on water efficiency, but include installing water-saving measures such as low-flow showerheads, low-flow and dual-mode toilets, faucet aerators, finding and fixing leaks and low-water landscaping. Because pumping water uses so much energy, combining water efficiency measures into energy efficiency audit and retrofit programs such as those described here can be an effective approach. Cities with a significant industrial sector should also consider a program targeted at increasing industrial efficiency. Milwaukee, Wisconsin's ME3 program helps manufacturers save money by reducing negative environmental impacts of their manufacturing processes and practices, often through energy or water efficiency measures.<sup>126</sup>

## RESIDENTIAL ENERGY EFFICIENCY

In the U.S., residential buildings account for 22 percent of primary energy consumption and 21 percent of carbon dioxide emissions.<sup>127</sup> A significant portion of this energy is used to heat and cool space within residences.<sup>128</sup>

### Building Codes

Adopting well-crafted residential building codes regulating building envelope performance, along with heating, air conditioning, and water heating units, is an effective way to reduce energy consumption and emissions in new or substantially renovated residential buildings. Like the suggestion in the discussion of commercial building codes, cities should adopt the most recent ICC residential energy building code or, where they do not have the home rule authority to do so, cities should encourage their states to adopt the code. Not only can code adoption lower the overall level of emissions and ongoing cost of energy for the residence,<sup>129</sup> but requiring energy efficient measures during construction also, generally, comes at a lower cost to the homeowner than retrofitting the home after construction is complete.<sup>130</sup>

Cities that wish to go beyond current building codes have several options at their disposal. If they are in a state where they are permitted to enact more stringent codes on their own, they can of course do so. Massachusetts has the Massachusetts Stretch Appendix to the Building Energy Code,<sup>131</sup> which cities and towns can choose to opt-in to and is roughly 20 percent more stringent than the IECC 2009 code. This stretch code has been adopted by 134 local governments covering 50 percent of the state's population.<sup>132</sup> In addition to the LEED designations, the National Green Building Standard,<sup>133</sup> the Standard for the Design of High Performance Green Buildings Except Low-rise Residential Buildings,<sup>134</sup> and the International Green Construction Code<sup>135</sup> all provide guidelines that increase the sustainability of a building.

Also, as with any regulation, enforcement is key. As with commercial buildings, cities should implement a combination of education and outreach to the contractor community and building trades, advanced education for building inspectors, and increased inspection rates. In addition, cities should require code officials to create or improve plan submittal forms for permit applicants. This will allow code officials the opportunity to educate builders about code requirements. Also, requiring a robust list of documents from the permit applicant at the time of application will help ensure all code requirements are met and save enforcement officials time.

As an example, Santa Fe, New Mexico's residential green building code is in the form of a checklist and "applies to all single-family units, attached and detached, including guest housing."<sup>136</sup> Buildings must meet a minimum number of points.<sup>137</sup> The City provides a user's guide within the Administrative Procedures document<sup>138</sup> available to the public on the City's website.<sup>139</sup> The City requires that each applicant submit a Home Energy Rating System (HERS) index for the residence.<sup>140</sup> The HERS index is prepared in two parts.

Based on the residence plans, a preliminary index is prepared. Then, when the residence is all but complete, a final HERS is prepared, verifying all facts assumed in the preliminary index.<sup>141</sup>

### Financing and Residential Retrofit Programs

For existing buildings, the residential retrofit market offers tremendous opportunities for energy savings. Local governments should begin by supporting programs that educate customers on the value of energy efficiency. WeatherizeDC uses a community organizing approach to build demand for energy efficiency, while Community Labor United in Boston partners with community-based organizations to do education and outreach on the benefits of home retrofits.<sup>142</sup>

Financing is a significant barrier for many homeowners considering an energy upgrade. Many middle- and lower-income homeowners cannot readily access sufficient capital at attractive rates to invest in energy efficiency, and if they can, an energy upgrade is not necessarily at the top of their spending priority list. Cities should support programs that provide access to low-cost capital that does not compete with other borrowing priorities to overcome this barrier.

In Sonoma County the California Energy Independence Program offers PACE financing for commercial and residential properties. Since it launched in 2009, it has financed improvements, both energy efficiency and renewable energy, on 1,700 residential properties and 57 commercial ones, worth \$58 million, creating or retaining 714 jobs.<sup>143</sup> However, guidance from the Federal Housing Finance Authority has limited the creation of new residential PACE programs.<sup>144</sup>

On-utility-bill finance programs similarly provide a source of financing that could not be used for anything else, and cities should work to authorize their creation at a local—especially in jurisdictions with a municipal utility—or state level as needed. By using utility-bill payment history as part of the underwriting criteria, on-bill programs can provide energy efficiency as a service to be paid for monthly rather than as a stand-alone loan. They are based on the premise that a customer who is already paying their utility bills will only be more likely to pay following an investment that lowers those same bills. If an occupant moves, the tariff stays with the meter.

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*Midwest Energy's How\$mart on-bill program has successfully retrofitted 680 homes since 2007 with several hundred more pending.*

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In Kansas, Midwest Energy's How\$mart on-bill program has successfully retrofitted 680 homes since 2007 with several hundred more pending. The program pays all upfront retrofit costs, which are to be repaid with a tariff on the bill. Eligibility is based on utility-bill payment history. This is important from an equity perspective, as programs that simply loan money for retrofits frequently find households with lower credit scores to be ineligible to participate. The monthly charge for How\$mart is typically around \$42, and the average energy savings are \$49.<sup>145</sup>

Public money can also be used to leverage private investment. By providing a loan-loss reserve, whereby some portion of a potential loss is covered in case of default, governments can attract private financing to the energy-efficiency retrofit market. This reduced risk for lenders can improve the interest rate on money and broaden the underwriting criteria, providing more accessible financing for businesses and homeowners.

The Milwaukee Energy Efficiency and the Green Madison programs in Wisconsin have set aside \$3 million from a federal grant as a 5 percent loan loss reserve, guaranteeing that losses sustained by the credit union lending partner in the program will be recoverable up to that amount and making available \$60 million to

households that invest in energy efficiency measures. This security also means that the programs' financial partner, Summit Credit Union, is willing to offer lower interest rates and serve households with FICO scores as low as 540.

Local governments should create or support comprehensive programs that include an attractive financing offer, marketing and outreach, a simple structure that makes every step as easy as possible for the homeowner, and verification of the work to make certain that homeowners are getting the savings they paid for. This approach can significantly increase uptake rates of home energy upgrades.

Clean Energy Works Oregon combines attractive financing options, on-bill repayment, a one-stop-shop approach to guide homeowners through the contracting and retrofit process, and a comprehensive High Road Agreement to ensure labor standards. As of 2012 they had retrofitted more than 900 homes, generating more than \$12 million for the local economy. The program has employed more than 500 people. Through contractor participation requirements, incentives, and support, the program has succeeded in having more than 55 percent of work hours be performed by women and people of color with 87 percent of contractors offering subsidized health insurance.<sup>146</sup>

### Benchmarking and Disclosure

Residential energy benchmarking and disclosure ordinances can significantly drive the uptake of retrofit programs, if they are offered, though such offerings should be available to lower-income homeowners. One approach to disclosure is to require energy audits at point of sale. For instance, Austin, Texas has an Energy Conservation Audit and Disclosure ordinance for its residential buildings. Managed by its municipal utility, the program has been in effect since 2008. A certified energy rater must perform the audits prior to sale and disclose the results to the buyer. This information is paired with recommendations on how to improve the energy efficiency of the property and information about the city's energy-efficiency loan program. Properties less than 10 years old that have recently completed energy upgrades or that are eligible for low-income weatherization are exempt. In the year following the ordinance's enactment, 12 percent of properties sold performed energy-efficiency upgrades.<sup>147</sup> The same model can be applied to rental properties where, at a minimum, the past energy usage of the property can be disclosed to prospective tenants. This is especially important for low-income renters because properties with lower rent may have very high heating costs. Ann Arbor, Michigan, has required this since 1987.<sup>148</sup>

A significant concern with residential energy disclosure ordinances is that such measures can further burden low-income property owners. Lower-income property owners tend to hold older, less efficient properties. These may already be hard to sell, but if they are slapped with a "D" or "F" energy rating, they will be even harder to sell. This is why cities should ensure that a rating or disclosure program is paired with resources to mitigate bad scores. These properties are also more likely to suffer from structural issues that prevent the installation of some energy efficiency measures. Cities can use CDBG funds to address these issues, "stacking" CDBG dollars and dedicated energy efficiency dollars to cover the needed improvements.

### COMMERCIAL RENEWABLE ENERGY

In the U.S., buildings account for almost 40 percent of all carbon dioxide emissions and over 70 percent of all electricity consumed.<sup>149</sup> Commercial buildings alone account for about 20 percent of all U.S. energy consumption.<sup>150</sup> Given the slow turnover rate of building stock and the long lifetime of these buildings, it is critical that local governments develop long-term strategies to address GHG emissions in commercial buildings. A robust strategy to address GHG emissions in the building sector should include policy levers for not only energy efficiency but also renewable energy. The installation of clean and renewable generation technologies like solar, wind, and geothermal stimulates the local economy, improves public health, creates good jobs, and perhaps most importantly, takes the most direct path to reducing greenhouse gas emission. Cities are in an excellent position to foster the creation of commercial renewable projects of varying scales. Money is saved by avoiding costly new fossil fuel generation, keeping money spent on fossil-fuel imports in the community, and protecting against future fuel price volatility.

Unfortunately, widespread adoption of clean energy technologies faces many hurdles. The fossil fuel industry is tremendously powerful and has invested significantly in current technologies, and in spite of some recent investments in renewables, fights, delays, and denies the need for clean generation. Local citizens and business groups concerned with the additional cost of renewables frequently oppose public investment in renewable energy systems. But one area that may be more politically viable is supporting financing mechanisms for renewable energy systems that a commercial building owner chooses to install.

There are many policies that can increase the development of renewable energy generation in the private sector. A city can provide education and training, and connect project developers with financing, trained installers, and bulk-buy programs. For example, city agencies in St. Paul, MN, are now better able to provide technical assistance on green building projects, as the city council implemented a policy that at least five LEED accredited staff work within the city departments with primary responsibilities for regulating the city's building stock.<sup>151</sup>

### Codes and Permitting

Cities have jurisdiction over distributed renewable generation facilities via zoning and building codes. Larger scale installations and those not attached to a building are likely to need the proper zoning, while smaller on-building installations are more likely to be covered by building codes. A comprehensive review of building codes, siting ordinances, and zoning regulations for obstacles to renewable generation should be performed, as many cities may have overly-restrictive codes still on the books.

Local governments can increase access to renewable energy by reducing regulatory hurdles and the future cost of renewable energy installation. For example, municipalities can pass zoning laws that simplify the installation of large solar installations by not requiring solar installers to get special permits, variances, amendments, waivers or other discretionary approval.<sup>152</sup> Another way to reduce the cost to implementation is to remove uncertainty for renewable energy installers by codifying reasonable height, setback, and coverage limits, as well as safety, design, and aesthetic standards, for the installation of renewable energy systems.

Where city permitting and regulations are involved, expedited or preferential processing can be given to those with renewable generation components. It should also be noted that municipalities have a lot of leeway in implementing the permitting policies described here as these issues are not ones typically addressed by state legislatures, and they are unlikely to run afoul of their home rule authority.

While many building owners are not ready to install on-site renewable energy systems, simple measures can be taken to reduce future installation costs. For example, Santa Monica, CA passed solar ready requirements for all new buildings, which mandate that all roofs be positioned and designed in ways that improve solar access, such as by requiring that at least 30 percent of a roof remains unshaded, free from obstructions, and flat or south-facing.

### Low Carbon Energy

Cities can advance distributed renewable energy generation in multiple ways:

- Review codes for outdated restrictions on renewable systems installation
- Educate staff on renewable energy systems
- Offer preferential treatment for renewable energy permits
- Require solar orientation in new developments
- Provide financing
- Offer incentives for including renewable generation in developments

## Financing and Incentives

Local governments can spur private investment in green buildings (including the use of renewable energy systems) by providing financial incentives to builders of commercial properties who receive LEED certification. In Cincinnati, OH, buildings with LEED Platinum certification are tax exempt up to \$500,000 over the first 15-years of a new building, or 10-years for a renovation. Another financial benefit to green building comes from density bonuses, such as those found in Arlington, VA where projects that are LEED certified receive a floor area ratio bonus of 15 percent to 35 percent and/or

up to three additional stories depending on the level of LEED certification. Another incentive to green building is an expedited permitting process for LEED certified buildings. Chicago's Green Permit Program has shrunk the permitting process down to 15-30 business days, depending on the number of green building elements within the proposal.

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*Chicago's Green Permit Program has shrunk the permitting process down to 15-30 business days, depending on the number of green building elements within the proposal.*

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Private installation of renewable energy systems can be stymied by the opportunity costs for commercial actors. For example, rather than investing \$1 million in a renewable energy system that will save \$400,000 per year, a business would prefer to invest the same amount in advertising that will generate \$500,000 in long-term annual revenues. Because the up-front cost of installing renewable generation can be too high for some in the commercial sector, an attractive and relatively straightforward option is to create a lending program, either as a government operated revolving loan fund (where loan repayments are then re-loaned in turn), or in conjunction with a lender (bank, community development financial institution, or credit union). The partnerships with financial institutions are frequently backed with credit enhancements to make the terms more appealing for borrowers. PACE financing is another option. Edina, MN recently launched a commercial PACE program that has already resulted in the installation of new solar PV systems, partnering private finance and local bonding authority with local businesses.<sup>153</sup>

Power Purchase Agreements are another tool to support Renewable Energy generation. Under a PPA, energy buyers (such as commercial building owners) contract with an energy supplier to buy power at a certain price for a certain amount of time. This means that renewable energy can be purchased for a guaranteed price without the opportunity cost of installing multiple distributed energy systems, and the energy provider has guaranteed revenue, as well as access to renewable energy incentives.<sup>154</sup>

Unfortunately, there are legal and administrative obstacles for third-party energy suppliers that often make the PPA market cost prohibitive to entry. One major barrier occurs when a state's statutory definition of an electric utility encompasses these third party energy suppliers/installers, and therefore, all relevant statutory regulations apply without the monopoly benefits of a traditional utility.

## RESIDENTIAL RENEWABLE ENERGY

As mentioned in the Commercial Renewable Energy section above, buildings in the U.S. account for almost 40 percent of all carbon dioxide emissions and over 70 percent of all electricity consumed.<sup>155</sup> Residential buildings alone account for over 20 percent of all U.S. energy consumption.<sup>156</sup> The installation of clean and renewable generation technologies helps to both reduce GHG emissions and provide a number of additional societal benefits. As the governmental level that most regularly interacts with homeowners, cities are in an excellent position to foster the creation of residential renewable projects. While broadly popular across the political spectrum, with 55 percent saying that renewable energy is a better investment than fossil fuels,<sup>157</sup> and increasingly affordable,<sup>158</sup> widespread adoption of clean energy technologies faces

many hurdles. While residential adoption of renewable energy systems are likely to be less tied to financial return on investments compared to commercial building owners, the initial costs to installing a renewable system is likely to pose an even greater barrier to homeowners. Municipal governments can and should enact policies that will reduce barriers to residential renewable energy.

### Codes and Permitting

As in the commercial sector, a city can provide education and training, and connect residential project developers with financing, trained installers, and bulk-buy programs. Where city permitting and regulations are involved, incentives can be given to projects with renewable generation components. As with all municipal green building initiatives, a comprehensive review of residential building codes, siting ordinances, and zoning regulations for obstacles to renewable generation should be performed.

Special attention should be given to the length and cost of the approval process – homeowners are likely to be more sensitive to a long process, and any permit fees add to the cost of the project, making it less likely that projects will get done. As was noted above, municipalities have a lot of leeway in implementing the permitting policies described here as these issues are not ones typically addressed by state legislatures, and they are unlikely to run afoul of their home rule authority. A clear, easy, fast and cheap approval process will go a long way towards encouraging renewable energy installations.

The Austin Energy Green Building Program, created by Austin, TX, provides green home ratings for family, multifamily, and commercial buildings. These ratings include the use of solar photovoltaic systems, as well as electric vehicle charging stations. The Single-Family Program also markets to and provides education to builders and the public.<sup>159</sup>

### Planning for Solar

Madison, WI, has taken steps to increase solar access in all subdivision planning. For example, new subdivision streets need to be oriented in an east-west direction to the maximum extent possible; lots must be oriented to maximize solar access to buildings by maximizing southerly building exposures; the location of open space lands are decided based on solar access objectives; and even the selection of tree species and planting location in the subdivision need to be chosen to minimize shading of future building locations.<sup>160</sup>

Lancaster, CA, passed one of the strongest mandates for residential renewable energy by requiring all builders of new dwelling units to provide solar energy systems for new homes, with a minimum generation of 1kW per unit.<sup>161</sup> This policy helps to reduce costs to homeowners by using a bulk purchase of solar panels to lower the per unit cost of the solar panel installation, as well as wrapping the cost of the solar energy into the price of the home, thereby effectively allowing homeowners to finance solar photovoltaic systems through a home mortgage, all while saving money on utility costs.

### Financing and Incentives

As with commercial buildings, local governments can spur private investment in green buildings (including the use of renewable energy systems) by providing financial incentives to builders of residential properties who receive LEED certification. For example, Cincinnati offers homeowners a property tax abatement if they renovate an existing home or construct a new home to LEED standards. And a Seattle law provides that a building that achieves LEED status and also contributes to affordable housing may be eligible for a density bonus, thereby offsetting the cost of implementing green building standards in high-rise residential buildings.<sup>162</sup>

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*Cincinnati offers homeowners a property tax abatement if they renovate an existing home or construct a new home to LEED standards*

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Unfortunately, many homeowners are faced with both capital constraints and transaction costs. For example, homeowners who want to add renewable energy systems may need to find and supervise the work of installers, secure financing, and understand the financial return on their investment to make wise decisions. Because the up-front cost of installing renewable generation can be too high for some in the residential sector, an option that applies to both commercial and residential buildings, is to create a lending program, either as a government operated revolving loan fund, or in conjunction with a lender.

The purchase of renewable technology becomes significantly cheaper at large scale – equivalent to purchasing at wholesale price. Aggregation also reduces the hassle of finding systems and installers for the end-owner. Cities, other jurisdictions, utilities, community groups, or for-profit entities can create bulk-buy programs, for either their own buildings or for residences, aggregating the purchasing. The model was pioneered in Portland, OR with the Solarize Portland program, where the city assists neighborhood associations and other organizations with program design, finding contractors, and marketing to participants. Since 2009, the program has purchased 600 solar installations.<sup>163</sup>

Another policy lever that local governments should investigate is the support of renewable energy cooperatives. These cooperatives often include worker members who are energy system experts, consumer members who own and operate the renewable energy systems, and investors who wish to support the goals of the renewable energy cooperative while earning a return. These co-ops provide a mix of advocacy, networking, and education for their members, including conducting preliminary energy audits, assessing site selection potential, finding installers and identifying funding sources.<sup>164</sup>

As mentioned in the Commercial Renewable Power section, Power Purchase Agreements are another tool to support Renewable Energy generation. In addition to commercial buildings, this model is also scalable to smaller rooftop distributed generation. Under a residential PPA, homeowners contract with an energy supplier/service provider to buy power at a certain price for a certain amount of time, effectively leasing an onsite renewable energy system with little to no up-front cost to the homeowner. This addresses the issues of homeowners not having sufficient capital, the transaction cost of finding and managing installers, and renewable energy incentive eligibility requirements. While this funding mechanism deals with many of the barriers to residential adoption of renewable energy systems, as with the commercial building side, there are legal and administrative obstacles for third-party energy suppliers that often make the PPA market cost prohibitive to entry. Municipalities may need to work with state policymakers to find acceptable means to open the market up to third-party energy service providers.

## UTILITIES

The power generation sector is, obviously, a large and important source of GHG emissions. However, it is one local governments have almost no control over – the majority of regulatory authority is at the state and federal level. There are exceptions to this – most notably, communities with municipal electric and/or gas utilities. Even communities without a municipal utility may be able to exercise some authority over their utility.

### Municipal Utilities

Municipal energy utilities provide a unique opportunity for cities to reduce a community's GHG footprint via energy efficiency and renewable energy. First and foremost, municipal utilities should support community-wide energy efficiency goals by providing their customers with good information about their energy use and how to be more efficient. This should include, but is not limited to, behavior-based programs that encourage conservation and efficiency, direct-install programs that provide efficient light

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*Participants save close to 4 percent, and total savings in 2010 were 5.4 GWhs.*

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bulbs and other technologies for free, and one-stop shop home energy improvement programs that help customers assess (via an audit) how to improve the efficiency of their home, identify a contractor, and access financing. On-bill financing and repayment programs are a particularly good fit for municipal utilities.

Seattle City Light, a municipal utility, provides home energy reports to single family customers that use behavioral science to encourage energy efficiency by comparing customers to their neighbors. Participants save close to 4 percent, and total savings in 2010 were 5.4 GWhs.<sup>165</sup> The utility offers energy audits, direct install of light bulbs, rebates on efficient appliances, and a comprehensive home energy improvement program through Community Power Works. Over 3,000 families have participated in Community Power Works, through which Seattle provides on-utility bill repayment for low-cost loans issued by a nonprofit lender to participating homeowners and emphasizes hiring local people and businesses to complete the retrofits.<sup>166</sup>

Local governments that control utilities should provide their customers with clean energy. A utility can promote renewable generation in a number of ways, starting with simply investing in it instead of other generation sources. Municipal utilities may be able to develop utility-scale wind or solar, or they may purchase clean generation capacity. San Antonio's municipal utility recently entered into a 25-year power-purchase agreement for a 400 MW solar array to provide electricity for 70,000 households, or around 10 percent of total customers. The city further leveraged this investment to include investment in local manufacturing of solar components and created around 800 new jobs, bringing in an estimated \$700 million annually for the city.<sup>167</sup>

Another option for city-controlled utilities is the feed-in tariff, or FIT. Cities that have the capacity to do so should adopt FITs to allow energy producers of different sizes to sell renewable energy back to the grid at a production cost-based price, varying according to the production technology implemented. Efficiently operated projects are thus guaranteed a rate of return, spurring investment. Gainesville, Florida, has enacted a FIT at the municipal utility that mimics many of the features of the most successful European programs. The tariff is based on the cost to generate the renewable energy plus a 5 percent to 6 percent return, incentivizing businesses and residents to install renewable generation capacity.<sup>168</sup> The program is currently fully subscribed. The Lincoln Electric System Administrative Board in Lincoln, Nebraska recently expanded their solar net metering program and improved the rates they pay for renewable generation.<sup>169</sup>

One potential issue for municipal utilities is the presence of long-term power supply contracts. Many utilities do not own their generation facilities, but rather contract for power. Some may have signed long-term contracts, locking them into a certain level of supply and/or a high-carbon energy mix. This can make utility managers reluctant to implement energy efficiency or renewable energy programs. Still, many of the most innovative renewable energy and energy-efficiency programs are run by municipal utilities. As they are under the control of the municipality's political leadership, they are more likely to be partners in addressing a city's clean energy goals. Investor-owned utilities are inherently guided by profit motives—and they profit by selling energy—and thus may not be as willing to invest in energy-efficiency or renewable-generation programs. In some places municipalities without a municipally owned utility are considering creating one or buying the existing one. Boulder, Colorado, is currently pursuing the creation of

## Utilities

Local government can require utilities to reduce their GHG emissions in a number of ways.

For cities with municipal utilities, they should:

- Provide simple, direct install efficiency measures
- Offer comprehensive energy upgrade programs
- Use behavior science to increase efficiency
- Develop or purchase low-carbon energy
- Institute a feed-in tariff for renewable energy generation

Cities served by investor-owned utilities should:

- Run community choice aggregation programs, where available
- Use utility franchise agreements to leverage renewable energy content
- Explore using public health and safety powers to regulate dirty energy generation within their borders
- Explore creating a municipal utility

a municipal utility and the acquisition of some of Xcel Energy’s assets, and Jefferson County, Washington, transitioned to a newly acquired public utility in 2013.<sup>170</sup>

### Community Choice Aggregation

For cities without a municipal utility, community choice aggregation (CCA) offers a convenient way to increase the amount of renewable energy available to residents and businesses. CCA must be enabled via state legislation. Under CCA, cities aggregate electricity demand within their boundaries and negotiate bulk purchasing agreements with power providers, while maintaining the existing electricity provider for transmission and distribution services. CCA allows a municipal government to negotiate both better prices and a higher quality (lower GHG) product.<sup>171</sup> Over 600 local governments in Illinois and over 300 local governments in Ohio have done CCAs.

In 2011, the Village of Oak Park became the first municipality in Illinois and possibly the nation purchase a 100 percent renewable power supply. The program saves participants about 25 percent over the default provider, and saved a total of \$4.9 million over two years. Oak Park’s aggregation program was recognized by a Green Power Community award from the USEPA.<sup>172</sup> In 2012, Cincinnati chose a 100 percent renewable provider for its CCA program. By switching 60,000 accounts to renewable energy, Cincinnati’s carbon footprint was reduced by approximately 550,000 tons per year.<sup>173</sup>

### Franchise Agreements

Cities may also be able to influence investor-owned utilities via the renegotiation of utility franchise agreements. Because utilities must run their pipes, lines, poles and other facilities over or on city-owned streets, alleys and rights-of-way, utilities agree to pay fees and conform to certain standards, as laid out in their franchise agreements with cities. The amount of control cities have to renegotiate these agreements varies from state to state, and few cities have used this vehicle to assert their preference for energy efficiency or low carbon energy. It is possible, however, to use franchise

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*By switching 60,000 accounts to renewable energy, Cincinnati's carbon footprint was reduced by approximately 550,000 tons per year*

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agreements to force utilities to offer more or better renewable power options. Ann Arbor, Michigan incorporated what is essentially a municipal renewable power standard into their franchise agreement.<sup>174</sup>

### Air Quality Regulation

Cities may also be able to impact GHG emissions from power generation facilities within their boundaries. Although local governments do not have direct authority over air quality, they may, depending on the degree of home rule they have under state law, be able to regulate emissions that have a negative impact on public health. Chicago, for example, was successful in getting two coal-fired plants to shut down, in part by introducing an ordinance that would have limited the amounts of particulate matter and carbon dioxide the plants could emit.<sup>175</sup>

## WATER

As noted above, water and wastewater facilities can be among the largest consumers of energy in a community—and thus among the largest contributors to the community’s total GHG emissions. While water facilities themselves can be made more energy efficient, water and wastewater utilities can also reduce energy use by promoting the efficient use of water, which reduces the amount of energy needed to

treat and distribute water. In California, for example, urban water use accounts for 70 percent of the electricity associated with water supply and treatment.<sup>176</sup>

### Efficiency Programs and Incentives

There are a variety of policies municipalities and/or municipal utilities can undertake to encourage efficient water use. One relatively straightforward and politically painless—though requiring a modest appropriation—way that cities can encourage minimizing water use is by creating programs that subsidize or directly install water-saving measures, including low-flow showerheads, low-flow and dual-mode toilets, faucet aerators, and water-saving dishwashers and clothes washers. Water utilities can distribute retrofit kits directly or through community organizations. Because pumping water uses so much energy, combining water efficiency measures into broader energy efficiency audit and retrofit programs such as those described in the energy efficiency section can be an effective approach. Utilities should also consider instituting targeted programs for different customer classes (residential, commercial, industrial, institutional, and so on). Retrofits of industrial premises can include facilities used by the public and employees, as well as facilities used for production purposes. Programs to retrofit low-income housing units may conserve considerable water in older residential housing units with inefficient plumbing fixtures. Targeted programs also could be designed in cooperation with community organizations.

To accelerate the replacement of older fixtures, cities or utilities can offer rebates and other incentives. Cities can provide fixtures at no cost, give rebates for consumer-purchased fixtures, or arrange for suppliers to provide fixtures at a reduced price. Madison, Wisconsin, emphasizes conservation with a highly successful low-flow toilet rebate program.<sup>177</sup> These programs can easily incorporate existing federal standards; the Madison program, for instance, give rebates for any High-Efficiency Toilet rated by the EPA's WaterSense program.<sup>178</sup> Program design can include incentives that are targeted to the nonresidential and residential sectors, and to indoor and outdoor uses. Note that the feasibility and effectiveness of replacements may depend to some extent on state and local plumbing codes.

Another low-cost water-efficiency intervention involves direct outreach to and education of consumers. For instance, the Santa Clara Valley Water District, a drinking water utility serving 1.8 million residents in the semi-arid region around San Jose, California, offers a free Water Wise House Call Program in which a water conservation expert comes to a home, calculates its water use, teaches residents how to read their water meter, surveys the irrigation system, and demonstrates simple ways to save water both inside and outside of the home. The district performed more than 1,500 of these house calls in 2009. Through its water conservation and water recycling programs, the water district calculates that it has saved approximately \$347 million over 16 years, equivalent to the annual electricity use of 412,000 average California households.<sup>179</sup>

### Pricing

A bigger political lift involves changing the way in which water utilities price drinking water. If billing does not reflect usage—that is, the variable part of the bill, if there is one, is insignificant compared to the fixed costs—there is little financial incentive to reduce use. Smart-water meters that reflect use can help, as can structuring water rates to tie fixed costs more closely to usage. In a conservation rate structure, individual

#### Water

Water pumping and treatment is a significant use of energy in most communities. Efforts to reduce the amount of drinking water pumped and treated, and the amount of water that enters wastewater system and must be treated, will save energy and reduce GHG emissions.

Possible efforts include:

- Water efficiency retrofits
- Rebates on efficient appliances
- Education and behavioral programs
- Conservation pricing
- Water-efficient landscaping requirements or incentives
- Limit on irrigation
- Rainwater capture and reuse
- Green infrastructure to increase on-site infiltration
- Stormwater fees
- Greywater reuse

customers are metered and pay for the volume of water they use, and the price charged should be sufficient to influence consumers' decisions about water use and to encourage efficiency. Conservation pricing in water generally assumes a tiered pricing structure, where the water used within the first tier is the least expensive, and subsequent water use is charged at a higher rate or rates. Only half of all national water utilities currently use tiered rates. Many others still reward extra water use, giving large volume buyers a discount—a policy that ends up imposing disproportionate costs on working families while effectively subsidizing large industrial users.<sup>180</sup> Cities might also consider seasonal variations in use or pricing indoor and outdoor usage based on differing contributions to system peaks.<sup>181</sup>

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*San Antonio, Texas has reduced its per capita water usage by 42 percent in the past few decades despite having one of the fastest-growing populations in the country.*

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While typically driven by conservation goals, implementation of a tiered price structure for water, if done right, also makes water pricing more progressive since lower rates are charged to typical residential users, as well as to households that conserve water. Structuring the tiers and rates to ensure that typical household water rates do not rise—and ideally, decrease—is particularly important since low-income households spend a larger percentage of their income on water and therefore are more sensitive to changes in price.

San Antonio, Texas has reduced its per capita water usage by 42 percent in the past few decades despite having one of the fastest-growing populations in the country. This reduction is due to large scale conservation efforts by the local water utility, including a tiered water rate structure that doubled the unit price of water for the highest usage tier.<sup>182</sup> Boulder, Colorado, introduced a tiered rate structure in 2007, where the highest tier is charged five times the base rate. It achieved a 16 percent reduction in water consumption in the first five months of implementing the structure.

### Reducing Outdoor Water Use

Outdoor water usage is one of the main drivers of peak demand for municipal water; reducing outdoor usage can thus be a very effective conservation strategy. The average single-family suburban home uses at least 30 percent of its water for outdoor purposes such as irrigation and as much as 70 percent in dry climates,<sup>183</sup> and some estimates put the amount of landscape water wasted due to evaporation, wind, or overwatering at over 50 percent.<sup>184</sup> One way outdoor water use can be reduced is through efficient landscaping principles. This may include Xeriscaping, an efficiency-oriented approach to landscaping that encompasses seven essential principles: planning and design; limited turf areas; efficient irrigation; soil improvement; mulching; use of lower water demand plants; and appropriate maintenance.<sup>185</sup> A study examining the impacts of Xeriscape application in seven cities in the Front Range in Colorado suggested that water savings in the 30 percent range could be sustained for a properly designed and maintained Xeriscape.<sup>186</sup> Another report describing a study in the North Marin Water District concluded that proper choice of plants and landscape design could reduce water use by up to 54 percent.<sup>187</sup>

In addition, standard lawn maintenance equipment such as lawn mowers, chain saws, leaf vacuums, and other fossil-fueled lawn maintenance equipment emit high levels of carbon monoxide, hydrocarbons and nitrogen oxides, which contribute to the formation of ground level ozone, toxins and other particulates. The USEPA estimates that a gasoline-powered lawn mower emits 11 times the air pollution of a new car for each hour of operation.<sup>188</sup> Gasoline lawn and power equipment can produce as much as five percent of smog-forming VOCs in certain areas.<sup>189</sup> In addition to reducing energy use through water conservation,

natural landscaping—in particular the reduction in use of turf grass described below—can significantly reduce the need for fossil-fueled lawn and garden equipment and thus reduce the associated air pollution and health risks. The Clean Air Counts campaign estimates that for every 1,000 acres of natural landscaping, 50 tons of VOCs and five tons of NO<sub>x</sub> are avoided per year.<sup>190</sup>

Cities can encourage low-water, natural landscaping in a variety of ways. Municipal utilities can work with commercial and industrial customers to plan and renovate landscaping in accordance with water conserving practices. Water audits can be done for outdoor usage, as well as for indoor processes. Audits of irrigation practices can provide large-volume commercial, industrial, and public users with information about usage and usage-reduction techniques. These audits can be used in conjunction with irrigation sub-metering and other landscaping efficiency practices. Utilities can also hold workshops for industries that might be able to contribute to water conservation efforts, such as builders or landscape and irrigation service providers.

Localities may also consider ordinances to restrict outdoor watering of lawns completely; on certain days of the week or times of day; or to require that landscaping plans for new construction projects consider water use. The City of Indio, California, passed an ordinance to improve water conservation by, among other things, mandating the installation of landscaping equipment to improve water conservation.<sup>191</sup> Eden Prairie, Minnesota has a similar ordinance that give the City Manager the power to restrict landscape irrigation.<sup>192</sup> Medina, Minnesota requires the installation of rain sensors as part of irrigation systems so the systems don't turn on when irrigation is not needed.<sup>193</sup>

Cities can also promote low-water landscaping by enacting limits (or removing requirements, if they exist) on turfgrass for private property, particularly for new buildings. Turfgrass receives the highest percentage of irrigation water in traditional landscaping. As a result, landscapes with large expanses of turfgrass generally use more water than those with a mixture of other plants.<sup>194</sup> For this reason, some cities have begun to limit the amount of turfgrass installed in new homes. El Paso, Texas amended its municipal code in 2002 to restrict turf areas to 50 percent or less of total outdoor landscaped area.<sup>195</sup> Green building programs around the country often include guidelines regarding turfgrass installation in new homes: for instance, the East Bay Municipal Utility District's WaterSmart program limits turf areas to no more than 25 percent of the total irrigated area. Other cities and utilities take the approach of providing incentives to reduce turfgrass in landscapes.<sup>196</sup>

Cities can also adopt or modify local codes and ordinances in order to facilitate the use of natural landscaping on private property. This can include reviewing and amending or replacing local weed ordinances to encourage natural landscaping; amending subdivision regulations and other ordinances that govern landscaping of development sites in order to accommodate and encourage natural landscaping; amending drainage code language that mandates storm sewers to the exclusion of vegetated swales and filter strips; and including natural landscaping goals and policies in comprehensive plans. Madison, Wisconsin was among the first communities to encourage natural landscaping by taking allowing homeowners to file an application for natural landscaping with approval from a majority of neighbors.<sup>197</sup> More recently enacted ordinances allow natural landscaping "by right" without case by case neighbor or city permission.<sup>198</sup> This is preferable, as just having to apply for a permit can deter homeowners. In general, city regulations and permits should be designed to make the sustainable thing the easy thing. Cities can go further: in addition to having no law regulating vegetation height, the village of Long Grove, Illinois requires developers to include scenic easements at least one hundred feet deep and planted with native plants, wildflowers and grasses between the homes and major streets in their subdivisions. Schaumburg, Illinois, amended its municipal code with a biodiversity ordinance that requires environmentally beneficial landscaping and sustainable development practices.

A comprehensive municipal water efficiency and conservation should incorporate all of the above elements as well as others. For instance, Gwinnett County, a suburb of Atlanta, Georgia, has started a public education and incentive program to encourage the use of water-efficient appliances and reduce water use.<sup>199</sup> The county developed a water conservation program that was implemented in 2003 and has been

updated and re-evaluated since. The program includes a broad range of elements: a residential toilet rebate program; conservation pricing; free conservation kits; an outdoor water schedule; leak detection; residential and commercial water audits; a reclaimed water program; and education/public outreach, including advertisements.

### Green Infrastructure

Cities should prioritize investment in green infrastructure that reduces water consumption and uses natural processes to deal with wastewater and stormwater, such as graywater recycling,<sup>200</sup> green roofs,<sup>201</sup> porous pavement,<sup>202</sup> tree planting,<sup>203</sup> bioswales,<sup>204</sup> rain gardens,<sup>205</sup> water capture,<sup>206</sup> and reducing infiltration and inflow to existing water systems. This will help reduce the volume of water that needs to be treated in wastewater systems, thus reducing energy use. Municipal leaders who want to invest in green infrastructure have to address both existing neighborhoods and buildings and any new construction or development. Existing neighborhoods require more intensive interventions, with investments aimed at reducing consumption, making existing gray infrastructure more efficient and augmenting or replacing it with new green strategies.

If cities want to increase green infrastructure on private property, a one-stop shop model that can connect owners with technical assistance, contractors, rebates and incentives, can help to ensure quality control, and can smooth the process and increase uptake rates. The Center for Neighborhood Technology has pioneered a “wetrofit” model in Chicago that connects neighborhoods with green infrastructure technology and contractors, funds solutions, and helps to coordinate with multiple agencies and stakeholders.<sup>207</sup> Local governments should support such technical assistance, outreach, and education programs.

A great deal of water that ends up in sewer systems—and therefore subject to energy-intensive treatment processes—comes in the form of inflow and infiltration. Inflow occurs where downspouts, sump pumps, and other sources are connected to the sanitary sewer system—sometimes illegally. Inflow can be addressed by disconnecting these sources and dealing with the stormwater they channel on-site via green infrastructure. Downspouts can feed rain barrels, cisterns, or rain gardens. Toronto, Ontario, mandates the disconnection of downspouts from the sewer system.<sup>208</sup> A coalition of communities in the Twin Cities area in Minnesota is working together to reduce inflow and infiltration, imposing a surcharge on areas that do not sufficiently address the issue and providing grants and technical assistance to help meet the targets.<sup>209</sup>

Another intervention that cities might consider to promote stormwater capture and reuse is charging stormwater user fees. The cost of stormwater management has historically been paid from general tax funds or included as a line item on monthly water bills. But increasingly, cities are linking stormwater user fees to each property’s impervious surface area to direct the costs for stormwater management toward those properties that generate the most runoff.

Philadelphia, which is faced with tremendous infrastructure needs and federal requirements, has taken an aggressive approach to pricing stormwater, calibrating its stormwater fees to the amount of a property that is impervious. It has significantly raised its stormwater fees for commercial properties, specifically targeting properties covered with impervious surfaces such as rooftops and parking lots, which contribute most of the pollutants that flow into the city’s drains. For the first time, the city has started to collect stormwater fees from parking lots and other structures that were previously treated as not being connected to the water system. On the other hand if a property owner installs wetlands, rain barrels, green roofs, pervious pavement, or other green infrastructure solutions, the city is willing to forgive at least a portion of, and sometimes the entire, stormwater bill. This avoided cost can help finance the green infrastructure investments, and opens up the possibility of financing arrangements similar to energy-efficiency performance contracting. The city also offers grants to assist with the development of projects.<sup>210</sup>

Finally, reusing graywater—the wastewater from washing, laundry, and dishwashers—for irrigation, or, after processing, for toilet flushing or washing, can significantly reduce water consumption. In jurisdictions that have adopted the International Plumbing Code, it is legal for graywater from showers and washing to be used to flush toilets. This measure alone could reduce household water consumption

by up to 30 percent.<sup>211</sup> Though the Uniform Plumbing Code in effect in some areas prohibits graywater use indoors, it may still allow it for irrigation.

To encourage graywater reuse, Tucson, Arizona, requires residential buildings constructed after 2010 to include graywater accommodations—including separate pipes for sink, shower, and bathtub drains—and an outdoor connection for laundry graywater to allow landscaping use. These requirements allow homeowners to install graywater systems without having to change the existing plumbing system.<sup>212</sup>

## WASTE

Managing solid waste is one area where local governments can make important reductions in the release of methane into the atmosphere. Solid waste management is one of the basic services provided by local government, sometimes via a regional waste management authority. While waste disposal and landfill emissions are the source of just 2-to-3 percent of all U.S. greenhouse gas emissions and a relatively small percentage of carbon dioxide emissions, waste is a significant source of methane. Landfills alone account for approximately 18.2 percent of total U.S. anthropogenic methane emissions in 2012, the third largest contribution of any methane source in the United States.<sup>213</sup>

Waste management is probably more properly looked at as materials management, because reducing waste begins much further upstream than the waste diversion/disposal process. A municipal solid waste plan should encompass a comprehensive look at the way material flows through municipal processes and the community at large. Internally, most cities already have a program in place that assures internal reuse of materials like furniture and equipment. Similar services are often also available to the community, usually in the form of resale businesses and charities. San Jose, CA requires “the use of recycled materials and recycled products” where practical, and has a preference for “replacing disposables with reusables or recyclables” in its purchasing policies. Berkeley, CA has an aggressive ordinance that, in addition to other environmentally friendly purchasing policies, limits the type of packaging the City will purchase, and requires vendors to have take-back policies for products (such as electronics) that are difficult to dispose.

In 2011, Americans generated about 250 million tons of trash, about 4.4 pounds per person per day, only about one-third of which was recycled or otherwise recovered. Two-thirds of municipal solid waste is household waste. About 29 percent is recyclable paper and paperboard; another 27 percent is compostable food scraps and yard waste.<sup>214</sup> To date, municipalities in America have relied heavily on landfills and incinerators to dispose of it all despite the fact that the majority of household waste is compostable or recyclable.

The Minnesota Climate Change Advisory Group quantified various GHG reduction strategies. In the area of waste management, by far the most promising strategy for GHG gas reduction in the state through 2025 was expanded recycling, followed by composting

### Waste

Municipal waste management can contribute to GHG emissions in many ways, and thus there are many opportunities for reduction in this sector, including:

- Set a zero waste goal
- Increase recycling rates
- Community-wide composting
- Coordinated waste pick-up

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*Landfills alone account for approximately 18.2 percent of total U.S. anthropogenic methane emissions in 2012, the third largest contribution of any methane source in the United States*

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and landfill methane recovery. They found that in Minnesota, source reduction, recycling and composting could avoid 70 million metric tons of CO<sub>2</sub>e over 17 years, while methane capture at landfills and biodigestion of organic waste could avoid another 20 million metric tons.<sup>215</sup> Some GHG reductions from improved waste management strategies are reflected in other sectors. For example, reduced GHG emissions from recycling include some avoided product/packaging lifecycle GHG emissions as well as avoided landfill GHG emissions, and both recycling and methane recovery can reduce or replace “dirty” energy generation.

### Zero Waste

The most effective municipal solid waste management plans include clear waste reduction goals and policies. Some communities, including not only Boulder CO, San Francisco, Seattle, Portland and Austin TX but also Logan County, Ohio, have adopted “zero waste” as an explicit objective. The concept of “zero waste” involves both maximizing the diversion of waste from landfills and incinerators (sometimes operationalized as 90% waste diversion by some future date) and reducing waste generation. The more specific the plan is regarding how the municipality will reach zero waste, the more likely it is to achieve its objective. The City of San Jose’s “Zero Waste Strategic Plan” identifies a number of specific policies intended to help the city achieve zero waste, including:

- Environmentally Preferable Procurement
- Extended Producer Responsibility and Product Stewardship
- Disposable Packaging Reduction
- Reducing Single-Use Carryout Bags

### Organic Waste

Food waste accounted for 14.5 percent of total generated waste in the US in 2011, but just 1.6 percent of “recovered” waste.<sup>216</sup> Yard waste is another major source of organic waste material. Composting involves collecting this waste and actively managing it under conditions that help it break down naturally. Diverting organic wastes from landfills reduces the methane released when these materials decompose. Composting also results in a usable end product – compost – that can be used as a soil amendment in landscaping and gardening, avoiding GHG emissions and groundwater pollution associated with synthetic fertilizers.<sup>217</sup> Composting can even be a profit stream for municipalities - compost can be sold throughout a community, from retail gardening stores to golf courses.

Several cities, such as Seattle WA, require residents to separate food scraps and yard waste from trash and utilize special green bins for curbside collection. New technology that allows composting facilities to control the temperature and aerate the compost yields a much faster turnaround than traditional composting. San Francisco, California has reduced the amount of necessary landfill space by almost 25 percent since implementing its mandatory composting program<sup>218</sup> which collects food scraps, yard waste, and soiled paper products. The city collected its millionth ton of organic waste for composting last fall. Overall, 78 percent of San Francisco’s waste is now diverted from landfills. In Portland, Oregon, mandatory curbside compost collection reduced the total volume of garbage

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*In Minnesota, source reduction, recycling and composting could avoid 70 million metric tons of CO<sub>2</sub>e over 17 years, while methane capture at landfills and biodigestion of organic waste could avoid another 20 million metric tons.*

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collected from 94 thousand tons a year to 58 thousand while collection of compostable material increased by 55 thousand tons.<sup>219</sup> Swift County, Minnesota, a largely rural county in west-central Minnesota that must transport landfill waste to distant landfills, mandates that residents properly separate organic wastes from recyclables and “non-processibles.”<sup>220</sup> It is important to make sure institutions and businesses participate in these programs, and that events on public property do as well. Portland, OR provides technical assistance<sup>221</sup> to events wishing to provide a composting option to their attendees, including a list of “green caterers.”<sup>222</sup>

While many municipalities allow and encourage residents to do backyard composting of yard waste, on-site composting of food and other organic waste has traditionally been discouraged or prohibited. Local government can do a lot to make backyard composting possible, including lifting prohibitions and writing reasonable regulations on setbacks from property lines, size limits, screening requirements, etc., into zoning and property maintenance codes. King County, WA provides both residents and businesses with guidance regarding food waste composting. Certain food wastes can be composted in the back yard. Commercial operations may compost on-site or utilize one of a number of local commercial composters.<sup>223</sup> Larger-scale composting should be allowed as well. For example, until 2009 the state of Illinois defined food scraps as “garbage” and required facilities interested in on-site composting to meet state standards of “Pollution Control Facilities.” In that year, legislation recategorizing food waste was passed so that on-site composting facilities are now regulated more like large-scale yard waste composting operations.<sup>224</sup> Perhaps the best type of composting from a climate perspective is large-scale collection and biodigestion of organic waste. This would include curbside pick-up of organic waste and centralized processing of waste that results in biogas and compost, both of which can be used (saving money) or sold for revenue. Madison, Wisconsin is currently running a pilot curbside pick-up program for organic waste, and is planning to build an anaerobic digester to process the waste. Once built, the digester will provide electricity, heating and cooling to city facilities, and produce compressed natural gas for city vehicles.<sup>225</sup>

## Recycling

Every day in America materials that could successfully reenter our manufacturing sector are unnecessarily buried in landfills. Metals and glass can be recycled essentially without limit, while paper can be recycled up to six times. Aluminum cans provide the most GHG emissions reductions from recycling per ton of recycled material, followed by carpeting, other metals (copper, steel, mixed), paper and cardboard, plastics, and glass.<sup>226</sup> There are multiple ways in which local governments can require or promote recycling. First and most commonly, cities can require residents and businesses to participate in curbside pick-up recycling programs. New technologies that allow for efficient sorting of recyclables at sorting facilities have made single-stream recycling the easiest and most economical way to do this.<sup>227</sup> Many Midwestern cities, including Green Bay and Madison in Wisconsin, and West Branch and Le Mars in Iowa have mandatory single-stream recycling. Unfortunately, many of the very largest cities in the U.S., including Chicago and Detroit, do not.<sup>228</sup>

Special attention should be given to multifamily, large commercial and institutional properties, as they are likely to generate large waste streams and may have particular needs related to collection. The most effective programs are mandatory, and cities should have a financial penalty for non-compliance. Education is also important, of both tenants and building managers.<sup>229</sup> Minneapolis requires all commercial, business, and multi-family properties to offer on-site recycling.<sup>230</sup> Portland, OR requires all multifamily residences of five or more units to provide recycling services.<sup>231</sup> Long Beach, CA requires private garbage collection companies operating in the City to provide recycling service as well.<sup>232</sup> Los Angeles, CA provides free recycling services to eligible multifamily residential buildings, including educational materials for tenants.<sup>233</sup>

The vast majority of construction materials can also be recycled. Deliberately deconstructing buildings with recycling in mind can salvage upwards of 70 percent of the building materials, most of which would otherwise have been landfilled.<sup>234</sup> Brawley, CA requires all construction projects with a value greater than \$50,000, or demolition projects greater than 1000 sq. ft., to submit, follow, and report on a recycling

plan.<sup>235</sup> The California Integrated Waste Management Board has developed a similar model ordinance to help municipalities comply with state law regarding waste diversion.<sup>236</sup>

Cities should also require large public events to provide both garbage and recycling services to their attendees. St. Paul, MN recently rolled out a requirement for large events to provide recycling options.<sup>237</sup> In Pittsburgh, PA events of over 200 individuals per day are required to provide recycling of beverage containers and cardboard. Staff provides technical assistance, and organizers can contract with the city for services, drop off materials at a collection point, or hire a private hauler.<sup>238</sup> New York City requires<sup>239</sup> recycling at street events, and provides guidance on how to best meet the requirement.<sup>240</sup> Portland, OR provides substantial guidance<sup>241</sup> to event planners on both recycling and composting (see below), including signs and containers, best practices, and suggestions for reducing waste, including a “Water Event Station”, which connects directly to the City water system and allows attendees to fill their own water bottles instead of purchasing bottled water.<sup>242</sup> Boise, ID includes recycling as one of the many things event organizers must address as they apply for permits or request to lease city facilities, and makes available containers, signs and technical assistance. The city has been successful in getting as much as 50 percent diversion from participating events.<sup>243</sup>

## Waste Collection

How waste is collected, and how that collection is paid for, can impact GHG emissions as well. In some communities, residents contract individually with waste haulers to pick up trash, recycling, or even organics. This is inefficient, adds to wear and tear on roads, and has a high GHG impact because multiple trucks cover the same ground to reach individual houses. Other cities contract out, but in a more organized way – that is, they run a competitive bidding process for one or more private haulers to collect from areas of the city. In 2012 Maplewood, Minnesota moved to this type of organized waste hauling. They found it would save residents collectively \$1.6 million annually. The MN Pollution Control Agency detailed the environmental benefits of organized collection, including energy savings from reduced hauler truck traffic.<sup>244</sup> Other cities use their own staff and equipment to collect waste, a system that is likely the most efficient and provides the greatest opportunity to promote recycling, organics collection, and other GHG reduction measures.

To encourage recycling, composting and other waste-reduction measures, communities should consider volume based pricing for waste collection. Often called “Pay-as-you-throw”, these systems provide incentives for customers to reduce the amount of trash they generate for disposal. Ithaca, NY is one community that requires residents to purchase “trash tags” that must be affixed to all municipally-collected trash bags. Fort Collins, CO requires the private haulers that collect trash (and recyclables) for the city to apply volume-based pricing by offering a range of trash can size options to all residents who live in single-family homes or in multi-family housing in which each unit has its own trash can. Minnesota, though, is the true leader in volume-based solid waste collection. Minnesota state law has since 1994 required municipalities using licensed private waste haulers to require them to charge customers rates for collection of mixed municipal solid waste that increase with the volume or weight of the waste collected. As a result, over 1800 Minnesota communities utilize volume-based pricing for waste collection. However, these communities vary in how much the price structure does to incentivize waste reduction. Even with this progressive state law, local governments in Minnesota have an important role to play in ensuring that the impact of the law is maximized, by requiring public disclosure of hauling rates and fees, encouraging pricing structures that incent waste reduction, etc.

## Food

Food systems account for about a quarter of global greenhouse gas (GHG) emissions.<sup>245</sup> Since most farms are located outside of cities, and most of our food comes from thousands of miles away, local government has limited leverage over emissions that result from agricultural production. But local government can take steps to promote the consumption of foods that have lower GHG impacts, and to create the conditions necessary for thriving local and regional food production. Beyond reducing emissions, these policies can

have the added benefits of improving public health and creating opportunities for job training, employment, and neighborhood revitalization.

### Food Choice

Red meat and dairy products account for two to three times the level of GHG emissions per food dollar spent, when compared to other types of food.<sup>246</sup> Recent climate reports have recommended that governments work to reduce consumption of red meat and dairy products.<sup>247</sup> Fortunately, local governments have already begun acting to do this as part of efforts to encourage students and public employees to eat more healthily. Such efforts often involve “nudging” consumers toward making healthier choices, by adjusting what behavioral economists call the “choice architecture” of how food is presented.<sup>248</sup> In one example, converting a high school lunch line into an express line that offered only healthy options produced a 21 percent increase in purchases of healthy items; other experiments have shown that students are more likely to choose healthy options when vegetables are given fun names (like “X-Ray Vision Carrots”) or when someone asks “would you like fruit with your lunch?”<sup>249</sup> The Smarter Lunchrooms Movement website, hosted by Cornell University’s Center for Behavioral Economics in Child Nutrition Program, provides resources for improving a cafeteria’s choice architecture.<sup>250</sup>

#### Food

Globally, food production and distribution is a significant contributor to GHG emissions. Local governments only have jurisdiction over a portion of the food chain, but they can take actions to reduce emissions, including:

- Change the choice architecture around food provided in government buildings
- Make urban agriculture legal
- Support the production and consumption of local food
- Support farmer’s markets
- Support community gardens and home gardens

In the past few years, public schools in the Midwest have begun to nudge their students toward healthier choices. The Minneapolis Public Schools recently began to require that students take a fruit or vegetable at lunch, while placing limits on meat serving sizes.<sup>251</sup> Of course, even simple changes such as these can have enormous implications for budgets and procurement procedures. This is why school districts in seven Midwestern cities recently partnered with the School Food FOCUS Upper Midwest Learning Lab to investigate how to include more regionally-grown fruits and vegetables in school meals.<sup>252</sup> Farther afield, a similar public-private partnership supported the gradual conversion of a cafeteria at a New York City public elementary school to a fully vegetarian menu, with assistance from the New York Coalition for Healthy School Food.<sup>253</sup> There, students remain free to pack a lunch that includes meat, but about 90 percent choose the cafeteria meals instead. School officials report an increase in test scores, better attention spans, and a decrease in childhood obesity rates.<sup>254</sup> Such a shift may be unimaginable in the Midwest in the near future, but policies that nudge students and public employees to eat more vegetables and less red meat and dairy, can help reduce emissions while also improving public health. This same principle can be applied to the choices offered in city-run or contracted cafeterias, snack bars, and vending machines.

### Urban Agriculture and Local Food

Transportation from producers to retailers accounts for only about 4 percent of GHG emissions in the agriculture sector, yet is an area where local governments have some leverage.<sup>255</sup> In addition to promoting regional food procurement by public institutions, as mentioned above, local government can create policies that help locate some food production closer to retailers and consumers. Many communities’ land-use plans do not protect—or even actively restrict—food-growing activities, due to outdated zoning ordinances

and lack of policy coordination. Where zoning ordinances do not explicitly allow or support “urban agriculture,” these activities may be considered illegal or extra-legal.

Chicago recently adopted zoning code changes to allow land to be used for agricultural purposes, expanding allowable urban growing areas to 25,000 square feet. The new code also relaxes rules for parking and fencing and allows farmers to use aquaponics for growing.<sup>256</sup> The code has offered legal certainty for social enterprises that offer youth programming and job-skills training. Many other cities have progressive policies that support urban animal food production. In Madison, Wisconsin, the city council worked closely with the Dane County Beekeepers Association to pass an ordinance that encourages beekeeping, a key part of urban agriculture and efforts to produce locally-grown food. The new law, a model for beekeepers around the country, defines the distances for locating hives in private yards and requires keepers to obtain a \$10 license from the city.<sup>257</sup> And in Portland—a city with a long-standing law protecting urban chicken-keeping—residents may keep up to three chickens, ducks, rabbits, or pygmy goats without obtaining a permit or paying fees.<sup>258</sup>

The market for locally- and regionally-produced food can be further supported by ensuring that all residents have access to farm-to-consumer outlets like farmers markets. Minneapolis has facilitated the creation of “mini markets,” with five or fewer vendors, by requiring a simpler, less-expensive zoning process.<sup>259</sup> Many cities have also made Electronic Benefit Transfer (EBT) technology available at farmers markets. A recent study showed that markets adopting EBT technology saw sales rise almost 40 percent in a year.<sup>260</sup> The USDA offers supplemental funds to provide wireless EBT equipment, service, and training to farmers’ markets.

Somewhere between seven and 18 million Americans lack an appropriate space to garden.<sup>261</sup> Beyond reducing food miles and GHG emissions due to transportation, community gardens help lower household food costs, create green spaces in urban neighborhoods, and improve public safety by putting vacant spaces into productive, monitored use. Some cities provide financial support for community gardens; others make municipal land and access to water available at low or no cost; and others act as partners in operating community garden programs. Seattle has the highest number of community gardens per capita in the United States. The City Council passed a resolution in support of community gardens, recommending they be located on city properties and setting a target of one community garden for every 2,000 households in high-density neighborhoods. In Seattle, anyone can grow food on plots of less than 4,000 square feet and sell their produce on-site or at a farmer’s market.<sup>262</sup>

Local government can also promote household food production by reviewing and modernizing regulations that restrict gardening in front yards and the spaces between sidewalks and streets. Together with reasonable standards for garden fences, raised vegetable beds, and vegetation height, such policies ensure that residents are not frustrated in their attempts to cultivate productive and healthy urban landscapes. Cities should make it proactively clear that gardens are allowed. Madison, Wisconsin recently affirmed that terrace gardens are allowed – without a permit – as long as gardeners follow basic safety provisions.<sup>263</sup>

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*Food systems account for about a quarter of global greenhouse gas (GHG) emissions... Red meat and dairy products account for two to three times the level of GHG emissions per food dollar spent, when compared to other types of food.*

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## CONCLUSION

While it may seem strange to characterize a fifty page document as an overview, that is nonetheless what this memo is. Our aim is to describe actions that most municipal governments can take, that are more or less politically feasible, and that would have a significant impact on GHG emissions. We hope the reader is stuck by the breadth of policy options at the local level, and by the substantial emissions reductions that are possible. Indeed, the full potential is greater than what we hint at here, because we do not include all possible policies, nor do we include actions that would take place solely in the private sector – things that business, organizations, and individuals can and will do on their own.

It is undeniable that action at the federal and state level, or with large private-sector actors like investor owned utilities, can have a larger emissions reduction impact than working city by city. However, in recent years it has been politically much more difficult to work at these levels than we would like, and we have seen little progress and even some backsliding. Local governments provide an opportunity for success – perhaps the most likely opportunity we have at the moment – and success at the local level can resonate upwards. Furthermore, because local government is the level of government closest to people’s day to day lives, it is well suited to create a policy environment that makes living a low carbon lifestyle possible, or even preferable.

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