NATIONAL LEAGUE of CITIES | MUNICIPAL ACTION GUIDE

By Corinne Kisner

Measuring Emissions and Creating a Greenhouse Gas Inventory

Climate change is a global problem, but its impacts will be felt, and its solutions will be found, at the local level. In the absence of strong federal direction, cities are seizing the initiative and setting their own climate goals. Not only will this approach give cities a leadership role in emissions reductions, but a thoughtful climate mitigation plan will produce substantial, ancillary benefits. Many cities that have implemented climate strategies are finding that these projects also save money, reduce air pollution, improve public health and boost a city's reputation for livability. For example, access to public transportation or bicycle/pedestrian trails reduces pollution, improves health and raises property values; energy efficiency projects slash electricity bills and ease municipal budgets.

> "…cities are seizing the initiative and setting their own climate goals."

CLIMATE CHANGE

While policy debates have sometimes become heated, there is scientific consensus that climate change is occurring at an alarming rate, and actions can be taken to address it. Since the Industrial Revolution, atmospheric carbon dioxide (CO_2) levels have increased 39%, and atmospheric methane (CH_4) levels have increased 157%. According to the Intergovernmental Panel on Climate Change (IPCC), the current CO_2 and CH_4 concentrations are higher than at any time in at least the past 650,000 years.

Carbon dioxide persists in the atmosphere for a century or more before breaking down, and warms the Earth throughout its atmospheric lifetime. Meanwhile, 50 times as much CO_2 has been absorbed by the oceans as by the atmosphere, leading to ocean acidification. Due to the long life spans of greenhouse gases, even if all emissions were halted today, the world would still experience changes to the climate from the concentrations of emissions that have already accumulated in the atmosphere and in the oceans.

The situation could reach a point where a number of dangerous feedback loops become unstoppable — i.e., rising temperatures melt ice, creating less reflective surfaces, leading to more sunlight absorption and rising temperatures, which melts more ice. The consequences would be potentially catastrophic, which is why many cities are investigating the role

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they can play with regard to emissions, while some are implementing comprehensive climate action plans. And regardless of climate change, the related benefits of taking action can be significant.

BEGIN BY MEASURING

Conducting a greenhouse gas emissions inventory serves as the foundation for an informed and effective strategy. After calculating the baseline, local governments can set reduction targets, create climate action plans that include programs to reduce emissions, and evaluate the progress in achieving targets. Local officials can select from a variety of tools, and can also choose what to measure, such as assessing emissions from only government operations or from community-wide activities.

Greenhouse gas inventories aggregate the emissions of methane, carbon dioxide, nitrous oxide, sulfur hexafluoride, perfluorocarbons and hydrofluorocarbons. Each gas has a different heat-trapping ability and atmospheric lifetime, so they're converted into a single common unit — carbon dioxide equivalent (CO_2e). Converting all greenhouse gas emissions to CO_2e allows them to be considered in comparable terms, and is especially useful when determining a cost-effective emissions reduction plan.

ACTION STEPS

ASSESS CAPACITY

Conducting a greenhouse gas inventory can seem daunting at first, but is feasible for most local governments. For some cities, self-inventories can be conducted by municipal staff using a variety of tools available online. For example, the U.S. Environmental Protection Agency (EPA) partnered with ICLEI-Local Governments for Sustainability and the National Association of Clean Air Agencies to create a program — Clean Air and Climate Protection Software — that calculates total greenhouse gas emissions based on energy consumption data inputs. The EPA Energy Star program also offers its Portfolio Manager tool, which can track emissions from public buildings. If the city lacks the required personnel resources to use these types of tools, independent consulting firms can conduct the baseline. Alternatively, a local university can be a great source of expertise.

The availability of possible funding sources may also affect the direction of this work. Federal government grants may be available, such as those through the American Reinvestment and Recovery Act of 2009, to fund a climate mitigation program. Some cities have used a dedicated tax, while others have planned to pay for an inventory by reserving future energy savings.

CREVE COEUR, MISSOURI
(WWW.CREVE-COEUR.ORG)

A greenhouse gas inventory was achieved thanks to one resident's charitable donation, dedicated to funding an internship at nearby St. Louis University. The student intern worked for 13 weeks during the summer under the supervision of municipal staff, collecting data and compiling an inventory. This arrangement benefited all parties: the university received funding to create the position, the intern gained valuable experience and compensation, the donor could claim a tax deduction, and the city gained the inventory.

DETERMINE THE SCOPE

Which greenhouse gases will be included? Will the inventory cover only municipal operations or community-wide activities? Will emissions be divided by sector (energy, transportation, buildings) or activity (emissions from City Hall, municipal vehicles, streetlights, solid waste)? Is data available for a previous year that can serve as a baseline for comparison?

CREATE A NETWORK OF STAKEHOLDERS

Engage individuals, local government agencies, utilities and other groups that can provide the data necessary to calculate emissions. An emissions inventory is as much an operational endeavor as an environmental one; compiling accurate and comprehensive data is the key to a useful and meaningful analysis. A kick-off meeting with as many of the key stakeholders as possible in one room could provide the necessary inspiration for a labor intensive project.

COLLECT THE DATA

Collection of data regarding energy and water consumption, agriculture, transportation, industry and waste is time consuming, but it is also the most important step in determining the quality of results. A standardized data collection form will make the process more convenient and consistent.

A "bottom-up" approach that collects data from end users could result in a more specific break-down of greenhouse gases by activity, and make it easier to identify potential reduction targets.

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CALCULATE EMISSIONS

Direct measurement of emissions from the source is usually outside the scope of municipal operations. Instead, scientific studies have determined the average quantity of greenhouse gases emitted for a variety of common activities. These "emission factors" allow for the approximation of greenhouse gas emissions based on activity data such as vehicle miles traveled, megawatts of electricity consumed, pounds of waste produced or even heads of cattle grazing. The EPA software program uses the city's energy data inputs to calculate total greenhouse gas emissions based on the emission factors. Alternatively, other organizations have set emission factors that municipal staff can use when conducting an inventory.

AFTER THE INVENTORY

Measuring is only the first step, and needs to be followed by a variety of potential measures focused on both mitigation of emissions and preparation to deal with the unavoidable effects of climate change.

Following an inventory, the city can set emission reduction targets. The World Mayors and Local Governments Climate Protection Agreement, supported by the National League of Cities, endorses a worldwide emissions reduction of 60% below 1990 levels by 2050, with a target of 80% reduction in the U.S. and other industrialized counties. Some cities have tied their goals to the international Kyoto Protocol targets, which were never ratified by the federal government. Many cities — from Durham, North Carolina, to Homer, Alaska — have determined their own, ambitious targets. In setting commitments, cities should include both long-term goals and short-term targets to help evaluate success over time.

EVANSTON, ILLINOIS
(WWW.CITYOFEVANSTON.ORG)

A vast community network is working to help the city meet its emissions goals. The city collaborated with the Network for Evanston's Future, a local sustainability coalition, to create an emission reduction strategy. Nine taskforces, each chaired by one municipal staffperson and two citizens, researched and drafted the Climate Action Plan. A grassroots group, Citizens for a Greener Evanston, formed to provide a continuing forum. The Evanston Community Foundation manages a Climate Action Fund, through which residents can donate to local projects that achieve emission reductions. And a Green Ribbon Committee comprised of the city's largest employers seeks innovative, high-impact strategies to meet the goals.

Next, a tailored climate mitigation plan should implement specific policies and programs to reduce emissions based on the trends revealed by the inventory. Regular analysis and adjustments are necessary and can achieve even greater reductions. Adaptation planning and preparation is equally necessary, and climate initiatives generally should be integrated

as part of the community's comprehensive sustainability plans in order to maximize benefits. As with all sustainability efforts, engage the community, keep the process transparent and publicize the results. And be sure to share your experiences so that other cities can learn from you, and vice versa.

RESOURCES

TOOLS AND CALCULATORS

- U.S. EPA: State and Local Climate and Energy Program: www.epa.gov/statelocalclimate/local/activities/ghg-inventory.html
  - Clean Air and Climate Protection Software
  - Climate Change Emission Calculator Kit (Climate CHECK)
  - Energy Star Portfolio Manager
  - Waste Reduction Model (WARM)

EMISSIONS FACTORS

- U.S. Energy Information Administration: www.eia.doe.gov/oiaf/1605/emission_factors.html
- The Greenhouse Gas Protocol Initiative: www.ghgprotocol.org
- Intergovernmental Panel on Climate Change: www.ipcc-nggip.iges.or.jp/EFDB/main.php

ABOUT THIS PUBLICATION

Corinne Kisner is the sustainability fellow in the Center for Research and Innovation at the National League of Cities. For additional information about cities and sustainability, visit the NLC webpage at www.nlc.org or e-mail sustainability@nlc.org.

The **National League of Cities** is the nation's oldest and largest organization devoted to strengthening and promoting cities as centers of opportunity, leadership and governance. NLC is a resource and advocate for more 1,600 member cities and the 49 state municipal leagues, representing 19,000 cities and towns and more than 218 million Americans. Through its Center for Research and Innovation, NLC provides research and analysis on key topics and trends important to cities, creative solutions to improve the quality of life in communities, inspiration and ideas for local officials to use in tackling tough issues and opportunities for city leaders to connect with peers, share experiences and learn about innovative approaches in cities.

The **Home Depot Foundation**, created in 2002, supports nonprofit organizations dedicated to creating and preserving healthy, affordable homes as the cornerstone of sustainable communities. The foundation's goal is for all families to have the opportunity to live in healthy, efficient homes they can afford over the long-term; to have access to safe, vibrant parks and greenspaces; and to receive the economic, social and environmental benefits of living in a sustainable community. For more information, visit www.homedepotfoundation.org and follow us on Twitter @homedepotfdn. Created in 2009, the **Sustainable Cities Institute** (SCI) is a two-part initiative from The Home Depot Foundation that provides a one-stop shop for cities and sustainability professionals to find vetted best practices from across the country to help them identify and implement local sustainable practices and policies as well as communicate with other cities about sustainability related issues and topics. For more information, visit www.sustainablecitiesinstitute.org and follow us on Twitter @sustcitiesinst.