

Leadership by U.S. Cities:

INNOVATIONS IN CLIMATE ACTION

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Innovation Network
for Communities

**Bloomberg
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FOREWORD FROM THE HONORABLE JOHN F. KERRY, U.S. SECRETARY OF STATE



U.S. Secretary of State John Kerry

FOR DECADES, WE'VE KNOWN that climate change is real and that unless we as a global community come together to alter the course our planet is on, the impacts will be devastating in every corner of the globe.

And, all the while, the alarming projections that scientists have been making have begun to unfold before our eyes — in some cases, occurring faster and with greater intensity than initially foretold.

Last December, the world came together at the UN Conference of Parties in Paris with a clear understanding of the urgency of this moment. We left with an agreement that finally charts a new, sustainable path for our planet. The United States and 194 other nations reached an agreement that will help the world transition to a clean energy economy and ultimately prevent the worst, most devastating consequences of climate change from ever happening.

Quite simply: It's the strongest, most ambitious global climate agreement ever negotiated.

Cities played a critical role in generating the momentum that led to the success of the Paris negotiations — and the actions cities take in the future will make all the difference in the ultimate outcome of our efforts. The global climate agreement was drafted to ensure that all nations keep an eye on their targets, so those targets remain as ambitious as possible. The entire world will be taking stock of the progress we're making and the opportunities we're missing — and reviewing our capabilities every five years, accounting for steady technological advancements. Wherever feasible, countries will strengthen their targets over time.

When you consider that more than 70 percent of greenhouse gas emissions worldwide come from urban centers, it's clear that cities will be vital in stimulating, developing and deploying systems for

high-efficiency buildings and low-carbon power, transportation and waste-management systems. In doing so, they will both motivate and enable national governments to meet their initial targets and to come forward with more ambitious ones in years ahead.

This Bloomberg Philanthropies report highlights the important work being done by U.S. cities to implement practical solutions to reduce emissions and to adapt to climate change. By 2050, a full two-thirds of the world's population will live in cities. Nine in ten major metropolitan areas are situated along inland or coastal waterways, making them particularly vulnerable to climate-driven sea-level rise and extreme weather. As a result, cities are on the front lines of climate change impacts. But they are also uniquely positioned to experiment with bold new ideas both for reducing impacts and for minimizing emissions. The innovative trends and systems framework highlighted in this report are valuable tools for cities in the U.S. and around the world to adopt in order to address the challenges they face.

No one has a better understanding of the critical role of cities in the climate fight than former New York City Mayor and current UN Special Envoy for Cities and Climate Change Michael R. Bloomberg. As mayor, he implemented changes that helped cut New York's greenhouse gas emissions by a full 20 percent. Mike understands that climate change is unlike anything we have faced before — as individual cities, as a community of nations or as one planet. He has long approached this global challenge with the sense of urgency and responsibility it demands, and I am enormously grateful for his engagement — including on the “Our Cities, Our Climate” partnership in which Bloomberg Philanthropies and the State Department brought city leaders from around the world to the U.S. to exchange insights and share practical climate solutions.

We know that no country is immune to climate change and all countries must act together in partnership with local governments and private actors to ensure global economic and physical security. This is a time of urgency and responsibility, but it's also a time of extraordinary opportunity and possibility. The Paris agreement is a historic step. But what we do next — how we implement our targets, the progress we make in our cities and communities, how we intensify our shared efforts in the time ahead — that's what will determine whether we're actually able to address one of the most complex challenges humankind has ever faced. I am convinced we can and will.

JOHN F. KERRY



FOREWORD FROM MICHAEL R. BLOOMBERG, UN SECRETARY-GENERAL'S SPECIAL ENVOY FOR CITIES AND CLIMATE CHANGE



Michael R. Bloomberg, UN Secretary-General's Special Envoy for Cities and Climate Change

THE GLOBAL AGREEMENT reached in Paris was a big step forward in the fight against climate change. While nations approved the deal, cities helped make it possible – and they are the key to making it work.

Cities are home to the majority of the world's people and account for most of the world's carbon emissions, so the road to solving climate change must go through cities. Fortunately, they are well-equipped to meet the challenge. Mayors usually have control

over some or all of the biggest sources of local carbon emissions – like buildings, transportation, and waste. They can move quickly to make those systems more efficient, free from the bureaucratic hurdles and political battles that can hinder progress at the national level.

Cities are capitalizing on this opportunity because they have strong incentives to do so. Steps cities take to reduce carbon emissions also clean the air people breathe, which leads to less sickness and longer lives. People want to live where the air is clean, and where people want to live, businesses want to invest.

Mayors see climate change as an immediate economic and public health issue. They are the officials most directly responsible for people's safety and well-being, and they're not taking chances. That's why some of the most innovative climate solutions are coming from mayors. This progress is being accelerated by collaboration and partnership.

That's the focus of "Our Cities, Our Climate" partnership. Last October, Bloomberg Philanthropies partnered with Secretary John F. Kerry and the U.S. Department of State to convene city leaders from across the world to exchange local climate strategies. The program was hosted by three of the U.S. cities that are providing strong leadership on the issue – Boston, San Francisco, and Washington, D.C. – and it brought great ideas from those cities and others to the forefront.

This report provides a summary of some of the insights that were shared. It outlines the ways U.S. cities are reducing carbon emissions, protecting people from risks, and helping people live longer, better lives – and it can serve as a great tool for spurring progress in other cities.

Our foundation is glad to be working with Secretary Kerry on this critical effort. He and his team deserve a lot of credit for helping forge a successful agreement in Paris, and for all they have done to highlight the work of cities – which, in turn, is helping to encourage nations to aim higher and act more quickly to address climate change.

The more cities borrow good ideas from one another, the faster they can make progress. When it comes to our climate, cities are rising to the occasion – and this report can help them take even bolder steps to protect our future and improve lives today.

MICHAEL R. BLOOMBERG



EXECUTIVE SUMMARY

This report highlights developments in climate action — insights and innovations — produced by cities across the United States. Five patterns have emerged among the 26 leading cities spotlighted here.



1 Cities are Uncoupling Growth from Carbon

Cities in the U.S. are demonstrating that it is possible to reduce GHG emissions substantially while also growing their economies and populations.



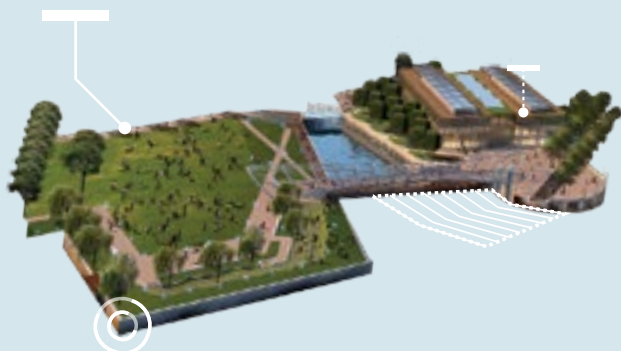
2 Cities are Transforming Core Urban Systems

More and more U.S. cities are serving as “innovation laboratories” for climate action — moving beyond pilot projects to develop and increasingly sophisticated framework for transforming core city systems to achieve desired climate outcomes.



3 Cities' Climate Actions are Delivering Impressive “Co-Benefits”

U.S. cities are finding that climate action leads to “co-benefits” for their residents and businesses, including improved livability, economic opportunity, public health and sustainability.

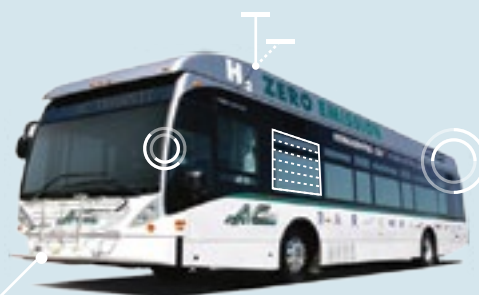


4 Cities are Engaging Local Stakeholders in Ambitious, Sustained Climate Action

U.S. cities are developing potent climate-action alliances with local business and community leaders and with specific business sectors, such as health care and commercial property, community-based activists, universities and philanthropies.

5 Federal and State Governments are Adopting Policies that Enable Cities' Climate Action

Cities cannot do this work alone — many aspects of effective climate action by U.S. cities, especially in transportation and energy-supply systems, depend on enabling policies being implemented by federal and state governments.



An Urban Vision for a Low-Carbon Future

U.S. cities are converging on a systems-change framework for achieving climate outcomes, focused in particular on the four main GHG-emitting core urban systems: energy supply, buildings, transportation and solid waste. A crucial element of this framework is the development of strong visions for what each system will look like when it has been redesigned for a no- or low-carbon future.

To achieve these visions, cities are employing a set of four strategic levers. They **encourage voluntary action, send price signals, make public investments and mandate changes**. A lever shifts underlying drivers in the core urban systems in ways that can dramatically change the decisions of people and organizations and, therefore, change the system's climate-related performance. Each lever is applied through various city actions—policies and programs mainly—that cities are constantly improving and adding to through innovation.

Four Core Urban Systems for Inciting Climate Action

In each of the four core systems, many cities are planning and implementing aggressive approaches to systemic transformation. The bulk of this report details numerous examples of promising city actions for each system, as well as discussing a raft of city efforts in climate adaptation and giving, several examples of highly successful engagement of local stakeholders; it also looks at some unprecedented efforts to monitor cities' performance results in climate action.

Energy Supply

- **Electricity imported** by the city (supplied by utilities) will be de-carbonized
- Substantial amounts of **renewable energy** will be produced locally
- Significant **reductions in demand and consumption** of electricity
- **Fossil-fuel heating sources** will be eliminated
- Modernization of the **electricity grid**

Buildings

- **Existing buildings** will be highly energy efficient and use renewable power and energy-recovery systems
- **New buildings** will be net-zero energy or even net producers of renewable energy
- **Building energy-management** will be a highly trained, technologically advanced occupation
- A robust, local **green-buildings industry** will generate substantial and sustainable business activity and jobs

Transportation

- The ways people get around—their “**modes of mobility**”—will radically shift to 60 percent or more by public transit, walking and biking
- The system will offer an **array of affordable, accessible, attractive mobility choices**
- The **market for cars and trucks** will be dominated by clean-fuel vehicles
- The **regional mobility system** will be seamlessly connected
- Cities will take on **alternative urban forms** that promote high density and livability

Solid Waste

- **Zero Waste**—no material will be landfilled or incinerated
- **Goods producers** will take responsibility for designing and packaging products for durability, reuse and recyclability and will take responsibility for the costs of resource recovery and disposal
- Sustainable Consumption—there will be a **shift in consumption to a prevailing and enduring culture that maximizes efficient use of all resources** through sustainable purchasing (“buy less, buy better, use longer”) reuse, recovery, composting, etc.

Cities in the Report

Hundreds of U.S. cities actively engage with one another and cities worldwide to share information about, experiences with and the tools of climate action. This spirit of openness and collaboration is an oft-noted feature of cities, and it is particularly vigorous among American cities. In October 2015, for example, Bloomberg Philanthropies and the U.S. Department of State partnered to conduct a nine-day learning exchange, “Our Cities, Our Climate,” with mayors and lead climate-action managers from cities in Africa, the Middle East, Asia, Australia, South America, Europe and North America—26 cities in all.

Many U.S. cities are providing ambitious leadership and inspired innovations for climate action, and they are learning much from cities worldwide that are striving to reduce GHG emissions and strengthen their resilience to emerging climate changes. The results of these and other exchanges and the successful climate actions of U.S. cities documented in this report and elsewhere provide examples and inspiration for cities and national governments globally.



● **Mapped Cities:** Aspen, Colorado; Atlanta, Georgia; Austin, Texas; Baltimore, Maryland; Boston, Massachusetts; Boulder, Colorado; Burlington, Vermont; Chicago, Illinois; Cincinnati, Ohio; Cleveland, Ohio; Fayetteville, Arkansas; Greensburg, Kansas; Honolulu, Hawaii; Houston, Texas; Los Angeles, California; Marquette, Michigan; Miami, Florida; Minneapolis, Minnesota; New York City, New York; Philadelphia, Pennsylvania; Portland, Oregon; San Diego, California; San Francisco, California; Seattle, Washington; St. Paul, Minnesota; Tucson, Arizona; Washington, District of Columbia

INSIGHTS FROM U.S. CITIES' EXPERIENCES IN CLIMATE ACTION

THE UNITED STATES is a nation of cities; the great majority of America's 350 million citizens live in cities, and, by the end of the 21st century, it is projected that nearly all will inhabit cities. The residents and businesses in cities generate most of the economic wealth and the carbon emissions produced in the U.S. Meanwhile, many of the nation's largest cities are located along the Atlantic or Pacific oceans and are highly vulnerable to sea-level rise. Cities across the U.S. are already experiencing extreme weather effects brought on by climate change.

These conditions have stimulated bold city leadership on climate action. Mayors, city councilors and city managers are developing and implementing innovative solutions at the local level. City leaders have moved beyond pilot programs and incremental changes and are beginning to reshape energy, transportation and other core systems vital to urban life. Their leadership is producing measurable results that inspire other cities to take up the charge. Their innovations are spreading across the country thanks to a proliferation of networks and initiatives for city-driven exchange, learning and innovation

- More than 1,000 U.S. mayors pledged to support the Kyoto Protocol targets.
- At least 116 local U.S. governments have set greenhouse gas (GHG) emissions reduction targets. At least 42 cities and urban counties, with a total population of 35.8 million, have formally

adopted the aggressive, science-based goal of an 80 percent reduction in GHG emissions by the year 2050 or earlier.

- More than 100 cities have joined the [Compact of Mayors](#), a global coalition of city officials committed to reducing local GHG emissions, enhancing resilience to climate change and tracking progress publicly.
- Dozens of U.S. cities actively engage in world-leading platforms for exchange, learning and collaboration on climate change—including the [C40 Cities Climate Leadership Group](#), the [Urban Sustainability Directors Network in North America](#) and the [Carbon Neutral Cities Alliance](#), an international innovation network of cities pushing toward deep reductions in carbon emissions.

The cities taking these actions reflect a remarkable diversity of American communities: cities in every region, with a wide range of climate conditions; cities with fewer than 100,000 residents and cities 30 or 40 times larger; cities with world-leading economies and cities that have faced declines in population and economic activity. What these cities have in common is this: In every one of them, leaders in government, business, universities, nonprofits and the community have accepted the economic, public health and social imperatives of climate change and are responding with bold action.

The climate actions and achievements of U.S. cities offer encouraging developments and powerful insights that can inform and embolden other cities' leaders. They offer compelling visions for what decarbonized and resilient cities of the future could look like, and they showcase the major strategies and numerous actions for changing public and private investment and behavior at the local level. Many of these visions and strategies are highly relevant to what other cities might undertake.

Five developments and insights are of particular importance:

1. **Uncoupling Growth from Carbon.** Cities in the U.S. are demonstrating that it is possible to reduce GHG emissions substantially while also growing their economies and populations.
2. **Transforming City Systems.** More and more U.S. cities are serving as "innovation laboratories" for climate action—moving beyond pilot projects to develop an increasingly sophisticated framework for transforming core city systems to achieve climate outcomes.
3. **Delivering "Co-Benefits."** U.S. cities are finding that climate action leads to "co-benefits" for their residents and businesses, including improved livability, economic opportunity, public health and sustainability.
4. **Engaging Local Stakeholders.** U.S. cities are developing potent climate-action alliances with local business and community leaders and with specific business sectors such as health care and commercial property, community-based activists, universities and philanthropies.
5. **Enabling Policies Matter.** Cities cannot do this work alone—many aspects of effective climate action by U.S. cities, especially in transportation and energy-supply systems, depend on enabling policies being implemented by federal and state governments.

1 CITIES IN THE U.S. ARE DEMONSTRATING THAT IT IS POSSIBLE TO REDUCE GHG

emissions substantially while also growing their economies and populations.

Cities in the U.S. are showing that they can aggressively reduce GHG emissions and increase their economic activity and population. This demonstrates that it is possible to decouple prosperity from the burning of fossil fuels for energy, as can be seen from the table below.

Similar uncoupling has been achieved in international cities, including Berlin, Copenhagen, Stockholm, Sydney and Vancouver.

These successes are promising, but they are only a beginning. As leading-edge cities look further into the future, they recognize that building aggressively on current efforts will be essential

SOME U.S. CITIES' GHG-REDUCTION PERFORMANCE

BOSTON	From 2005 to 2013, GHG emissions decreased 17 percent, while the Gross City Product grew nearly 13 percent and the city population increased 24 percent.
MINNEAPOLIS	Between 2006 and 2013, GHG emissions decreased 9.4 percent, while population increased 6.5 percent and regional GDP increased 22 percent.
PORTLAND	Since 1990, GHG emissions decreased 14 percent, while population increased 31 percent and the number of jobs increased 20 percent.
SAN FRANCISCO	Since 1990, GHG emissions decreased 23 percent, while population increased 15 percent and GDP increased 49 percent.
SEATTLE	From 1990 through 2012, GHG emissions decreased 4 percent (after accounting for offsets), while population grew 23 percent and the number of jobs increased 14 percent. On a per-person basis, GHG emissions have declined 22 percent since 1990 and 6 percent since 2008.
WASHINGTON, D.C.	Between 2006 and 2013, GHG emissions decreased 16 percent and per-capita emissions 24 percent, while population increased 11 percent, employment grew 8 percent and GDP grew 9 percent.



San Francisco Mayor Edwin Lee

“San Francisco has made steady progress toward reducing greenhouse gas emissions—even as the city’s economy and population have continued to grow. But how do we grow responsibly? The answer is by taking care of our environment. Our city has been able to achieve these results by working with residents and the business community to use cleaner electricity, invest in energy efficiency and recycle and compost more materials.”

2 MORE AND MORE U.S. CITIES ARE SERVING AS “INNOVATION LABORATORIES”

for climate action—moving beyond pilot projects to develop an increasingly sophisticated framework for transforming core city systems to achieve climate outcomes.

As long as 20 years ago, when early warnings about climate change were emerging from scientists, some cities in the U.S., as well as others internationally, started planning to reduce their GHG emissions. Climate action was a blank slate: No one was sure what cities should do, or even what they could do. Comprehensive, long-term climate-action planning was beyond the cities’ capabilities; instead, they articulated general aspirations for the future and developed initiatives and projects. Since those beginnings, a growing number of cities worldwide have evolved climate-action planning into a distinct practice and have embraced science-based goals and interim targets for emissions reduction. Along the way, cities also began to focus on adaptation to address already evident and projected climate effects, an entirely new planning process that is becoming increasingly linked with GHG-reduction planning. Some cities are now integrating both types of climate action into other city plans and processes. By 2015, many cities’ planning had evolved substantially beyond a list of promising projects to a more comprehensive and strategic approach designed to effect systemic changes across a range of city systems. Elements of this approach are described in the following table.

ELEMENTS OF CLIMATE-ACTION PLANNING

A FOCUS ON SYSTEM TRANSFORMATION	Cities recognize that climate action is really about long-term transformation of the core systems in cities that produce most of the emissions and that may be highly vulnerable to climate effects.
ANALYSIS OF “AS-IS” CONDITIONS OF EACH SYSTEM	Cities produce sophisticated analyses of their energy supply, transportation, solid waste and buildings systems to understand how to reduce their emissions and decrease vulnerability to climate effects.
VISIONS OF REDESIGNED SYSTEMS	Cities envision what these systems must look like, decades ahead, if they are to become “post-carbon” and be resilient to the extreme weather resulting from climate change.
STRATEGIC LEVERS FOR SYSTEM CHANGE	Cities know what the levers are that they control to change public and private investments and behaviors, and they can seek to influence the levers they don’t directly control.
STRATEGIC ACTIONS	Cities know the growing menu of actions—policies, practices, information, tools, investments and more—that go with each strategic lever.

For both GHG reduction and climate adaptation, U.S. cities are converging on similar, comprehensive approaches that they tailor to their unique situations and capacities to act. Many of these approaches draw on practices already under way in cities outside the U.S., while also recognizing important differences in national contexts. Mainstreaming climate action into local planning as a regular practice is just beginning. Moving forward, a “standard” for climate-smart planning will be built out of the diligent and profuse experimentation under way in the dozens of “innovation laboratory” cities. (The report’s next sections describe the climate-action frameworks emerging from the living urban laboratories and how transformation is occurring in core urban systems.)



Boston Mayor Martin J. Walsh

“Cities are on the front lines when it comes to climate change and its dangerous impacts; they are the incubators of innovative solutions to this immediate problem.”

3 U.S. CITIES ARE FINDING THAT CLIMATE ACTION LEADS TO “CO-BENEFITS” for their residents and businesses, including livability, economic opportunity, public health and sustainability.

In the U.S., “climate-smart” cities are becoming known for attracting talent, young people and private investment—in part because ambitious local climate action can create numerous positive co-benefits for cities, such as economic development, energy security, cost savings, public health and environmental protection. City leaders can use these co-benefits to engage their communities and stakeholders on issues important to them, even if climate action is not a motivating narrative. Climate action does not have to be a burden for cities, but can, instead, represent an opportunity to develop a city’s comparative advantage for sustainable prosperity.

Seattle’s climate-action plan highlights many of its co-benefits: “While reducing GHG emissions is the primary purpose of this plan, it is important to note that these strategies provide a number of other community benefits. Residents who can meet many of their daily needs by walking, bicycling or riding transit also benefit from lower overall household costs, improved health, thriving local business districts and increased opportunities for housing and jobs. The city’s economy also benefits from reduced fossil-fuel use in the transportation system.”

The table below describes the types of co-benefits that U.S. cities are starting to develop:

CO-BENEFITS OF CITY CLIMATE ACTION

AN ATTRACTIVE PLACE FOR BUSINESSES AND PEOPLE TO LOCATE	Efficient transportation, clean air, parks and walkable communities—qualities of a low-carbon city—make the city a place in which companies can attract and retain talented employees.
LOCAL BUSINESS, ECONOMIC DEVELOPMENT AND JOB CREATION OPPORTUNITIES	The shift to low-carbon generates significant market opportunities, including: green and sustainable real estate; low- and no-carbon technologies such as renewable energy and electricity microgrids; energy-efficiency services (e.g., jobs for electricians, engineers, builders and weatherization technicians); construction-sector spending; and a “clean” technology sector. Much of this economic potential is captured locally in the form of business growth and jobs within the city.
IMPROVED LIVABILITY/QUALITY OF LIFE	These co-benefits include shorter commute times between home, work and school; increased choices for transportation; reduced noise; and increased access to green space, water and other green infrastructure.
COST SAVINGS FOR CONSUMERS, HOUSEHOLDS AND BUSINESSES	Renovating homes to reduce energy consumption not only cuts bills but safeguards against rising energy prices in the future. The affordability of residential housing is particularly important to many cities and can benefit from climate action.
ENERGY DOLLARS KEPT LOCAL	Many communities send a significant portion of their energy expenditures out of the local economy when depending on fossil-fuel energy sources produced elsewhere in the country or world. Reducing energy consumption and switching to clean-energy options can create jobs locally and keep energy spending from leaving the local economy.
IMPROVED PUBLIC HEALTH AND SAFETY	This includes the health benefits of reduced air pollution and increased physical activity from walking and biking as investments in safe multimodal transportation systems increase, which impacts obesity and chronic disease and reduces the risk of automobile-related injuries. Adaptation planning can also improve emergency preparedness for extreme weather events, protect water supplies, reduce heat-related illnesses and limit the spread of new diseases.
IMPROVED ENVIRONMENTAL QUALITY	Initiatives include expanding and enhancing the urban forest canopy, natural areas, biodiversity corridors, greenways, blue ways and green roofs. This can improve air quality and water quality and provide more habitat for wildlife. Improving environmental quality can also increase resiliency during extreme weather events by reducing the urban heat-island effect and by using green infrastructure to hold stormwater that could cause flooding or sewer overflows.

4 U.S. CITIES ARE DEVELOPING POTENT CLIMATE-ACTION ALLIANCES WITH LOCAL

STAKEHOLDERS: business and community leaders, and specific sectors such as health care and commercial property, community-based activists, universities and philanthropies.

Many U.S. cities are successfully making the public case for climate action and working closely with a broad range of local stakeholders, including the business community and previously marginalized groups and neighborhoods. City leaders use these alliances to co-develop climate-action approaches that will work locally and benefit all populations in the city. This helps to build political support for taking specific actions and to ensure that there will be strong stakeholder networks ready to help implement actions. The ultimate goal is to ensure that stakeholders “own” a city’s GHG reduction and climate-resilience goals and interim targets and that, over the years, this ownership transcends changes in city government leadership and helps to shape the climate agendas of future administrations.

Local businesses are a key stakeholder for cities to engage. In Boston, Washington, D.C., San Francisco and other U.S. cities, the keys to engaging the local business community have included:

- Emphasize economic opportunity. Civic-minded businesses can see that climate action will generate economic opportunities and strengthen a city’s comparative advantages in the future.
- Lead by example. Businesses run key parts of a city’s emissions-producing infrastructure systems (energy, buildings, transportation and waste). They are producers of emissions, not just stakeholders, and can be enlisted to take action to reduce their emissions.
- Gain influence through co-development. When a city’s business community embraces its city’s climate-action vision, it can more easily support city strategies to promote voluntary action and undertake important public investments, while co-developing with the city the types of economic incentives and mandates that might also be put into place.
- Institutionalize businesses’ commitment. Establishing a standing, sufficiently resourced and business-driven committee can enable a sustained presence by business in the city’s climate-action planning and implementation. An organized, active and constructive business voice can also shape decisions of future city leaders.

Another important aspect of stakeholder engagement in U.S. cities is to carefully consider who will be most impacted by climate change and how to design city climate action to ensure that benefits and costs of climate actions are distributed fairly across the city’s population, focusing particular attention on those most vulnerable. Examples of an equity-focused lens on climate change can mean planning for how lower-income and older residents might evacuate a city during a storm or survive high-heat events during summer months. It can mean ensuring that public transportation provides access to all neighborhoods in a city and that green jobs with living wages created by climate action are available to populations with higher unemployment rates. Equity also means that people have a voice in determining the types of mitigation and adaptation strategies the city prioritizes within its neighborhoods.

5 CITIES CANNOT DO THIS WORK ALONE— MANY ASPECTS OF EFFECTIVE CLIMATE

action by U.S. cities, especially in transportation and energy-supply systems, depend on enabling policies being implemented by federal and state governments.

U.S. Secretary of State John Kerry noted in an October 2015 address to mayors that, “many city governments are more nimble than their federal counterparts. So, city leaders are, frankly, uniquely positioned to experiment with bold new ideas in all kinds of policy areas.” Cities’ leadership efforts have revealed that they have substantial control and influence over policy making and assets that are key to climate action. But cities cannot achieve deep, long-term emissions reductions or build climate resilience on their own. Instead, they must work with federal and state governments to develop climate-smart solutions, especially when it comes to transforming transportation and energy-supply systems.

In the U.S., the federal government and the governments of each state share control over many systems relevant to city climate action, such as environmental protection regulations, energy supply, transportation funding and waste-management standards. This shared control creates a patchwork of legal and regulatory frameworks for cities. Across the 50 states, policies relevant to mitigation and adaptation—and the degree of control available to cities—vary widely.

The U.S. federal government has made an international commitment to cut net GHG emissions to 26–28 percent below 2005 levels by 2025. In addition, the federal government is modernizing many of its programs to support investments in resilience and managing federal lands and waters for climate preparedness.

In the U.S., federal and state governments play three key roles in enabling city climate action, as described in the following table.

ENABLING ROLES OF FEDERAL AND STATE GOVERNMENTS

SETTING STANDARDS AND ENFORCING RULES TO REDUCE CARBON EMISSIONS FROM VEHICLES, ENERGY GENERATION, APPLIANCES AND OTHER SOURCES	<p>The federal government has developed carbon-pollution standards for new and existing power plants; implemented vehicle fuel standards that will double the fuel efficiency of cars and trucks by 2025; and initiated new approaches to protect and restore forests, grasslands and wetlands to reduce net emissions and enhance carbon sequestration. More than half of the nation's states have mandated that a portion of all electricity sold be generated from renewable sources. For example, California recently required that 50 percent of energy in the state come from renewable sources by 2030 and Hawaii now requires 100 percent by 2045.</p>
PROVIDING FINANCIAL, INFORMATIONAL AND TECHNICAL RESOURCES DIRECTLY TO CITY CLIMATE INITIATIVES	<p>The federal government provided more than \$3.2 billion in grants to cities and communities to support energy efficiency and renewable energy initiatives. In 2014, the U.S. Department of Housing and Urban Development launched a \$1-billion national disaster resilience competition designed to help communities recently impacted by natural disasters build resilience to future events. At the state level, Massachusetts has one of the largest state energy-efficiency funds, spending \$574 million in 2013 to help homeowners and businesses take energy-efficiency actions that generated \$2.8 billion in energy savings. Federal and state governments provide climate data, toolkits and technical assistance for cities to use in assessing vulnerabilities to climate effects. Twenty-two states have been developing state-level climate adaptation plans, and some now require that applicants for state funding and permits consider the impacts of extreme weather.</p>
ENACTING POLICIES, REGULATIONS AND INCENTIVES TO TRANSITION ENERGY-SUPPLY AND OTHER MARKETS TO LOWER-CARBON TECHNOLOGIES AND PROCESSES AND TO PLAN FOR LONG-TERM CLIMATE IMPACTS	<p>Federal tax credits, grants and other incentives are available for renewable energy, energy efficiency and alternative-fuel vehicle projects. These policies increase the cost-effectiveness of low-carbon technology adoption by businesses, residents and local governments. At the same time, several states have formed cap-and-trade markets for GHG emissions. The emissions market in California, the largest state economy in the U.S., started in 2012 and has generated more than \$2 billion a year in revenue for state government. In 2008, the nine-state Regional Greenhouse Gas Initiative in the northeast U.S. started carbon-emissions auctions for the power sector only and has generated \$2.1 billion in revenue.</p>

ACHIEVING CLIMATE OUTCOMES IN THE FOUR CORE URBAN SYSTEMS

U.S. CITIES' CLIMATE-ACTION PLANNING

has evolved beyond aspirational visions and lists of promising projects, becoming more comprehensive, strategic and impactful. Leading cities now aim to effect systemic changes across a range of city systems, seeking long-term transformation of the systems. Increasingly, they have the experience and expertise to make substantial progress in advancing this ambition.

FOUR CORE URBAN SYSTEMS

The core systems in U.S. cities that are important in climate action are much the same as in cities everywhere: energy supply, buildings, transportation and solid waste. These systems generate most of a city's GHG emissions and they may be vulnerable to climate effects. But the emissions profile of these systems within a specific city—the proportion of emissions from each system—varies considerably between cities. Some cities, for example, rely heavily on hydropower for electricity, while others rely heavily on coal. Some cities have substantial aggregations of large commercial buildings, while others are dominated by single-family housing. The table to the right summarizes the major systems and subsystems that need to be taken into account when conducting citywide, climate-smart planning.

TYPICAL CITY SYSTEMS AND SUB-SYSTEMS

BUILDINGS	<ul style="list-style-type: none">• Single-Family Residential• Multifamily• Small Commercial• Large Commercial• Industrial• Institutional (Education, Medical/Laboratory, etc.)
ENERGY SUPPLY	<ul style="list-style-type: none">• Electricity• Thermal Combustion (Natural Gas, Fuel Oil, etc.)
TRANSPORTATION	<ul style="list-style-type: none">• Private Vehicles• Commercial Freight• Air• Public Transit• Biking/Walking
SOLID WASTE	<ul style="list-style-type: none">• Commodities (Paper, Textiles, Plastics, Metals, etc.)• Organics/Biological Materials• Industrial Waste (Chemicals, etc.)• Construction & Demolition

U.S. cities also have varying control over different systems, depending, in part, on which state they are located in, since different state governments regulate and support energy, buildings and other systems in different ways. Variations also are driven by historical legacies, such as whether the city owns its electric utility, its parking facilities and/or its green spaces.

VISIONS OF REDESIGNED URBAN SYSTEMS

In spite of the variations in city systems and control, an increasingly clear vision is gradually emerging among U.S. cities of what core urban systems will look like when they have been redesigned for a no- or low-carbon future. The breakdown below presents what transformation for each core system could entail.

VISIONS FOR REDESIGNED URBAN SYSTEMS BUILDINGS

- Existing buildings will be highly energy efficient and use renewable power and energy-recovery systems.
- New buildings will be net-zero energy or even net producers of renewable energy.
- Building energy-management will be a highly trained, technologically advanced occupation.
- A robust, local green-buildings industry will generate substantial and sustainable business activity and jobs.

ENERGY SUPPLY (not including transportation fuels)

- Electricity imported by the city (supplied by utilities) will be de-carbonized.
- Substantial amounts of renewable energy will be produced locally.

- Significant reductions in demand for and consumption of electricity.
- Fossil-fuel heating sources will be eliminated.
- Modernization of the electricity grid.

TRANSPORTATION

- The ways people get around—their “modes of mobility”—will radically shift to 60 percent or more by public transit, walking and biking.
- The system will offer an array of affordable, accessible, attractive mobility choices.
- The market for cars and trucks will be dominated by clean-fuel vehicles.
- The regional mobility system will be seamlessly connected.
- Cities will take on alternative urban forms that promote high density and livability.

SOLID WASTE

- Zero Waste—no material will be landfilled or incinerated.
- Goods producers will take responsibility for designing and packaging products for durability, reuse and recyclability and will take responsibility for the costs of resource recovery and disposal.
- Sustainable Consumption—there will be a shift in consumption to a prevailing and enduring culture that maximizes efficient use of all resources through sustainable purchasing (“buy less, buy better, use longer”) reuse, recovery, composting, etc.

STRATEGIC LEVERS FOR SYSTEM CHANGE

To achieve these visions, cities are employing a set of four strategic levers. A strategic lever is an approach for motivating the people and organizations in a city's system—owners, managers, employees, suppliers, customers and stakeholders—to change their decisions, behaviors and investments in ways that reduce the system's carbon emissions and strengthen resilience. A lever shifts underlying drivers in the system in ways that can dramatically change the system's climate-related performance.

Each lever is applied through a variety of city actions—policies and programs mainly—that cities are constantly improving and adding to through innovation.

STRATEGIC LEVER**DEFINITION****EXAMPLES OF CITATIONS**

ENCOURAGING VOLUNTARY ACTION	Providing information, challenges, learning opportunities, technical assistance, examples and other support that motivates people to try new behaviors.	<ul style="list-style-type: none">• Promote competitive challenges among commercial buildings• Use public facilities to promote “cool roofs”—using reflective roofing to reduce building heat gain and energy use
SENDING PRICE SIGNALS	Changing the economic drivers—the cost of consumption and other behaviors and the return on investments—through fees/taxes and/or incentives that motivate new behaviors and investment.	<ul style="list-style-type: none">• Increase parking fees or impose “congestion charges” in downtown districts• Provide grants and/or low-interest loans for energy retrofitting by building owners• Promote the development of supportive market mechanisms such as building appraisal and mortgage underwriting that capture the value of investments in energy efficiency
MAKING PUBLIC INVESTMENTS	Investing government funds, short and long term, to create conditions that stimulate others to behave in new ways and also significantly change the government’s own carbon footprint.	<ul style="list-style-type: none">• Develop and expand low- to no-carbon district heating and cooling systems• Expand the city’s bicycle network
MANDATING CHANGE	Requiring behaviors and enforcing the requirements that result in widespread compliance.	<ul style="list-style-type: none">• Require targeted buildings to benchmark (measure and disclose) energy performance and/or conduct energy audits• Ban the use of plastic bags

Cities typically embed the four levers into their climate-action and adaptation plans, applied differently to each of the core systems; these then become the basis for large sets of actions. Often cities use the levers in a sequence or progression, driven in part by the degree of difficulty involved in building local political support for certain types of actions.

A typical starting point is voluntary action, for which political support can usually be gained because no economic or behavior changes are being required of community members or stakeholders. Promoting voluntary action is usually within a city's power without having to negotiate with other levels of government. And, it is a way of educating the community and stakeholder groups about climate change and the role the city could play in reducing carbon emissions. But voluntary action is unlikely to yield the desired substantial reductions in emissions; it may mobilize "early adopters," but will not affect the mainstream of city residents and businesses

Cities turn next to a combination of price signals and public investments. Investments in public infrastructure, such as transportation equipment or solid waste-processing facilities, are needed to achieve emissions reduction—these fall within the city's normal responsibilities. Some price signals, such as tax incentives to reduce the cost of producing renewable energy or improving a building's energy efficiency, are also a typical way that local governments support desired behaviors. Although these draw from city funds or sacrifice revenues, they don't directly impose higher costs on anyone. However, the effectiveness of incentives is uncertain, as other factors may strongly influence whether or not the desired behavior occurs. Other price signals may increase the cost of consuming fossil-fuel energy in, for example, buildings or vehicles, through taxes, fees or carbon-pricing market mechanisms—and gathering the political will

to take such actions can be much more difficult. Cities are unlikely to have complete freedom when it comes to price signals and may need approval by other levels of government

For many cities, mandates are the final lever utilized—the approach taken when it becomes clear, either through analysis or experience or both, that voluntary action, public investments and price signals will not lead to sufficient carbon-emissions reduction. Mandates may generate stronger political opposition than other levers, because they may be viewed as expanding the reach of government bureaucracy. They also may affect specific and politically influential stakeholders (commercial building owners, for example) who may organize to actively oppose the mandates.

When cities impose mandates, they usually phase them in to provide time for adoption, and they sometimes provide technical assistance and financial incentives to support the transition. Some cities signal the potential use of mandates in the future while they are using the other levers.

ENERGY EFFICIENCY OF BUILDINGS SYSTEMS

WASHINGTON, D.C., is the nation's capital and home to 660,000 people. Like many cities in the U.S., Washington generates the great majority of its GHG emissions in its buildings. By targeting its system of about 128,000 buildings for carbon reduction since 2006, the city has demonstrated remarkable leadership and innovation in establishing high green-building design standards for new construction and improving the energy efficiency of existing buildings. The city's approach is as comprehensive and aggressive in its requirements as any in the U.S., and it is producing results. Washington leads major U.S. cities in the number of building projects on a per-capita basis that have been certified LEED®, a third-party green-building certification program for best-in-class building practices, and ENERGY STAR®, a federal government program that promotes energy-efficient products, practices and buildings. Washington is first in the nation in green-roof square footage per capita and, in 2015, ranked third in the nation (behind Boston and New York City) for energy-efficiency programs and policies according to the American Council for an Energy-Efficient Economy.

As a national leader, Washington, D.C., has recorded a number of firsts: It was the first city to pass a law that requires green-building certification for new construction and major renovations of public and private buildings. It was first to pass a law requiring large building owners to track and report on energy water use through the Energy Star Portfolio Manager program developed by the federal government.

And, it was first to adopt as a mandatory code the major chapters of the International Green Construction Code. Washington has also been active in developing programs, such as [Property-Assessed Clean Energy](#) (PACE), that help property owners to finance their investments in energy efficiency by allowing lenders to be repaid by a multi-year assessment on the owners' property taxes. And, the city has commissioned research to identify ways to increase the market value of energy-efficient properties—by ensuring that real estate listings of property include relevant “green” information and that appraisals of properties' value fully reflect the benefits of energy-efficiency investments.

In U.S. cities, strategies for boosting the energy-efficiency retrofitting divide between new and existing buildings are being implemented, with a large portion of the focus on existing buildings since they will still exist decades from now or even longer. Cities further divide the buildings sector into markets for commercial, residential and industrial buildings, as well as sub-markets within each of those markets. There are various ways to achieve energy conservation in existing buildings:

- Upgrading building management practices and equipment
- Improving lighting by installing LED lights and occupancy sensors that turn lights on and off

- Improving windows by using high-performance windows and glazing
- Switching to high-efficiency heating and cooling systems, including heating systems powered by renewable fuels
- Conducting initiatives to change building occupants' consumption of energy

But cities have to figure out how to make energy efficiency happen at enormous scale, in hundreds of thousands of buildings and within the context of an existing real estate market. Commercial buildings have become a priority target because a small number of property owners often control a substantial percentage of the buildings and because commercial buildings account for a large share of citywide GHG emissions. In Boston, for instance, the 50 largest property owners control buildings responsible for at least 30 percent of the carbon emissions in the city.

Some U.S. cities have strong control over their built environments through local building and energy codes for construction and regulations and policies for real estate development and land use. Other cities must follow state government policies. Energy-efficiency strategies vary from city to city based on the characteristics of their building stock (age, size and other factors) and the strength or weakness of local real estate markets. And many cities are closely aligning their building energy-efficiency strategies with their efforts to shift city energy supplies to renewable sources. As the table below illustrates, cities are using all four of the basic strategic levers to initiate transformation of existing and new buildings' energy performance.

LEVERS AND ACTIONS FOR INCREASING THE ENERGY EFFICIENCY OF BUILDINGS

ENCOURAGE VOLUNTARY ACTION	<ul style="list-style-type: none"> • Help building owners share best practices • Sponsor building energy-performance challenge programs • Create building energy-performance districts • Support the use of voluntary building energy-benchmarking programs
SEND PRICE SIGNALS AND PROVIDE INCENTIVES	<ul style="list-style-type: none"> • Incentivize the costs of energy-efficiency investments • Help lenders to provide property owners with access to funding for energy-efficiency upgrades • Provide rewards for buildings that meet high energy-performance standards (e.g., LEED®) • Provide regulatory or zoning relief for building projects that meet high energy-performance standards
MAKE TARGETED PUBLIC INVESTMENTS	<ul style="list-style-type: none"> • Invest in energy-efficiency retrofitting of government buildings • Help to pilot new technologies for building energy • Establish advanced energy-management systems for municipal facilities • Support development of businesses focused on energy-efficiency solutions (e.g., “innovation hubs” or “clusters” of businesses)
MANDATE BEHAVIORS AND INVESTMENTS	<ul style="list-style-type: none"> • Require building energy-performance measurement and public disclosure • Require energy audits, sub-building metering and building energy-performance rating systems • Increase energy-efficiency requirements in building codes • Require net-zero energy performance in codes for new building construction • Require energy-efficiency upgrades at time of sale of a property • Require certification of building operators for competence in building energy-management

Over the past few years, some of America's best-known cities have quietly engineered a bold expansion of regulatory oversight that picks up where building codes leave off and seeks to change the way the real estate market functions.

- In 2008, under former Mayor Will Wynn, Austin, the nation's 11th-largest city with more than 900,000 residents, passed a sweeping ordinance requiring energy measurement and disclosure for both commercial property and single-family homes and mandatory energy upgrades for the city's most inefficient multifamily properties.
- Chicago, with more than 2.7 million residents, and nine other U.S. cities—total population, 12 million—are working together and with national nonprofit organizations in the [City Energy Project](#) to reduce energy consumption in large private and public buildings. They are developing and implementing a common suite of policies and programs. In 2014, Chicago city officials said that 348 properties with 260 million square feet (24.2 million square meters) of floor space, which consume about 11 percent of all energy used in Chicago buildings, have reported their annual energy usage. An analysis found that as much as 23 percent of their energy use could be eliminated, with annual savings of up to \$77 million. In 2015, the number of reporting properties increased fivefold. At the same time, 50 commercial buildings totaling more than 40 million square feet are working to reduce energy use by 20 percent over five years.

CITY ENERGY PROJECT PARTICIPANTS

- Atlanta, Georgia
- Boston, Massachusetts
- Chicago, Illinois
- Denver, Colorado
- Houston, Texas
- Kansas City, Missouri
- Los Angeles, California
- Orlando, Florida
- Philadelphia, Pennsylvania
- Salt Lake City, Utah

LED STREETLIGHTS REDUCE CARBON, SAVE MILLIONS

In 2014, Houston began converting its 165,000 streetlights to light-emitting diode (LED) technology, the largest conversion project in the U.S. In addition to reducing the city government's streetlight energy use by about 50 percent and GHG emissions by 5 percent, the project will increase the quality of outdoor lighting and increase public safety. And—no small benefit—the project will reduce the city's energy costs by about \$1.4 million annually.



Chicago Mayor Rahm Emanuel

"I want Chicago to be the greenest city in the world, and I am committed to fostering opportunities for Chicagoans to make sustainability a part of their lives and their experience in the city."



ENERGY-SUPPLY SYSTEMS

TO REDUCE CARBON EMISSIONS in electricity production, many U.S. cities actively promote the generation and purchase of renewable energy, often with the support of state government policies and investor-owned electric utilities. Some cities have joined states and energy-providing utilities and businesses on the front line of inventing the “electricity utility of the future.”

In 2012, Cincinnati, Ohio, became the largest U.S. city, population 300,000, to decide to deliver 100 percent clean green energy to residents and businesses—a decision that has cut utility bills by a reported 23 percent while providing 500,000 megawatt hours of certified renewable electricity to 60,000 customers. Two years later, the city broke ground on a net-zero-energy police station that uses geothermal heating and cooling systems, solar panels and advanced building materials.

San Francisco created a nonprofit, CleanPower SF, to aggregate residents’ and businesses’ demand for clean power at no extra cost as part of its approach for sourcing 100 percent of residential and 80 percent of commercial electricity from renewable energy by 2030. Starting in 2016, the new nonprofit will use the state’s Community Choice Aggregation program, under which it purchases renewable energy for city consumers, while the existing utility maintains the power grid and monthly billing. Three smaller U.S. cities—Aspen, Colorado; Burlington, Vermont; and Greensburg, Kansas—already run

entirely on renewable energy. Austin recently purchased 288 megawatts of solar power generation and Washington, D.C., signed a power purchase agreement for 46 megawatts of wind power, the largest such purchase for a U.S. city.

Cities are also providing residents and businesses with incentives for and assistance with installing small-scale, on-site solar generation. For example, Honolulu offers zero- or low-interest solar loans to eligible low- and moderate-income homeowners for up to 20 years. These same loans can be applied to roofing and other repairs that may be deemed necessary.

In an unprecedented energy-related policy action in 2015, Portland refused to accept a proposed change in the city code that would have allowed a 50-acre (20 hectares), \$500-million propane export terminal to be built in the city’s port. Then, in September, the city council committed the city to hold no financial stake in the largest 200 fossil-fuel companies.

The actions described above are part of a growing menu of approaches that cities are using to decarbonize energy supply, while also working on ways to reduce energy consumption in buildings and transportation systems.

LEVERS AND ACTIONS FOR TRANSFORMING ENERGY-SUPPLY SYSTEMS

ENCOURAGE VOLUNTARY ACTION	<ul style="list-style-type: none"> • Provide clean power-purchasing options for consumers (e.g., through the local utility or on the open electricity market; these are known as Community Choice Aggregation programs) • Assist large enterprises in implementing clean energy purchasing through Power Purchase Agreements (PPAs) and other arrangements • Reduce permitting/land use barriers for on-site renewables (e.g., rooftop solar)
SEND PRICE SIGNALS AND PROVIDE INCENTIVES	<ul style="list-style-type: none"> • Provide financial incentives for on-site and off-site renewable generation (e.g., property tax exemptions and abatements) • Provide feed-in tariffs and/or net metering incentives for excess distributed renewable generation • Reduce regulatory barriers to combined heat and power (CHP), microgrids, district energy and tri-generation
MAKE TARGETED PUBLIC INVESTMENTS	<ul style="list-style-type: none"> • Invest in large- and medium-scale public sector energy infrastructure such as district energy for heating and cooling, microgrids, CHP, tri-generation district) or invest through public-private partnerships • Invest in converting city-owned fossil-fuel power-generating facilities • Invest in large-scale renewable production (wind, solar) facilities • Invest in creating new municipal utilities • Install distributed renewable energy generation in city facilities • Purchase clean energy for city operations
MANDATE BEHAVIORS AND INVESTMENTS	<ul style="list-style-type: none"> • Force retirement/conversion of fossil-fuel plants • Implement an emissions “cap-and-trade” market (state government level) • Require the phasing out/conversion of buildings’ fossil-fuel heating • Increase efficiency and emissions requirements for fossil-fuel plants

Several U.S. cities have battled to gain more control of their energy-supply future. Boulder is in the middle of a unique and complex process backed by local voters to transfer ownership of the assets of the investor-owned utility that serves the city to the city itself. Boulder's goal is to then create its own utility and rapidly shift to renewable energy production. The city was unable to reach a de-carbonization agreement with the utility, which generates nearly 90 percent of its electricity from fossil fuels. A feasibility study found that a city-owned utility could obtain 54 percent or more of its electricity from renewable sources. The city has proposed that state regulators allow it to acquire the utility's assets (a forced sale); if that is approved, the city hopes to start operating its utility in 2018. Meanwhile, Minneapolis used the expiration of its long-term agreement with investor-owned utilities to negotiate for cleaner energy and began to engage in state utility regulatory proceedings to advocate for increases in renewable energy. What emerged was the Minneapolis Clean Energy Partnership, in which the city and electric and gas utilities work together to help the city reach its 2040 goals for renewable energy and energy efficiency. The Partnership, led by a joint city-utility board, reviews and approves work plans after collecting community feedback.

An important aspect of the vision for the future utility is the use of decentralized, rather than highly centralized, electricity-generation and distribution structures. Boston, for example, has focused on maximizing the use of district energy and microgrids to reduce GHG emissions and increase system resilience. In particular, the strategy looks at the potential for "multi-user microgrids" that produce heating, cooling and electricity services for a group of buildings that have multiple owners and are capable of supporting mission-critical loads when the surrounding electric grid fails.

A number of cities, including Minneapolis and Boston, have engaged in emerging efforts in the U.S. to design and test models for the electric utility of the future. In a special report, Minneapolis noted that "the current electric grid—with its large centralized power plants and miles of transmission and distribution lines—relies on many technologies that originated more than a century ago with Edison and Westinghouse. The rapidly emerging modern grid looks much more distributed and decentralized, with many actors in the system sending electricity and data back and forth."

TRANSPORTATION SYSTEMS

CITIES ACROSS THE U.S. are reinventing and investing in their urban mobility systems to reduce carbon emissions, ease traffic congestion and improve air quality. Houston, with 2.2 million residents, added two new light-rail lines in 2015, bringing the length of the total system to 22.7 miles (36.5 kilometers), which is the third-busiest in the nation based on boardings per mile. Atlanta, population 450,000, has emerged as the number one city in the U.S. for plug-in electric vehicle sales—with more than 10,000 registered by 2015—thanks to the creation of 200 publicly available charging stations and a state tax break on purchases. Minneapolis, population 400,000, known as a bicycle-friendly city, launched the nation's first bike-sharing system five years ago and is developing a 30-mile network of protected bicycle lanes to make bicycling safer and more accessible, especially for commuters. Portland with more than 600,000 residents, opened a new 1,700-foot-long bridge (518 meters) built for light-rail trains, a streetcar, buses, bicycles, pedestrians and emergency vehicles—but not for cars and trucks.

Each of these projects is part of these cities' comprehensive, long-term plans to shift the dominant mode of transportation away from fossil-fueled cars and trucks. Atlanta, for instance, is creating the Atlanta Beltline, a 22-mile continuous multimodal corridor with 11 miles of arteries—connecting 45 neighborhoods with trails, networks of parks and, ultimately, a light-rail system. To further reduce

transportation emissions, the city plans to double its alternative-fuel infrastructure and miles of bicycle lanes.

In Los Angeles, population 3.8 million, where 80 percent of commuters get to work by car, the city has adopted a comprehensive transportation plan to add hundreds of miles of bicycle lanes, bus-only lanes and pedestrian safety features. The city council approved a plan that would reshape the streetscape over the next 20 years, adding hundreds of miles of bicycle lanes, bus-only lanes and pedestrian safety features. Today, there are 87 miles (140 kilometers) of subway and light rail across the metropolitan area, with five projects under way to add 32 more miles.

Chicago has embedded into city law incentives for transit-oriented development (TOD), a way to develop mixed-use residential and commercial areas around a public transit station or stop. Such development expands access to and use of transit, which reduces GHG emissions while bringing new amenities to neighborhoods and spurring local economic development. Chicago's incentives for TOD within a quarter mile (400 meters) of a subway or train station include lessening of restrictions on minimum lot size, floor space and building height, and reduction of residential parking requirements if alternative transportation options such as a car-sharing station or bicycle parking are available.

A challenge for many U.S. cities is to reduce driving while their populations and economic activity are increasing. San Francisco, for example, is seeking to increase use of public transit, bicycles and walking to 50 percent of all trips in 2018 from 38 percent in 2011, while accommodating a 20 percent growth in population. An important key to achieving this is to expand the availability of public transit, while also reducing parking availability and increasing parking prices. More than half of the city's transit system is zero-emission electric vehicles. As cities take comprehensive approaches, they are initiating actions based on all four of the strategic levers.

U.S. cities increasingly recognize that land-use planning is an important tool for shaping long-range transportation plans. For example, locating major destinations and centers at rapid transit stations or along mobility corridors helps to boost public transit ridership and enhance conditions in neighborhoods. A well-connected pedestrian and bicycle network helps to increase non-vehicle mobility and makes neighborhoods and districts more attractive. Higher densities in residential neighborhoods and commercial districts help justify higher levels of transit service. An analysis of real estate in Boston found that walkable urban neighborhoods have 20 to 134 percent higher value per square foot than suburban locations.

At the same time, some cities are recognizing that transportation projects have important consequences for equitable treatment of low-income, minority-population neighborhoods that have long been neglected. Transportation projects—new roads and rail lines—often ignore or isolate low-income neighborhoods and communities. But that didn't happen when the \$1-billion Green Line was designed for the Minneapolis and St. Paul region (known as the "Twin Cities"). Initial plans for the light-rail line were to bypass low-income neighborhoods that were

the historic home of African-Americans and the new home of large populations of Somali and Hmong immigrants. Community groups advocated for more stops in these transit-dependent neighborhoods; in a three-year effort, the coalition secured the additional stations, as well as an increase in the required use of minority-owned businesses and workers for the design and construction. With more than 1,000 small businesses operating along the Green Line, the cities provided a \$16-million package of forgivable loans, technical assistance, marketing support and other resources to help businesses survive through the construction period and then prosper. With the opening of the line, attention has turned to Transit-Oriented Development—building economic and cultural assets around the new stations and promoting them as destinations.

A similar concern for equity drives a pilot program in Los Angeles, supported by a \$16-million grant from the state, to put 100 car-share vehicles, at least 80 of them electric, into low-income neighborhoods around the city's downtown district.



Los Angeles Mayor Eric Garcetti

"The old model of a car-centric, different-neighborhood-for-every-task city is in many ways slipping through our fingers whether we like it or not. We have to have neighborhoods that are more self-contained. People want to be able to walk or bike or take transit to a movie."



LEVERS AND ACTIONS FOR TRANSFORMING TRANSPORTATION SYSTEMS

ENCOURAGE VOLUNTARY ACTION	<ul style="list-style-type: none"> • Promote the recreational and health benefits of bicycling and walking • Promote tele-working (connecting to workplaces electronically) • Promote carpooling and High Occupancy Vehicle lanes • Partner with employers to encourage employee commuting using public transit, biking or walking • Support pilot programs and address regulatory barriers for on-demand busing, shared-use mobility, driverless vehicles, etc. • Encourage private investment in streetcars, highways, shared-use systems
SEND PRICE SIGNALS AND PROVIDE INCENTIVES	<ul style="list-style-type: none"> • Establish congestion/climate taxes on fossil-fuel vehicles in designated areas • Establish taxes/fees on fossil-fuel vehicles and fuels • Subsidize fossil-fuel-free vehicles • Institute new parking pricing models, especially in central city districts • Establish regional road tolls • Promote “pay as you drive” insurance • Tax off-street parking
MAKE TARGETED PUBLIC INVESTMENTS	<ul style="list-style-type: none"> • Convert public transit, government fleets and taxi fleets to low-carbon fuels • Invest in public transit expansion and new modes (e.g., light rail) • Implement Bus Rapid Transit • Invest in bicycle infrastructure and bike-sharing • Invest in fuel infrastructure for low-carbon vehicles (electric, hydrogen) • Support commercial freight shift to rail and ship • Implement “Complete Streets” programs that allow for safe, convenient and comfortable travel by users of all modes of transportation (not just vehicles) • Prioritize investment in Transit-Oriented Development that develops mixed-use residential and commercial areas around a public transit station or stop • Develop an integrated multi-modal mobility system at the regional level • Redesign goods/freight movement in the city to increase efficiency
MANDATE BEHAVIORS AND INVESTMENTS	<ul style="list-style-type: none"> • Establish reduced-idling ordinances • Establish car-free zones

SOLID WASTE SYSTEMS

NO LARGE CITY IN THE U.S. has been more successful than San Francisco at eliminating solid waste and the GHG emissions from waste. The city's drive to achieve "zero waste" began more than ten years ago, using a combination of programs, outreach, incentives, mandates and enforcement that have increased to 80 percent the amount of waste material recycled, reused or composted instead of going to landfills or incinerators. There is still much to be done to get to zero waste—the city of 820,000 residents is testing innovative approaches to using compost for carbon sequestration.

In U.S. cities, the solid waste system typically generates a small percentage of a city's carbon emissions; in San Francisco, for instance, it produces about 5 percent of total emissions. But every bit of GHG reduction counts. Emissions come from several sources: When compostable materials like food scraps and yard trimmings decompose in landfills, the process produces methane, which has much greater global-warming effect than other GHGs. In addition, fossil-fuel vehicles that transport waste produce carbon emissions, as do waste-to-energy incineration facilities. An analysis by New York City found that landfill methane was responsible for 89 percent of the city's solid waste GHG emissions, with emissions from waste-to-energy processing accounting for 6 percent and the remainder due to transport of waste.

One of San Francisco's early policy actions, in 2004, was to require contractors and developers to manage debris and to provide adequate recycling storage space in buildings. In 2007, the city passed the first ordinance in the U.S. to ban plastic bags, an action that more than 120 cities have now taken. Other actions included:

- Setting recycled-content and other guidelines for commodities regularly purchased by city departments.
- Requiring restaurants and food vendors to not use Styrofoam food-service ware and instead use food ware that is recyclable or compostable.
- Requiring the use of compostable plastic, recyclable paper and/or reusable checkout bags by stores.
- Mandating recycling and composting under an ordinance that requires San Francisco residents and businesses to keep recyclables and compostables out of the landfill. The city requires all residents and businesses to separate recyclables, compostable materials and landfill trash into three bins of different colors.

In many cities, organic waste is one of the least-managed sources of waste. Even in cities with high rates of waste recovery through recycling, composting or anaerobic digestion, there is typically a much lower rate of recovery of food waste. In Portland, for instance, the waste recovery of 70 percent is among the highest in U.S. cities, but “food scraps now make up the biggest slice of landfill-bound waste.” In New York City, organic waste makes up 35 percent of the city’s waste stream, and 99 percent of that amount went to landfills.

Those involved in zero-waste efforts in cities consider the solid waste that would typically go to a landfill as the “tip of the waste-berg.” The more important emissions-reduction potential is in decreasing the overall consumption of goods and services and the emissions produced in manufacturing, transporting, designing, packaging and using goods and services. Focusing on achieving zero waste creates the opportunity to move “upstream” and try to minimize consumption-based GHG emissions, most of which are not accounted for in the typical city emissions inventories. Consuming less and consuming more intelligently will make a difference in emissions.

OTHER CITY EXAMPLES/SOLID WASTE

LESS GARBAGE, MORE COMPOST. Sometimes a seemingly small change in waste-system services can have big impact. A few years ago, Portland began to provide residences with once-a-week curbside collection of organic material—food scraps and yard debris—and shifted garbage collection to every other week. As a result, the amount of residential garbage collected in the first year dropped 35 percent compared with the previous year. Meanwhile, the food scraps and yard debris collected nearly tripled. The bottom line reported by the city: “The new curbside collection program has helped dramatically

reduce the amount of garbage Portland sends to landfills and increase the amount of yard debris and food scraps turned into rich compost for healthier soil.”

FOAM FREE. WASHINGTON, D.C., in 2014, joined Seattle, San Francisco and other cities in banning plastic foam food and drink containers for carryout use from restaurants (effective in 2016). Four years earlier, the city had implemented a 5-cent tax on plastic bags, which has been praised for keeping stray bags out of the rivers, while generating about \$2 million a year for river cleanup programs.

CLIMATE ADAPTATION

DROUGHTS AND EXTREME HEAT, 1,000-year storms and intense winds, dire river flooding and sea-level rise and intense rainfall: Cities across the U.S. are moving to respond to the actual and projected climate changes that leave them highly vulnerable to weather disasters. In the wake of Hurricane Katrina in New Orleans, Hurricane Sandy in New York City and several other weather-caused urban disasters, America's other cities came to realize that the climate is changing in ways that can put any city at serious risk. Just three years ago, Hurricane Sandy killed at least 186 people, damaged or destroyed more than 600,000 homes, closed 200,000 small businesses, left 8.5 million customers without power, released hundreds of millions of gallons of sewage into waterways and caused more than \$65 billion in damages and economic loss.

The federal and many state governments took notice and responded. In 2013, the Obama administration created the Task Force on Climate Preparedness and Resilience to recommend how the federal government can respond to the needs of communities nationwide that are dealing with the impacts of climate change. In 2014, the Department of Housing and Urban Development launched a \$1-billion national disaster resilience competition designed to help communities recently impacted by natural disasters build resilience to future events. Supported by multiple federal agencies and a pilot toolkit for resiliency, city officials in Marquette, population 21,000, are part of a countywide effort to

develop recommendations for local water utilities in preparing for extreme weather events in an area that has experienced floods, lakeshore erosion, declining inland lake water levels, depletion of aquifers, infestations of invasive plant and aquatic species, and damage to roads and bridges.

Today, 22 states have developed or are working on state-level adaptation plans, typically focusing on these systems: emergency management, public health, buildings, transportation, water, energy, land use and natural systems. States are increasingly setting aside resources with which to realize the objectives of these plans. In Massachusetts, for example, the Climate Preparedness Initiative provides more than \$40 million in grants to municipalities to enhance resilience in critical infrastructure.

The following table describes key adaptation elements that cities are focusing on.

KEY ELEMENTS OF CITY CLIMATE ADAPTATION

MANAGING COASTAL FLOODING	Investment in man-made and natural barriers and structures to channel water—to limit the damage from sea-level rise and storm surges
BUILDING RESILIENCE	Incentivizing and mandating changes in new and existing residential and commercial buildings
INFRASTRUCTURE RESILIENCE	Designing key urban infrastructure (transportation, power supply and distribution, water, waste, health care and communications) to assure continuity of operations or rapid recovery from acute climate-change events
NEIGHBORHOOD RESILIENCE	Preparing neighborhoods so that they can reduce damage and rapidly recover from extreme weather events and flooding
EMERGENCY PREPAREDNESS	Developing plans for evacuation, emergency medical response and disaster assistance linked to climate change
MARKET SIGNALS	Creating market-based incentives for property owners to increase the climate resilience of their assets or to avoid high-risk areas
ECONOMIC RECOVERY	Developing strategies that support rapid economic recovery following disaster events and helping businesses affected by climate shifts (e.g., tourism, fishing, etc.) adapt their business models to be successful under new conditions

Much of what cities are doing is still in the planning stages: understanding the climate changes that are already happening and are foreseen; recognizing how climate effects might occur in specific regions and places in the U.S.; assessing communities' various vulnerabilities; and examining the options for taking action and setting priorities for implementation. The Southeast Sustainability Directors Network, with more than 25 member cities, including Miami and Fayetteville, in six states used a grant from the Urban Sustainability Directors Network to develop and disseminate a [Community Resilience Planning Handbook](#) to assist cities in resilience planning, especially with regard to extreme weather events. The online document identifies and explains the key planning steps in climate adaptation. Some cities have provided exemplary leadership in developing and implementing sophisticated, comprehensive adaptation planning:

- **BALTIMORE**, a coastal city of 622,000, has to address the potential for coastal storms, flooding and extreme heat. The city's 2013 plan adopted new floodplain regulations that exceed federal emergency standards and regulate development in the citywide 500-year floodplain. It doubled to 2 feet (0.6 meters) the base flood elevation ("free board standard") of new or retrofitted buildings. It initiated transformation of vacant lots for use in stormwater management, stream restoration and for buffering against coastal storms. It also prompted the installation of 200 sensors in "hot spot" neighborhoods to measure temperature differences due to tree plantings, cool-roof installations and impervious-surface removal.
- **TUCSON**, a desert community with 527,000 residents, faces a different climate adaptation challenge: extreme heat and not enough water in a region prone to drought. The city's 50-year water plan includes a rain-harvesting rule that requires all

new commercial developments to capture enough stormwater on site to support at least 50 percent of irrigation needs. The city also offers incentives for residents to install rainwater- or graywater-harvesting systems; larger cisterns and more complex systems receive larger rebates. Tucson's Green Streets policy requires new or improved roadways to incorporate green infrastructure and to use rainwater-harvesting to water plants.

- **CHICAGO'S** comprehensive climate adaptation plan includes key strategies to manage heat, pursue innovative cooling, protect air quality, manage stormwater, implement green urban design, preserve plants and trees and engage the public and businesses.
- **COASTAL SAN DIEGO'S** plan identified vulnerabilities to storm surges, very high tides and the Pacific Ocean's El Niño weather cycle. The plan for the city of 1.4 million consists of ten comprehensive strategies to address the vulnerabilities.

In many cities, very specific climate-adaptation actions provide examples of how extensive, customized and thoughtfully designed adaptations must be. For example, after Hurricane Sandy, New York City allocated \$293 million to help small- and medium-sized businesses in the city improve their resilience. When Portland designed its new \$135-million pedestrian, bicycle and public transit bridge over the Willamette River, a tidally influenced river, the structure was altered to raise the span an additional three feet to account for projected sea-level rise (in the Pacific Ocean, some 70 miles or 42 kilometers to the west) that would affect river flows. In an effort to reduce the heat-island effect, which makes built urban areas hotter than surrounding areas by as much as 22°F (12°C), Baltimore set a goal of increasing its tree canopy to 40 percent by

2030; the canopy coverage currently is 27.4 percent. New York City has planted nearly 1 million trees in less than ten years, mostly in parks, increasing its urban forest by about 20 percent. In Denver, the water utility partnered with the U.S. Forest Service to manage lands surrounding key water reservoirs and water sources for forest fire risk. Washington, D.C.'s Smart Roof Initiative addresses the issue of heat islanding and energy efficiency: The city is implementing green roofs and/or solar panels on 435 of its buildings, including schools, office buildings, police stations, fire stations and parks and recreational centers.

Philadelphia, population 1.5 million, and Washington, D.C., have been leading innovators in managing urban stormwater risks. Philadelphia's \$2.4-billion, 25-year Green City, Clean Water plan, one of the nation's most ambitious green infrastructure efforts, requires private property owners to manage stormwater on-site by using pervious surfaces or to pay a fee for the runoff—the fees fund green infrastructure projects in the city. The plan's goal is to manage runoff from 9,000 acres (3,600 hectares) of impervious surface in the city and reduce sewage overflow pollution by 85 percent, as well as lessening flooding risks. Washington, D.C.'s Stormwater Retention Credit Market allows residents and businesses that install rain gardens, green roofs and other stormwater-retention green infrastructure to sell Stormwater Retention Credits (based on how much runoff they retain) to regulated land-development sites that need to meet retention requirements.

ENGAGING STAKEHOLDERS

MANY U.S. CITIES WORK closely with local stakeholders whose ideas, actions and support they need to accomplish their climate-action goals. Most municipal governments directly control only a small percentage of the carbon emissions within their jurisdictions, so they look for ways to inspire, incentivize and enable residents and businesses to engage in climate action.

Stakeholders come in two major categories: community groups such as environmental advocacy, faith-based, neighborhood, community-based and school organizations, and civic and business leaders from industry sectors such as real estate and health care, cultural institutions, universities and major corporations. Each group may have distinct interests, so cities tend to engage them separately. The cities articulate and make the case for their climate goals and direction and invite stakeholders to co-develop strategies and actions with them. They use taskforces and working groups, often supported by consultants and city staff specialists to capture the deep knowledge that stakeholders have and uncover gaps in their knowledge. This can be an important learning experience for cities and stakeholders, as well as a relationship-building opportunity for both.

Even as U.S. cities engage many stakeholder groups, the efforts in Boston and Cleveland stand out. Few cities have been as successful as Boston in aligning local businesses, which produce substantial amounts of carbon emissions and may have great influence

with elected officials and the public, and few have been as energetic and persistent as Cleveland in communicating with and engaging local residents in taking and supporting climate action.

BOSTON'S GREEN RIBBON COMMISSION

As the city, with 636,000 residents, undertook climate-action planning that called for big reductions in emissions, officials realized they would need active support from stakeholders for decades, especially from the buildings, transportation and energy sectors, Boston's three largest sources of emissions. The [Boston Green Ribbon Commission](#) (GRC)—created in 2010 by then-mayor Thomas Menino and Amos Hostetter, a businessman and co-founder of the Barr Foundation—brought together more than 30 business and civic leaders to advise the city on implementing its plan, to advocate within sectors for strategies that aligned with the plan's goals and to highlight and spread best practices within and across sectors. The GRC includes representatives of the largest commercial property companies, the major educational institutions and hospitals, the regional gas, electric and steam utilities, the largest employers in the city, and the philanthropic, finance and hospitality sectors. In addition, the heads of both the state government and city environmental agencies sit on the commission.

During its five years of life, the GRC has treated Boston as its client, with the implementation of the city's climate plan goals as the ultimate objective. It meets twice a year with the mayor and his top staff and operates through a set of working groups for key sectors and crosscutting issues such as climate preparedness or transportation. The Commission has helped fund and launch the city's climate-event preparedness planning process; partnered with the city on the design and launch of a transportation-planning process that will reduce transportation-related emissions; organized a large-scale renewable energy-purchasing network and prize; and is supporting the development of the city's plan for reducing emissions by 80 percent by 2050.

Overall, the GRC's most important impact has been to create a place where the ongoing conversation about the city's climate planning can occur and where strategy can develop at the right level to produce results. When the current mayor, Martin J. Walsh, came into office in 2014, he seamlessly picked up where Mayor Menino had left off. Austin Blackmon, the mayor's new chief of Energy, Environment, and Open Space said, "I would not have been able to establish the connections I needed nearly as quickly without participating on the Green Ribbon Commission."

CLEVELAND'S COMMUNITY ENGAGEMENT APPROACH

As Cleveland, a city of 390,000, developed its climate action plan, city officials recognized that engaging the community in the process could accelerate progress and ease implementation of strategies. The plan specifically acknowledged "the capacity of neighborhoods and community groups to implement climate mitigation and adaptation initiatives."

Over the years, the city's community engagement effort has publicly highlighted the commitment and activities of climate-action leaders in the community; brought together hundreds of local climate leaders in an annual sustainability summit, now in its seventh year; initiated dozens of working groups to develop and support climate-action projects; and conducted Climate 101 workshops in each neighborhood, while providing [Neighborhood Climate Action Toolkits](#) and mini-grants of as much as \$5,000 for neighborhood-driven projects.

To help organize its engagement efforts, each year the city identifies a theme based on an urban system such as energy efficiency of buildings, renewable energy, zero waste or sustainable transportation. In 2015, the Cleveland Climate Action Fund awarded 23 grants, moving toward its goal of funding projects in all of the city's neighborhoods. The latest round of grants, announced in August, included projects to compost coffee grounds from the airport's Starbucks store for use in a neighborhood farm; reforest an urban lot; and install bicycle racks and create a public bike repair station in a neighborhood.

The [I Am Sustainable, Cleveland](#) campaign enables community members to submit online a photograph and a sentence describing their climate-related action, which city staff turns into a poster that is displayed online, in malls and kiosks and at the annual summit. “It’s very simple, but very exciting,” noted Jenita McGowan, the city’s Chief of Sustainability. “Everyone gets to participate.” A key to successful community engagement, said McGowan, is good, consistent communication and outreach by the city. “Communication is what allows you to go further. It is work and it takes time, but it is worth it.” The city communicates with stakeholders, residents and its own employees through websites, e-newsletters, social media, quarterly meetings with stakeholder groups and media news stories, as well as during large events such as the annual summit.



Jenita McGowan

THE ROLE OF PHILANTHROPY

PRIVATE PHILANTHROPY PLAYS an important role in supporting city climate action strategies in the U.S. A number of foundations that operate at a national scale have been investing significantly in supporting city-based networks and demonstration projects. For instance, the City Energy Project, involving 10 cities in energy-efficiency efforts, received grants from the Kresge and Doris Duke Charitable Foundations as well as Bloomberg Philanthropies. The Urban Sustainability Directors Network, representing 140 North American cities with a strong focus on climate action, has obtained funding from more than a dozen foundations, including the JPB, Kendeda, Kresge, Summit, and Surdna Foundations and the Rockefeller Brothers Fund. At the same time, a number of local-level foundations have been showing how philanthropic funders can drive change in their cities. The San Diego Foundation, established in 1975, and the Barr Foundation in Boston have been leaders in this pioneering work.

Since 2006, the **San Diego Foundation** has invested more than \$3 million to support local efforts to address climate change, often in partnership with several national foundations. Its strategy has been to invest in locally based research, technical expertise, nonprofit and community-based advocacy, and peer networking among local governments in the region. A particular focus has been on transportation systems, the region's largest source of carbon emissions. In making more than 50 grants, the foundation has

helped San Diego and smaller cities in the region to establish GHG inventories and adopt climate action plans, including a sea-level rise plan that galvanized projects along the local coast line. It has enabled advocates for transportation, health, and environmental protection to engage in regional planning efforts to lower carbon emissions. And it has participated in a collaboration of local organizations led by the University of San Diego, with funding from the federal government's National Science Foundation to implement a multi-year education and communications plan to increase climate-science literacy among community leaders and stakeholders. Foundation-supported research has provided local decision makers with science-based assessments of climate change impacts to use in planning and policy development, an assessment of the vulnerability of San Diego's low-income communities to extreme heat events and flood and wildfire risks, and analysis of future regional precipitation and water supply.

More recent grants created a regional forum, the [Climate Collaborative](#), for government agencies in San Diego and other cities to share expertise, leverage resources, and partner with academia, nonprofits, and businesses. In this setting, cities have worked to update hazard mitigation plans to take climate change risks into account and have conducted planning to address climate vulnerabilities of San Diego Bay. When the foundation started its climate work nine years ago, only two of region's 19 local governments had committed to action on

climate change. Today, all 19 have GHG inventories, two-thirds have adopted or are working on climate action plans, and the largest city, San Diego, is poised to adopt an ambitious update of its plan.

In 2008, the \$1.5 billion **Barr Foundation**, founded by Amos and Barbara Hostetter, was the largest environmental grant maker in New England, but was making no grants in the climate change arena. The foundation undertook a strategic review of its environmental portfolio and ultimately decided to focus all of its environmental grant making on having an impact on climate change, primarily in the Greater Boston and New England region. In 2010, the foundation committed \$10 million a year for five years for strategies to reduce greenhouse gas emissions. The strategic focus has been in two areas – clean energy and transportation.

The clean energy strategy enhances renewable energy deployment across the region by developing roadmaps for a carbon-free future, advancing renewable energy policy at the state level, and supporting large-scale renewable energy purchasing. In addition, Barr supports modernization of the electricity grid to improve its efficiency and increase its capacity to manage large proportions of renewable energy supply, and it advances comprehensive energy efficiency approaches in the building sector, including support for net-zero building codes.

The transportation strategy invests in modernizing the regional and state transportation system in ways that enable a significant mode shift from private vehicles to public transit, biking, and walking, and accelerates development of low-carbon communities that require minimal transportation emissions.

In pursuing its climate change strategy Barr works with its grantees in three primary ways:

- **Network building** that enables collaboration between organizations and across sectors to achieve greater impact.
- **Demonstration projects** that highlight the “art of the possible” and smooth the pathway to larger scale adoption.
- **Research and communications** to advance understanding of climate risks and solutions, such as research on alternatives to new natural gas pipelines to serve regional energy needs.

The foundation has been a major driver of the New England region’s aggressive climate policy and strategy. The depth, focus, and consistency of Barr’s resources have helped build a network of sophisticated capacity and relationships in the region that allows grantees to tackle complex issues over a sustained period of time. As an example, the foundation has supported several staff positions in the City of Boston focused on energy efficiency, transportation policy, and district energy that have provided the city with capacity it otherwise would not be able to afford. Barr believes in building the long-term capacity of grantees, both through grants that support general operations and sustained grant making over multiple years.

MONITORING PERFORMANCE

AS CLIMATE-ACTION PLANNING has spread through U.S. cities, it is evident that cities have been building capacity for the sophisticated modeling and analysis needed to develop system-changing strategies and model their potential impacts. To do this, they have been developing staff expertise as well as contracting and pro bono relationships with consultants and assembling working groups of academics and businesspeople with expertise in specific topics.

An essential element of cities' new capacity for climate action includes the ability to measure GHG emissions, which is why 63 U.S. cities, large and small, have joined the [Compact of Mayors](#), launched in 2014. The Compact establishes a common platform to capture the impact of cities' collective actions through standardized measurement of emissions and climate risk and consistent public reporting of their efforts.

THE COMPACT APPROACH PROVIDES THE FOLLOWING BENEFITS FOR CITIES:

- A platform to demonstrate cities' commitment to be a part of the global climate solution
- Consistent, standardized and reliable assessments of a city's impact on GHG emissions and progress toward meeting commitments
- Aggregated evidence of the GHG impact of multiple cities' actions
- A mechanism for national governments to recognize local commitments and support them

In addition to analysis of baseline GHG emissions, cities are developing analytical tools in specific sectors that increase their ability to design, develop and monitor interventions intended to significantly reduce emissions. Examples include:

- Citywide energy studies that map and model energy demand, distribution and supply at high levels of technical detail and allow scenario modeling of alternative system designs
- Building-by-building energy-use modeling to identify opportunities for energy-efficiency investments
- Use of "smart" technologies to monitor real-time transportation flows in the city. It is expected that the scope and precision of these analytical tools will greatly increase as smart-cities technologies and distributed-sensing networks become more widely deployed.

EXCHANGE, LEARNING AND COLLABORATION

HUNDREDS OF U.S. CITIES ACTIVELY ENGAGE

with one another and cities worldwide to share information, experiences and tools about climate action. This spirit of openness and collaboration is an oft-noted feature of cities, and it is particularly vigorous among American cities.

“Each city has its own unique culture and its own unique needs. But the principal nuts and bolts of mass transit, parks, sanitation and the power grid tend to be pretty similar. So, the more we help mayors and city officials innovate and collaborate, the more progress we can all make.”

—Michael R. Bloomberg

United Nations Secretary-General’s Special Envoy for Cities and Climate Change



There are global city learning networks for every imaginable climate action topic—especially through the [C40 Cities Climate Leadership Group](#), now in its 10th year, which features more than a dozen city-only networks that help participants to replicate, improve and accelerate climate action.

In just the last months of 2015, cross-city learning has occurred through multiple forums. For example:

- More than 100 North American cities said in September that participating in the [Urban Sustainability Directors Network](#) (USDN) in 2015 contributed to their local climate-adaptation or resilience efforts. And, at its annual meeting, USDN sponsored a daylong workshop for cities developing strategies for long-term, deep carbon-emissions reduction.
- About 50 U.S. and Canadian cities and counties met in Philadelphia for a three-day practitioners’ technical exchange on green stormwater infrastructure.
- The [Carbon Neutral Cities Alliance](#), formed in 2014 with 17 cities worldwide, including eight U.S. cities, awarded more than \$700,000 for cities collaborating on seven innovation projects to advance carbon-emissions-reduction efforts.
- In 2015, four regional networks with local government sustainability directors in 35 U.S. cities completed adaptation-planning projects.
- In October, [CDP](#) conducted a two-day workshop in Charlotte that provided leaders from 36 cities with valuable climate measurement and management tools.

- The [Shared Use Mobility Center](#) conducted a U.S. summit in September in Chicago that brought together city, transportation and public policy leaders across the U.S. to discuss developments in shared mobility transportation services, such as car-sharing, bike-sharing, neighborhood jitneys and more.

"OUR CITIES, OUR CLIMATE" INTERNATIONAL CITIES EXCHANGE ON CLIMATE ACTION

In October of 2015, mayors and lead climate-action managers from cities in Africa, the Middle East, Asia, Australia, South America, Europe and North America—26 cities in all, seven of them in the U.S.—participated in the initiative, "Our Cities, Our Climate," organized by Bloomberg Philanthropies and the U.S. Department of State. They represented more than 200 million people living in metropolitan areas in 19 nations. And, they have been taking ambitious actions to achieve deep reductions in their cities' carbon emissions and to strengthen resilience to sea-level rise, flooding, drought and other extreme weather.

The Exchange focused on how cities are reducing carbon emissions and increasing resilience to climate change. City leaders in Boston, San Francisco and Washington, D.C., described their approaches to climate action and, along with international cities, presented and discussed their approaches to de-carbonization and resiliency for key urban systems: energy efficiency of buildings systems, energy supply, transportation and solid waste. Exchange participants also examined how cities engage local stakeholders in supporting and taking climate action; how to address a city's challenges with flooding and extreme heat; how cities undertake district- and neighborhood-scale planning that integrates carbon-emissions reduction and adaptation actions; and how federal and state government policies in the U.S. enable cities to take ambitious actions. They heard from recycling specialists in San Francisco, community activists and business leaders in Boston and water utility officials in Washington, D.C. They visited recycling and environmental education facilities, a hospital built for resilience against sea-level rise and a redeveloped waterfront district.

"Obviously, no two cities are alike. But many have the same goals and they face the same challenges when it comes to de-carbonizing their local economies, and that's why the State Department and Bloomberg Philanthropies created the "Our Cities, Our Climate" Exchange for city officials across the globe. We want to create a platform for urban leaders to share their individual successes and to exchange ideas about those future projects that can make a difference."

—U.S. Secretary of State John Kerry

At the end of the Exchange, participants reflected on what had been most valuable for them:

- “I appreciated the opportunity to get out of office and back to the classroom,” said Rodrigo Rosa, Special Advisor for the Mayor of Rio de Janeiro. “The learning will be helpful with engagement of the Rio community.”
- “I have a pledge,” announced Dr. Afolabi Abioden, Director of Monitoring, Enforcement and Compliance, Lagos State Ministry of Environment. “That pledge is when I get back home to my country I am going to practice as much as possible what I learned in San Francisco. The work on composting there was fantastic.”
- “What I have learned here is that city target is very important otherwise it is difficult to move cities forward,” stated Tariq bin Yousef, Superintendent Engineer in Dhaka North’s Environment, Climate Change, and Disaster Management Circle.
- “The Exchange has been fantastic in terms of networks, learning and context,” said Ian Shears, Melbourne’s Manager of Urban Sustainability. “The power of partnerships that government can enter into has been clearly highlighted.”
- “My key takeaway is that in developing countries, it is important to make it easy for everyone in the community to understand the climate-action strategy,” said Lebogang Molefe, Acting Director of Air Quality, Climate Change, and Energy for Johannesburg. “Normal residents can champion and live the strategy. This is quite fundamental.”
- “The diversity of the cities participating—it really enriched the program to have both less-developed cities that are implementing strategies with cities that are leading,” noted Flavia Brofonni, Environmental Strategies Director of Buenos Aires. “This is really helpful and doesn’t typically happen a lot.”
- “We brought the world together [in this Exchange]. We ‘visited’ Stockholm and Sydney, as well as U.S. cities,” said Zaidoun Elqasem, Senior Environmental Advisor for Greater Amman. “We all have the same interest in sustainability and climate change, but everyone has their own problems, passion and targets.”
- “We did so many things in this group. It was a great investment, and I’m convinced that so many more successful things are yet to come from it,” said Toshinori Mishima, Assistant Manager in Yokohama’s Climate Change Policy Headquarters.



“Our Cities, Our Climate” International Participants

CITIES WHOSE LEADERS PARTICIPATED IN THE “OUR CITIES, OUR CLIMATE”

- Addis Ababa, Ethiopia
- Amman, Jordan
- Anchorage, USA
- Berlin, Germany
- Boston, USA
- Boulder, USA
- Buenos Aires, Argentina
- Copenhagen, Denmark
- Detroit, USA
- Dhaka North, Bangladesh
- Dhaka South, Bangladesh
- Jakarta, Indonesia
- Johannesburg, South Africa
- Lagos, Nigeria
- London, United Kingdom
- Melbourne, Australia
- Mexico City, Mexico
- New Orleans, USA
- Orlando, USA
- Oslo, Norway
- Rio de Janeiro, Brazil
- San Francisco, USA
- Stockholm, Sweden
- Sydney, Australia
- Vancouver, Canada
- Washington, D.C., USA
- Yokohama, Japan

CONCLUSION

Many U.S. cities are providing ambitious leadership and inspired innovations for climate action, and they are learning much from cities worldwide that are striving to reduce GHG emissions and strengthen their resilience to emerging climate changes. The results of these and other exchanges, and the successful climate actions of U.S. cities documented in this report and elsewhere, provide examples and inspiration for cities and national governments globally.

RESOURCES

C40 CITIES CLIMATE LEADERSHIP GROUP

C40 is a network of more than 75 of the world's megacities committed to addressing climate change. C40 supports cities to collaborate effectively, share knowledge and drive meaningful, measurable and sustainable action on climate change.

<http://www.c40.org/>

URBAN SUSTAINABILITY DIRECTORS NETWORK (USDN)

USDN is a member-driven organization of local-level sustainability directors that provides a forum for peer-to-peer exchange about innovative solutions to sustainability challenges in cities.

www.usdn.org/

CARBON NEUTRAL CITIES ALLIANCE

Supported by USDN, a collaboration of international cities that are committed to achieving aggressive and long-term carbon-reduction goals and reducing their GHG emissions by at least 80 percent by 2050 or earlier via mitigation strategies.

<http://usdn.org/public/Carbon-Neutral-Cities.html>

CDP

CDP works with cities globally to help them measure, monitor and manage their impact on the environment, particularly through measuring GHG emissions.

www.cdp.net

COMPACT OF MAYORS

The world's largest cooperative effort among mayors and city officials to reduce GHG emissions. Cities set voluntary reduction goals and report their GHG reduction progress to CDP, which makes the data publicly available.

<http://www.compactofmayors.org/>

INNOVATION NETWORK FOR COMMUNITIES

INC works to develop and spread scalable innovations that transform community systems, working on sustainability issues and supporting city-level climate action.

www.in4c.net/

ICLEI USA

ICLEI USA helps local governments pursue deep reductions in GHG emissions and improvements in sustainability and resilience via resources, programs and a national network.

<http://icleiusa.org/>

WORLD RESOURCES INSTITUTE

A global research organization focused on sustaining natural resources and human well-being. With World Business Council for Sustainable Development, developed the Global Protocol for Community-Scale GHG Emissions Measurement and Reporting (GPC), which provides tailored standards and tools for cities to use in tracking their GHG emissions, developing reduction strategies and tracking progress.

<http://www.ghgprotocol.org/city-accounting>

REPORTS ON CITY CLIMATE ACTION

CLIMATE ACTION IN MEGACITIES (C40)

A quantitative study of efforts to reduce GHG emissions and improve urban resilience to climate change in C40 cities.

http://www.c40.org/blog_posts/CAM2

MEASURING UP 2015: HOW U.S. CITIES ARE ACCELERATING PROGRESS TOWARD NATIONAL CLIMATE GOALS (WWF AND ICLEI USA)

An analysis of climate data from 116 U.S. cities that shows how communities are tackling climate change while also focusing on improving livability and economic development.

http://icleiusa.org/wp-content/uploads/2015/08/Measuring_Up_2015.pdf

ADVANCING CLIMATE AMBITION: HOW CITY-SCALE ACTIONS CAN CONTRIBUTE TO GLOBAL CLIMATE GOALS (SEI, BLOOMBERG PHILANTHROPIES AND C40)

An analysis of how different urban climate-action strategies can reduce GHG emissions in city sectors and systems.

<http://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-WP-2014-06-C40-Cities-mitigation.pdf>

PROTECTING OUR CAPITAL: HOW CLIMATE ADAPTATION IN CITIES CREATES A RESILIENT PLACE FOR BUSINESS (CDP)

Report on findings from 207 cities that disclosed environmental data to CDP, with a focus on how those cities' actions can impact businesses and how business actions impact cities.

<https://www.cdp.net/CDPResults/CDP-global-cities-report-2014.pdf>

AUTHORS

This report was researched and written by Innovation Network for Communities (John Cleveland and Peter Plastrik) and Meister Consultants Group (Jon Crowe, Julie Curti and Wilson Rickerson). Both organizations also provided the content for the “Our Cities, Our Climate” international cities exchange on climate action.

