PLACES
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Over the last year, USGBC has fully embraced the mantra, “partnership is the new leadership.” And we have strived to live up to this mantra in many ways as we continue to find new paths forward in collaboration with other change makers and leaders, including many of our incredible members.

It is particularly meaningful to me to author this issue’s LEED ON column as we close out what has been a monumental year for USGBC and for our movement. In the past two months alone we have announced Washington, D.C., as the first LEED Platinum city and have held two inaugural Greenbuild conferences in China and India before coming to Boston for the annual Greenbuild International Conference & Expo. It is the perfect time to reflect on the depth of our roots and the breadth of our reach.

USGBC+ is the official media partner for Greenbuild Boston and this issue reflects the conference theme of “All In.” Greenbuild is where we come together from every corner of the sustainability realm to celebrate our progress and to face our challenges. USGBC+ serves a similar purpose but in a different way. It tells the stories of our successes and raises our collective awareness of the obstacles we are still working to overcome, connecting us to something bigger than our individual careers and contributions.

Greenbuild and USGBC+ are grounded in the same principle: that people are and always have been at the center of the green building movement. In this issue, we present a suite of pieces with a common thread running through them—from the impact of a community land trust in Boston to the provision of innovative sanitation systems in India—every story in these pages is personal. Far from an anomaly, this is the truth of my experience as a member of this movement; everything we do begins and ends with people.

This is why the notion of All In resonates so deeply for so many of us working to further sustainable development locally, regionally and globally. In order to grow and prosper we must celebrate diversity and be mindful of inclusivity. To increase our impact on individuals, communities, cities and entire countries, we must dig deeper and commit ourselves to ongoing improvement.

We are affirming our dedication to making green buildings healthier, more accessible, and more integrated into communities that support well-being and economic prosperity. It is a declaration that we are invested in a sustainable future that benefits people from every race, class, and creed all over the world.

As 2017 comes to a close I am certain that all of the companies and individuals that make up USGBC and GBCI, along with our staff, our Boards, our credential holders, our partners and our members are All In. The stakes are higher than ever before in our 24-year history, and we have never been more ready.

MAHESH RAMANUJAM
President and CEO
USGBC & GBCI

LEED ON

“All In”
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The way Greater Boston’s Dudley Triangle community has organized to revitalize and take ownership of their neighborhood is nothing short of inspired. So remarkable are their achievements that they now serve as a model for the development of community land trusts across the country.

Dudley Neighbors Incorporated (DNI) is a community land trust created by the Dudley Street Neighborhood Initiative (DSNI) to implement a comprehensive master plan—drafted by residents—to guide the reclamation of their neighborhood, formerly a sea of vacant and abused lots. Principal among their goals was to avoid resident displacement, which is all too common when development occurs in marginalized communities.

Established in 1984, DSNI enabled residents—a predominantly Cape Verdean, African American, and Latino demographic—to gain control over a critical mass of 1,300 parcels of abandoned land. The nonprofit was backed by the City of Boston, which adopted the development plan and granted the power of eminent domain over much of the privately owned vacant land in the 62-acre area known as the Dudley Triangle.

DNI’s Director of Operations and Stewardship, Tony Hernandez, is a key figure leading the ongoing work of pushing the nonprofit’s agenda. He recalls the impetus for creating DNI: “You’d drive through here and it looked like a war zone.” There was a high rate of arson and illegal dumping—resulting in a profoundly blighted neighborhood of brownfields. “That sparked a campaign called ‘Enough Is Enough, Don’t Dump on Us,’ explains Hernandez, adding that it took the form of residents demanding that Mayor Ray Flynn help not only build the neighborhood but also give the community control of the development process. It worked. “It was a huge victory,” says Hernandez. “The organization then used eminent domain as a poking stick to reach out to owners of these parcels. That, along with a $2 million foundation grant, helped the organization acquire land and fold it into what, today, is our community land trust.”

The question became what to do with that land.

Social equity and sustainable development are the driving forces behind the Dudley Neighborhood Community Land Trust.

BY KILEY JACQUES
Meeting of the Minds

In 1989, DNI began bringing in people who knew how to work with developers, whom the nonprofit partnered with to design and implement affordable housing plans.

Often, designers and developers are not intimately familiar with the project locale and its people. To address that scenario, DNI invites them to join community meetings for introductions and project presentations and discussions. Community members express to developers how they would like housing to look and function. For example, at the start of initial development they called for children’s bedrooms to be no less than 100 square feet in order to accommodate both a bed set and a desk; that is, a place to do homework. “It was a simple thing but it was meaningful to the community,” notes Hernandez. Additionally, they wanted larger backyards. Those requests resulted in 226 units rather than the 500 called for in the original plan.

During these meetings, developers and architects took notes and integrated requests into their design plans. “The community intent is to really drive a product that isn’t substandard,” explains Hernandez. “And to ensure that the developer isn’t coming in to create quantity. The community holds them accountable for creating quality.”

The process itself strengthened and benefitted the community. “It’s a great feeling when you walk away from these meetings knowing that your voice was heard—literally,” says Hernandez. “People from all around the community leave feeling empowered to control what happens in their neighborhood.”

The Equity Ratio

DNI’s reputation has solidified to such a degree that incoming developers who approached the City for building permits are directed to the nonprofit right off the bat to present their projects. “We’ve built that respect over the last few decades,” says Hernandez. “Initially it was more us fighting to have a seat at the table just to be heard. Now, people understand that we won’t back down.”

The developers are asked, point blank, “What are you bringing to the community?”

DNI holds developers accountable by getting everything in writing—signed agreements ensure units remain at an affordable rate; cost developers are not allowed in to build at market rate. “We created a standard because we think it is fair that [housing] be divided into a third income, a third moderate, and a third market—that’s a level playing field for development.
in our neighborhood,” explains Hernandez. They also advocate for a local workforce to be used—one that comprises 51 percent minority, 34 percent local, and 15 percent women.

For 30 years, DNI has worked to prevent resident displacement as a result of development. “The process is an anti-inflammatory against gentrification,” says Hernandez. Strategies for ensuring social equity include getting enough community members engaged to keep their eyes open for new developments, and to bring news to DNI when something unfamiliar is slated for the neighborhood. In such cases an invitation is sent to the developer to start a conversation. “We want to make it a community project, not an individual project,” stresses Hernandez.

**Earning the Credit**

The Social Equity in the Community credit within the Leadership in Energy and Environmental Design (LEED) rating system dovetails perfectly with projects such as DNI’s. The credit intends to encourage developers to promote social equity by integrating strategies that address social and community needs and disparities among community members affected by the project. The idea is to build fair, healthy, supportive environments.
For projects like DNI’s, working with community members is an integral part of the design process and improving equitable access is a core part of the project mission. In some cases, however, that deep engagement is beyond a developer's scope or capacity. Therefore, developers looking to earn the credit can follow one of two paths: One is for a project team to conduct its own community engagement and needs assessment process using the Social Economic Environmental Design (SEED) documentation system. The other is for teams to partner with local organizations representing community needs and concerns—DNI being a prime example of this path.

**Success Hard Won**

Today, DNI owns 226 units of affordable housing, 96 of which are owned homes; the rest are co-operative rentals. There is a 10,000-sq-ft greenhouse, a 1.5-acre farm, community gardens, a playground, and one commercial space. Plans in the pipeline include the addition of 12 more affordable homes, an increase in commercial space, and development of a robust agricultural agenda.

Ultimately, the number of stakeholders working with DNI has grown to include not only local residents and small businesses but also Upham Corner Main Street; the Food Project; the Urban Farming Institute; Dorchester Bay Economic Development Corporation; the City of Boston’s Department of Neighborhood Development and the Mayor’s Office; pro bono attorneys from Goulston and Storrs; and financial institutions including Boston Private Bank, One United, and Century Bank. “We need to have representation from all perspectives to really make this work,” notes Hernandez.

Thanks to the comprehensive and deeply thoughtful approach to development without displacement, DNI stands as one of the nation’s most successful urban community land trusts to date.

Above: The Dudley Street Neighborhood Initiative’s (DSNI) mission is to empower Dudley residents to organize, plan for, create, and control a vibrant, diverse, and high-quality neighborhood in collaboration with community partners.
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Big sustainability projects often begin with big dreams. Visionaries John Schmid, CEO of Propark America and the developer of Canopy Airport Parking in Denver, and Richard Piacentini, executive director of Phipps Conservatory and Botanical Gardens in Pittsburgh, both recall the moment they crystallized remarkable concepts to save the Earth’s resources.

Schmid set his mind to constructing a parking facility that would elevate energy efficiency to a lofty new level. Piacentini and his board, using a master planning process, began with the U.S. Green Building Council’s (USGBC) Leadership in Energy and Environmental Design (LEED) green building rating system and then folded in other sustainability certifications for a robust solution.

As Schmid recalls, “We set out to build the most sustainable parking facility on the planet. Two years later, we welcomed a baby called Canopy Airport Parking, which we then used as a springboard to influence, challenge, and inspire the parking world to emulate.”

When Phipps began its journey toward sustainability in the early 2000s, Piacentini says, his group originally pursued LEED Silver. “As we became more familiar with the reasons behind all of the LEED requirements and why they are important,” he says, “we shifted our sights and now start every project with LEED Platinum as one of our primary goals. We like using LEED because of what it stands for, and the broad recognition it has in the marketplace both locally and nationally.”
Left: Phipps is the first project in the world to achieve LEED Platinum, WELL Building Platinum, Sustainable SITES Initiative (SITES) certification for land design and development, and the Living Building Challenge certification.

Top photo: Denmarsh Photography, Inc.
Bottom photo: Paul G. Wiegman

Phipps Conservatory

After serving as a botanical refuge funded by the City of Pittsburgh for 100 years, Phipps Conservatory became a privately funded nonprofit in 1993. Piacentini came on board shortly after and helped begin a master planning process, as he says, “to figure out the best way to make the conservatory thrive as a private nonprofit organization.” Then he learned about LEED. “We didn’t know that buildings were responsible for so much environmental damage,” he recalls. “We knew that our buildings should reflect our values.”

Phipps Welcome Center, opened in 2005, was the first LEED-certified visitor center in a public garden in the world. That was just the beginning. “We got excited with everything that LEED was all about,” Piacentini says. Today, Phipps is on the forefront of sustainability, its vision culminating in the Center for Sustainable Landscapes (CSL). The popular attraction is a model of environmentalism and the first project in the world to simultaneously achieve LEED Platinum, Sustainable SITES Initiative (SITES) certification for sustainable land design, development and management, and the Living Building Challenge certification.

Achieving LEED got Piacentini thinking about a flood of topics: toxic pesticides, plastic bottles, composting, and irrigation systems. “We started making massive changes in what we were doing, following the guidelines in LEED certification,” he says. Today the CSL produces all of its own energy using sun and wind; manages 3.25 million gallons of stormwater per year, processing sanitary water through constructed wetlands; and provides shelter and food for local wildlife.

Piacentini was looking at the CSL in terms of systems. “Everything is connected between buildings, the natural environment, and human health,” he says. “We realized we could minimize the impact of buildings on human health and Earth’s health and make things better than they were. The four rating systems actually work very well together. It was possible to build off each of them.”

After LEED certification, achieving SITES certification for sustainable landscapes seemed the next logical step to Piacentini. (SITES aligns land development and management with innovative sustainable design—defining what a sustainable site is and, ultimately, elevating the value of landscapes in the built environment.) “We decided the landscape and building needed to be environmentally connected,” Piacentini says. For example, he says, both LEED and SITES recognize the importance of redeveloping degraded sites. “We then went on to SITES to design our stormwater capture systems as visitor amenities and restore the native plant communities with 100 different species of plants.”

“Then we heard about the WELL building program,” Piacentini recalls. “We became totally focused on how buildings significantly impact human health, as we spend 90 percent of our time in buildings.”

For Piacentini, it was consistently shooting for the stars. “We created a track record of continually raising the bar and achieving successes,” he says. Phipps now includes two net-zero energy buildings, so the buildings literally have no cooling, electric, or heating bills.

“We meter all the energy we produce in each building against all the energy each building uses,” he says. “Both buildings produce more energy than they use, so there are no energy bills.”

Overall, since 2005, carbon dioxide emissions at Phipps have been reduced by 56 percent on a square-foot basis across the entire campus. As Piacentini says, “We’re way ahead of the Paris Climate Agreement.”

Before connecting rating systems, Piacentini says, identify your goals. “My advice is to sit down and understand what’s important to you,” he says. “Try to see what your focus is. Once you understand that, you can look at the rating systems and see what resonates with your values.”

A strong certification project is the way to start, he says. “I’ve seen too many projects where people say, I’ll follow the LEED guidelines and build to standard, but not go for certification. I see so many problems when people do that. It’s too easy to cut corners, if you’re not worried about third-party verifications.”

For Piacentini, combining LEED with other rating systems confirms that Phipps “is walking the walk.” “It allows us to take a comprehensive, holistic approach to maximize human and environmental health, Piacentini says. “By doing so, Phipps has become a sustainability leader and model, inspiring guests from around the world.”
Canopy Airport Parking

West of Denver International Airport, Canopy Airport Parking has staked a claim as a paragon of sustainability. The pavement that runs underneath the facility—enough space for 4,200 vehicles—was built with recycled roofing shingles. The railings were created with steel reclaimed from old cars. The 72 solar panels and eight wind turbines on site pump out energy and, along with LED lighting, make Canopy 80 percent more efficient than traditional parking facilities. Nine Juice Bar brand electric vehicle (EV) charging stations (and a 10th on the way) are offered free for patrons.

“We created a new standard in energy-efficient parking facilities,” says Dennis Safford, corporate director of marketing and communications for Propark America, a parking management company that operates facilities across the country.

A $16 million project, Canopy was the brainchild of John Schmid, who wanted to make all operations as sustainable as possible from the ground up.

Schmid first pursued LEED certification for Canopy and achieved Gold certification. When the rating system changed several years ago—to require that parking facilities be connected to a building—Schmid saw a void. He reached out to other parking companies and vendors and started the Green Parking Council, which began the Green Garage Certification project. Ultimately, the council came under the aegis of Green Business Certification Inc. (GBCI), which also administers LEED, and relaunched as Parksmart in 2016.

Today, Parksmart is the world’s only rating system that advances sustainable mobility through sustainable parking structure design and operation.

‘John knew that incorporating sustainable values into our operations was good for the environment and good for business,” Safford says. “This is one way he wanted to leave his mark.”

LEED and Parksmart are natural partners, Safford says. “All the aspects that made Canopy Airport Parking LEED Gold were absolutely beneficial in getting the project Parksmart certified. We custom-built the facility to achieve a high LEED rating, and that made it easier for us to achieve Parksmart certification, because our facility was already built upon sustainability.”

Joining LEED certification with other, more specialized rating systems creates a stronger entity, both Piacentini and Safford say.

“In creating the Green Parking Council, John rallied the industry to come together in a common thread of sustainability,” Safford says. “Our philosophy was that ‘nobody is as smart as everybody,’ so it was important to get as many industry thought leaders together, in a collaborative sense, as possible. We wanted to chart the most intelligent course toward helping to create the new standard of sustainability within parking. I think we achieved what we set out to accomplish.”

Above: Canopy achieved LEED Gold and set a new standard in energy-efficient parking facilities.
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Investment banks bridge the gap and help fund the future of climate-resilient infrastructure.

BY JEFF HARDER

The words “green bank” might conjure ATMs, drive-up windows, and deposit slips, but don’t be fooled by the name. Green banks—alternatively known as green investment banks—are akin to impact funds and use a mix of public and private money to back billions of dollars worth of low-carbon and climate-resilient infrastructure (among other initiatives), galvanizing the private sector to invest in and scale up sustainability and clean energy projects within the United States and around the world. And with an estimated $90 trillion required to transition the world to low-carbon and climate-resilient infrastructure by 2030, according to the Global Commission on Climate and the Economy, green banks are helping bridge a critical gap in funding.

“There’s more and more talk of [green investment banks] in the climate resilience space, which I think is a good thing: There’s a lot of infrastructure to make resilient within the next 15 years,” says Stacy Swann, a founding partner of Washington, D.C.-based consulting and advisory firm Climate Finance Advisors, as well as board vice chair of Maryland’s Montgomery County Green Bank.

Swann previously worked for the International Finance Corporation, a member of the World Bank Group that deals with private sector investment in developing countries, where she spent nearly a decade heading its Blended Finance Unit. A blended finance model involves capitalizing a financial entity with public dollars; leveraging the far larger coffers of private investors by issuing guarantees, equity, and debt with discounted, concessional terms (for example, offering 5 percent interest if the market rate offers 10 percent); and steering the funds into projects with significant social benefits. The model has been around for decades—Rhode Island’s Infrastructure Bank has followed a blended model since the 1990s—but as public budgets dwindled and clean energy and climate resilience became transnational concerns in the last decade, blended finance models have helped correct certain market failures—say, for instance, under-investment in clean energy technology because of its perceived risks.
“Due to the relative lack of performance history for many proven technologies in the new and evolving energy landscape—including solar, wind, fuel cells, battery storage, et cetera—traditional capital providers tend to be less familiar with developing financing products to enable the deployment of those resources,” says Keely Conway, an analyst at New York Green Bank, the largest green bank in the United States. “Traditional financing therefore may not yet be available and/or borrowing costs can be higher due to a perception of greater project risk, leaving otherwise technically and economically feasible projects without needed capital.”

The same concepts that drive blended finance more broadly drive green investment banks in particular. Today, there are at least 13 green banks around the world, all nonprofit or government-affiliated entities independently established through policy or legislation (though not all adorned with the “green bank” label) to address the regional burdens of a warming world. Capitalized through tax dollars, utility bill surcharges, and other public sources of money, green banks draw private investment to fund a variety of sustainability projects—solar, wind, and hydropower; energy storage; LED streetlights and low-carbon vehicles; and energy-efficiency retrofits in low-income housing.

Each green bank specifies the limits on how to spend investors’ money, whether for energy efficiency upgrades or clean energy projects, and enacts restrictions and safeguards to prevent steering public money directly to private companies’ bottom lines. And by operating at smaller scales, green banks direct attention to projects that might not catch the attention—or the funding—or large financial institutions. “There are very few options for financing these things,” Swann says. “In the U.S., the green bank model is really filling a gap at the state and local level.”

Since the United Kingdom’s government established the first bona fide green bank in 2011, at least a dozen more have emerged in the United States, Australia, Asia, and elsewhere in Europe, and early returns show green banks making a remarkable impact. According to a working paper produced by Climate Finance Advisors, the Natural Resources Defense Council, and the Coalition for Green Capital, a network of six green banks—the UK Green Investment Bank, New York Green Bank, Connecticut Green Bank, the Australia Clean Energy Finance Corporation, the Green Technology Corporation of Malaysia, and the Green Finance Organization of Japan—have raised $22 billion for clean energy projects since 2014, putting the group on pace to exceed its goal of $40 billion by 2019. And rather than leeching off ratepayers, green banks have amplified the impact of limited funds: According to the working paper, green banks have mobilized eight dollars in total financing for clean energy projects for every public dollar invested.

So far, green banks have made a profound impact. By June 2017, New York Green Bank, a $1 billion state-sponsored investment fund, had invested more than $400 million in clean energy projects in New York State and generated $17.8 million in revenues, all of which was reinvested in the business. Recently, the UK Green Investment Bank established the Offshore Wind Fund to attract institutional investors to offshore wind farms and free up developers to finance new wind projects; by the end of 2016, the fund invested in five projects. Last year, the
Rhode Island Infrastructure Bank’s Efficient Buildings Fund lent $17 million to carry out energy efficiency and renewable energy projects in six communities that reduce greenhouse gas emissions by the equivalent of millions of car miles per year, generate enough power to run 8,700 homes, and free up a combined $20 million for those communities. “That’s a significant savings in taxpayer dollars that can be directed into education and other services that cities and towns provide,” says Jeff Diehl, executive director and CEO of Rhode Island Infrastructure Bank.

Homeowners and commercial building owners enjoy subtler connections to green banks: While they can’t offer direct consumer financing, they work with local financial institutions to offer underwriting, risk-sharing, or credit lines, which the institution might deliver as attractive financing for a retrofit or a solar installation, for example. Green banks can also function as matchmakers, vetting and recommending contractors and lenders for a given project, and also bring wider awareness to the value of green building, resilient infrastructure, and energy efficiency. “When a local bank is financing a remodeling project or a retrofitting project, they’re usually not thinking about the need to implement or integrate measures that would make it more resilient in the long run,” Swann says. “Part of the role green banks have played, and certainly part of the role that blended finance plays internationally, is building that awareness into the projects themselves.”

And as states and municipalities become leaders in building for resilience, green banks can help finance infrastructure that remedies drought, intense rain, coastal storms, and other disparate effects of climate change. (“The impacts are very contextual, and the people who understand that context really well are the local policy makers,” Swann says.) And while green banks are complements—not substitutes—for thoughtful climate and resilience policies, their role often goes beyond finance: The Rhode Island Infrastructure Bank, for example, now makes available a consulting engineer to municipalities—free of charge—to help determine which energy efficiency measures will have the greatest benefits. “That’s part of our mission: not just accelerating investment and providing finance, but also helping bring technical expertise so decisions are being made in a better-informed way,” Diehl says.

In the long run, Swann says, the true measure of success of green banks is when they become less and less necessary. Other actors in the financial ecosystem will fulfill the same functions. The finance gap will disappear. A more resilient world will gradually arrive, and it won’t break the bank.

JPMorgan Chase

Sustainability is a fixture of the culture at JPMorgan Chase, the New York City–headquartered bank and financial services company, and an ever-increasing priority for its clients—so much so that by 2020 the company plans to lean entirely on renewable energy for its operations at 5,500 properties across 60 countries. And recently, JPMorgan Chase announced that it’s going a few steps further: By 2025, it will offer $200 billion in clean financing, the largest such commitment made by a multinational finance institution.

“Our commitment to sustainability reflects our continued belief that business must play a leadership role in creating solutions that protect the environment and grow the economy,” says Erin Robert, head of capital strategy for sustainable finance at JPMorgan Chase. “That means leveraging our core business and expertise as a global financial institution to advance sustainability focused financing opportunities.”

That $200 billion commitment takes many forms—advisory services, financing and risk management solutions, and debt underwriting for companies and projects that facilitate clean energy, clean transportation, sustainable waste management and water treatment, pollution control, and clean technology innovations. In recent years, JPMorgan Chase has been involved in some of the largest strategic transactions in the renewable energy sector, advising DONG Energy, an offshore wind company, on its $3 billion initial public offering (IPO); serving as bookrunner on Apple’s $1 billion green bond offering this past June; and contributing to the $900 million Teesside Renewable Energy Plant, the UK’s largest dedicated biomass project, which produces enough energy to power 600,000 homes.

“We continually strive to be a leader in this space,” Robert says, “and demonstrate that supporting sustainability-focused companies and projects can both generate significant environmental benefits and make good business sense.”
BIG RED STATE.
BIG GREEN MARKET.
Five of Texas’s cities demonstrate a strengthening commitment to sustainability in the nation’s largest red state.

Unbeknownst to many, Texas is leading the charge in the nation’s green building movement. In fact, the U.S. Green Building Council (USGBC) named Texas one of the Top 10 Leadership in Energy and Environmental Design (LEED) States for 2016—recognizing its strides in sustainable design, construction, and transformation.

The impetus for making those strides is layered, and includes a strong economic component. According to USGBC’s 2015 Green Building Economic Impact Study, LEED construction is expected to support 244,000 jobs in Texas and impact the state’s Gross Domestic Product by $21.39 billion by 2018. But there are other factors driving the movement, too.

Sustainability advocates, research institutes, academics, and architects in Austin, Houston, San Antonio, Lubbock, and Dallas are banding together in diverse unions to work with city officials to build “green” into the infrastructure (and mentalities) of their urban communities—an approach that makes both business and social good sense.

Awake in Austin

Perched on the banks of the Colorado River, the City of Austin is brimming with natural beauty, and its dynamic trails and parks system allows residents to experience it up close. Much of the population appreciates the importance of preserving natural resources. That, coupled with it being home to the University of Texas—a major research institution—as well as many high-tech companies, make it one of the state’s most progressive cities. “We have a very well-informed citizenry about environmental issues, and we tend to be on the cutting edge of technology,” says Austin Chief Sustainability Officer Lucia Athens. “We were one of the early cities to come up with strict development standards to protect water quality.” She notes, too, that the city has looked for a long time at how to best leverage green development.

Athens manages the Climate Protection Program and related actions to reduce Austin’s carbon footprint and make it more resilient to the effects of climate change. The program outlines hundreds of actions designed to meet department goals, which include the implementation of 28 green building plans. “Most of our footprint, like other major metropolitan cities, is energy use—primarily by buildings. We have been a leader in municipal actions since 2007, when the City Council first adopted a climate protection resolution,” says Athens, adding that they continue to update their goals. (They have seen a 58 percent reduction of greenhouse gas emissions since making the resolution.)

Austin’s climate resiliency programming is gaining traction. The Office of Sustainability has been leading an effort with multiple city departments and public agencies to look at means of preparing for events like Hurricane Harvey. Given the large numbers of “climate refugees” the City takes in during such natural disasters, one idea is to integrate a rooftop solar program into emergency evacuation facilities, so that backup power will be available when and where it’s needed most.
Previous spread: The LEED Platinum TreeHouse Memorial City, in Houston, Texas, achieved a score of 95 points—the highest credit point total in Texas and the second highest in the U.S. for projects certified under the Building Design and Construction rating system. It was also certified LEED Platinum for Interior Design and Construction.

This page: Austin’s City Hall, designed by Antoine Predock, reflects its natural surroundings, the four-story 118,000-sq-ft structure incorporates local limestone, a cascading waterfall, and nonsymmetrical shapes, all of which reflect the waterways and canyons of Austin’s surroundings.
The integration of renewable sources of energy is a hot-button topic in much of Texas, but Austin fully embraces the tactic. In August 2017, the City’s utility provider, Austin Energy, announced the acquisition of an additional 200 megawatts of wind power through a power purchase agreement. They also recently adopted a goal to be 65 percent renewable by 2027. (They are at roughly 35 percent now.) “We have been making significant strides to green our energy production portfolio, including [major] investments in wind and solar,” says Athens, noting their robust incentive program for rooftop solar. Additionally, they aim to generate carbon-neutral power by 2030 and are looking for net-zero carbon emissions by 2050.

In terms of green building, the City has a LEED certification capital project policy, which designates LEED Silver as the standard. It also has a green building program of its own, Austin Energy Green Building, as well as LEED. “It was the first green building rating program in the world that we know of,” notes Athens. It continues today in addition to LEED, so both types of certification are found throughout the city. To date, over 14,000 single-family homes have been certified under the Austin Energy Green Building program.

Austin Energy Green Building is currently capturing 25 percent of the market for new permits for single-family homes; 23,000 multi-family buildings capture 35 percent of that market for new construction; and 25 million square feet of commercial projects have been rated, capturing 60 percent of that market.

“I really see green building as part of our resiliency strategy,” says Athens. “The more we can have buildings that are increasingly self-sufficient—moving toward net-zero energy, net-zero water, and growing food, that is all a part of how we are approaching resilience.”

Above and beyond a focus on buildings, Austin is also addressing the need for economic resilience. More than 200 members strong, Austin Green Business Leaders is comprised of businesses that support sustainability—on multiple fronts, including its profitability. “That group is a robust peer network of companies sharing strategies. A lot of them are involved because they recognize it will make their business stronger—it can help their bottom line, and there is a marketing cache that goes along with it,” explains Lucia.

**Hope for Houston**

Ravaged by Hurricane Harvey, Houston has received unprecedented national attention as of late. The flooding and damage from the storm made painfully clear the need for a sound resiliency plan. To the City’s credit, it has been working toward creating one. In fact, Mayor Sylvester Turner co-chaired the Mayors National Climate Action Agenda, an association of U.S.
mayors with the stated goal of reducing greenhouse gas emissions. Founded in 2014, it was an effort to organize cities in advance of the signing of the 2015 Paris Agreement. Collectively, 379 “Climate Mayors,” representing 67.8 million Americans, committed to upholding the Paris goals.

Despite being a major city in a fossil-fueled state, Houston is the nation’s largest municipal user of green power—nearly 100 percent of the city government’s energy comes from renewable sources. This achievement is a direct result of the City’s 2008 Emissions Reduction Plan. Though Texas has long been a leader in wind power, it has been slow to adopt solar. But Houston is ahead on that front. In April 2017, it announced plans for a 50MW solar plant, based 600 miles away, with 203,840 solar panels covering more than 360 acres.

Gavin Dillingham, Ph.D., is program director for Clean Energy Policy at HARC, a nonprofit research hub providing independent analysis on energy, air, and water issues. HARC seeks solutions to the environmental, social, and economic challenges facing the greater Houston-Galveston metropolitan area and the Texas Gulf Coast. Dillingham leads research and program efforts to improve climate resilience of electric power infrastructure and the built environment.

“One of the things the City likes to do is lead by example by mandating within the [local government] community to demonstrate how something works internally and [we] hope that the example will be pushed out into the public [sphere],” says Dillingham, noting the drive behind the City’s 2004 Green Building Resolution, which required all new City buildings and renovations to achieve LEED Silver or higher. “That built capacity among the architectural and engineering community, which helped later when it came to cost analysis for similar projects.”

Dillingham explains that the plan for city operations was completed a few years ago but was never officially published. Ultimately, HARC will collaborate with the City of Houston to develop a community-wide Sustainability Action Plan. They aim to introduce a climate resilience or adaptation component, and plans are in the works to hold discussions with community leaders around resilience planning. “There may be a greater opportunity now [since Hurricane Harvey], to make some incremental changes in how we approach resilience and sustainability in our region,” says Dillingham.

The new plan will enable Houston to implement cost-effective strategies for energy efficiency, renewable energy, water conservation, infrastructure development, and other operations; the goal being a city that functions in a sustainable manner by using resources wisely and improving operational resiliency.
Dillingham points to the impetus for the plan: “We could not say that it was a Climate Action Plan because of the nonbelievers of climate change; it had to be a Sustainability Action Plan with minimal discussion of what the carbon impact would be, and more [of a focus on] improving energy savings, which translated into cost savings. It had to show an economic argument.”

Dillingham describes a general resistance to planning for sustainability: “We are very much a red state in that regard. We do not like to be told how to do business, or to have heavy-handed mandates on land use. The Houston region continues to expand because there are few geographical barriers. We don’t have mountains or major rivers so there is nothing constraining growth and continual expansion.” That being said, Dillingham is beginning to see some changes in the city planning guidelines and the types of projects developers are building. His experience suggests that, relative to 10 or 15 years ago, there is less resistance to working toward a more sustainable and resilient community; he attributes that yielding to more positive attitudes toward sustainability—driven by improved project economics, reduction in technology-related costs, improved understanding of the long-term cost/benefit analysis of green building, and a more diverse population that has experienced the benefits in other locations. “We are seeing a behavioral and attitude change that I think is largely due to a shift in the demographics—to the betterment of the city. Even after Hurricane Harvey ravaged the city, there is hope that things can change toward a more resilient approach to development and land use but there is nothing definite.”

**Strategizing in San Antonio**

Krystel Castillo, Ph.D., Sc.D., founder of the Texas Sustainable Energy Research Institute (TSERI) at the University of Texas at San Antonio (UTSA), has a vision for a new energy future—one born of a partnership with San Antonio’s greater community. The hope is to turn the City into a major contributor to a 21st-century global energy economy by integrating scientific discovery, engineering innovation, and policy-making strategies. (Strides toward that end are evidenced...
by the University of Texas System’s commitment to achieving, whenever possible, LEED certification for all of its campuses’ buildings.

TSERI looks for opportunities to apply technology to improve the reliability and environmental stewardship of City systems while reducing costs. It also promotes equitable socioeconomic development on a regional, national, and global scale. “Our impact will drive San Antonio’s economic future, coalesce our intellectual capital, serve as a magnet for future leaders, and help secure a foundation for enhanced prosperity for south Texas and the Alamo region for decades to come,” explains Dr. Castillo.

The Institute works collaboratively with government, academic, industry, and national laboratory partners on clean energy and sustainability research. Vital to their work, for example, is their partnership with the City of Antonio and CPS Energy, the nation’s largest municipally owned energy company. “This strategic alliance—established in 2010—provides the opportunity for students to engage in experiential learning and for faculty members to tackle real-life projects with societal impact, as well as to contribute cutting-edge solutions to the most pressing challenges in sustainable energy and sustainability,” notes Dr. Castillo.

Currently, UTSA, CPS Energy, and the City are developing a Climate Action and Adaptation Plan for San Antonio, the goal of which is to reduce greenhouse gas emissions. Benchmarks and time frames are being determined, as are plans for implementation. Also in the works is the creation of a new energy management system that integrates control of battery energy storage and solar-powered buildings. Other ideas in the making include: harvesting energy from roadways; developing a smart grid security system; and applying computational methods to improve solar forecasting.

TSERI is committed to preparing students for leadership roles in new energy and sustainability planning and policy—the foundation for economic growth and job creation. “The new energy economy requires professionals with an interdisciplinary background,” says Castillo. “Our vision is to develop citizen leaders capable of shaping the new energy future.”
Lessons from Lubbock

Katharine Hayhoe, Ph.D., is contagiously spirited when discussing her work on climate change and resilience planning.

As a climate scientist based at Texas Tech University, she focuses on developing and applying high-resolution climate projections to evaluate the future impacts of climate change on human life and the natural environment.

“My research examines trends in extreme weather events that have been seen already, and demonstrates what we can expect for [future] impact on temperature, precipitation, and evaporation—and how that will change our water supply, infrastructure, and public health,” she explains.

Dr. Hayhoe says that since 1980, the state has had more billion-dollar climate and weather disasters than any other in the country. In other words, Texas is naturally more at risk because of its extreme—and diverse—weather patterns; it gets everything from droughts to blizzards.

“Let’s connect the dots here,” says Dr. Hayhoe. “Why do we care about changing climate? We care because [a changing climate] takes the risks that we already face today and it exacerbates them.”

Furthermore, Texas traditionally has been a place where people disproportionately reject the reality of climate change. Yet over the last 10 years, there has been a tremendous shift in thinking. What was once seen as a “natural cycle” is now understood by nearly all to be something more; Hayhoe points to a poll taken a few years ago indicating that only 3 in 10 people didn’t think climate was changing. “If you can build resilience to a changing climate in Texas,” she says, “I think you can build it anywhere.”

In the face of climate change, Hayhoe advocates for adaptation and preparation. But her research shows that the faster the rate of climate change, the greater the risk; and the greater the risk, the less likely attempts to adapt will be successful. She believes the solution lies with alternative energy sources to mitigate carbon emissions associated with conventional fossil fuel.

Texas is the No. 1 producer of wind energy in the nation, with over 25,000 jobs in that industry. Wind power accounted for 12.6 percent of the electricity generated in Texas in the 12 months ending in October 2016. Cities like Georgetown and Fort Hood are now investing in renewables. “Texas is simultaneously one of the most at-risk states in terms of a changing climate, but it also has the greatest potential to
mitigate these risks through reducing [dependency] on fossil fuel,” explains Hayhoe.

Ironically, Texas is also the No. 1 producer of carbon pollution in the country. “Texas is a big part of the problem,” notes Hayhoe. “But energy is energy. And Texans understand energy.” Though Texas has been slow to adopt solar power, the state has the potential to lead the nation there, too. She sees solar as a huge untapped resource. “Climate change isn’t just a great economic challenge; it represents a great economic opportunity. There’s a growing commitment to investing in our future—a future that just so happens to be building a more resilient [state] and a new clean energy economy at the same time.” As an example, she points to the Defense Department’s new solar farm at Fort Hood, which, along with an off-site wind farm, will generate enough electricity to power half the base—it will also save the army (and taxpayers) $168 million for the lifetime of the contract.

Dr. Hayhoe doesn’t much care how people drum up the desire to plan for climate change—whether it is a wish to support a cleaner planet or to save money—just as long as we are all in agreement that something needs to happen. “The point is to agree on solutions, no matter how you arrive there.”

Digging in Dallas

Dallas’s George W. Bush Presidential Center was the first presidential library and museum to achieve LEED Platinum. The decision to go for Platinum was an ambitious goal, but former President Bush and Mrs. Bush were determined to achieve it.

“It wasn’t the easiest thing to design a museum to meet all of the standards that were set,” notes Herb Sweeney, associate principal with Michael Van Valkenburgh Associates, Inc., the landscape architecture firm responsible for the project’s 15-acre park.

“They were interested in how they could lead by example with this building and the landscape.”

The Bushes are well known for their love of the Texas landscape and for their efforts to support environmental stewardship and conservation—that was the inspiration for the aesthetic and functionality of the landscape. “It was based on an understanding of their interests and objectives that we proposed what was a very atypical design for this presidential landscape,” says Sweeney.

The decision to plant seven acres of prairie and nine acres of native lawns, in addition to the 250-gallon cistern, resulted in a 73 percent reduction in water use in the landscape. Perhaps even more remarkable is the
Seven acres of prairie and nine acres of native lawns, in addition to the 250-gallon cistern, resulted in a 73 percent reduction in water use in the landscape.
The fact that the native lawn seed mix, Habiturf, was not commercially available at the time; it was developed in collaboration with the Ladybird Johnson Wildlife Center. It has been so successful that it is now available in the retail marketplace. “The Center’s landscape has become a showcase for this product,” notes Sweeney, adding that is exciting to introduce the public to a sustainable alternative to conventional turf—especially in a drought-susceptible region.

In fact, that susceptibility was another design-driving factor. “One of the biggest challenges Dallas faces that makes LEED and sustainable strategies more interesting to the city is the fact that they are hard hit with issues of water conservation,” explains Sweeney. Minimal average rainfall, in addition to the city’s traditionally high water usage, are prompting careful consideration of how to utilize water efficiently. “It is a city that has overused water, and in recent years has realized it is a significant issue . . . they experience a lot of water bans. It was one of the things that [determined] many of the design decisions for this project.”

Interestingly, finding native plants proved difficult, as they are not typically grown by the Texas nursery industry. They sourced trees from far and wide,
including from ranch owners’ private properties. But again, that is changing: “One of the things we have seen since the project was completed is that some of the nurseries—where we were unable to find native materials—are now growing them,” notes Sweeney. “We’ve seen a shift in the commercial practices of some of these nurseries to meet the demand that we introduced with this project. It’s very rewarding to see that. This project is helping people open their eyes.”

Sweeney attributes the completion of several LEED-certified public buildings in recent years to the City’s growing recognition of the value inherent in sustainable design. He also understands performance and operating costs to be motivating factors. But perhaps the biggest driver, he says, is public appeal. “One of the great motivators in the industry right now is public perception—companies and institutions use social media and other formats to [highlight] their sustainable objectives.”

In a city steeped in revolutionary spirit, Boston Properties pushes the boundaries of sustainable design.

What does it take to be a revolutionary in Boston, the city that launched the American Revolution? Just ask the innovators at Boston Properties, Inc. (BXP), one of the largest owners and developers of office properties in the nation. As a leading real estate company, BXP has been a pioneer in sustainable design and construction.

From rooftop gardens with beehives and rainwater harvesting to wind turbines and solar power, BXP’s latest landmark buildings stand at the cutting edge of sustainable building. In 2011, the firm completed Atlantic Wharf, Boston’s first green skyscraper. Atlantic Wharf integrates historical structures and a sustainably designed high-rise mixed-use development with commercial, retail, and residential space between the vibrant Rose Kennedy Greenway and Boston Harbor, just steps from the site of the Boston Tea Party. And this past December, BXP opened 888 Boylston Street, Boston’s most sustainable office building, located at the Prudential Center in the heart of the Back Bay neighborhood. Both projects achieved Leadership in Energy and Environmental Design (LEED) Platinum, the highest mark for sustainable design and construction.

“Innovation is about questioning the status quo,” says Ben Myers, Boston Properties’ sustainability manager. “It’s about going beyond code requirements and industry standards to develop something truly special.”

For BXP, LEED Platinum projects are a mark of pride, but they’re also a centerpiece in the firm’s contribution to Boston’s Climate Action Plan. Launched in 2014, the citywide initiative calls for reducing carbon emissions by 80 percent by 2050, a goal that will require more than electric cars and bike lanes. According to Myers, developers, architects, engineers, and builders have an important responsibility as urban environmental leaders and stewards of the built environment.

“Green building is an essential strategy to achieve the city’s and the region’s goals,” he says.

For almost 50 years, Boston Properties has owned, managed, and developed Class A office space and mixed-use buildings concentrated in Boston, Los Angeles, New York, San Francisco, and Washington, DC. In the Boston region, BXP owns and manages more than 13 million square feet in 48 properties, including the Prudential Center and 200 Clarendon Street in Boston’s Back Bay, and Kendall Center, in the heart of Kendall Square. “The firm’s leadership in sustainable development as a publicly traded real estate investment trust (REIT) has been supported by efforts to attract creditworthy tenants. These tenants often have their own sustainability goals and a long-term hold strategy that encourages investment in technology that maximizes profitability over the full life-cycle of the asset.”

Those forces have made LEED certification central to the firm’s portfolio of more than 160 office, retail, and residential buildings totaling 48.4 million square feet. In 2016 alone, Boston Properties achieved LEED certification and recertification for 3.3 million square feet of real estate, growing its portfolio of sustainably designed space to 17.1 million square feet—and by the end of 2017, BXP expects to have more than 20 million square feet certified, over 95 percent of which will be Gold or Platinum.
Atlantic Wharf’s opening set the early benchmark for sustainability in Boston’s construction market, and the LEED Platinum building quickly became one of the city’s most sought-after mixed-use developments. Now, Boston Properties has set a new standard in sustainable design with the LEED Platinum 888 Boylston Street.

The 425,000 square feet of mixed-use space includes three ground floors of retail, is already occupied by Tesla Motors, Inc., Under Armour, and the Italian marketplace Eataly. A 14-story commercial tower is anchored by Natixis Global Asset Management, which has leased 128,000 square feet across five floors. The building integrates visually compelling green features and groundbreaking sustainable designs that make a bold statement across the Boston skyline, and a meaningful impact on the city’s environment and its residents.

Sipping Energy
From the beginning, the goal at 888 Boylston Street was clear: build Boston’s most sustainable Class A office building. To do that, Boston Properties assembled a team of industry leaders, fellow visionaries who were well versed in sustainable design and construction and unafraid to step into new paradigms and technologies.

The project’s architect, New York City–based FXFOWLE Architects, is world-renowned for green building design. In 1992, the firm designed Shanghai’s first green high-rise, the Industrial and Commercial Bank of China. And in 1999, FXFOWLE designed New York’s first green skyscraper, the Condé Nast building at 4 Times Square. Today, the company has more than 9 million square feet of LEED-certified space to its credit, and 70 percent of its 2016 projects are LEED-certified or seeking certification.
Leading the construction effort was Turner Construction Company, a construction manager committed to sustainability that has been recognized as the largest green builder in the United States by Engineering News-Record magazine, and a Platinum-level member of USGBC. Turner’s projects can be found across North America and in 16 different countries, and it has been a major player in Boston since its 1909 renovation of Harvard University’s sports stadium. Since 2000, the firm has delivered 500 LEED-certified projects worth an estimated $20 billion.

Despite their impressive depth of experience, the 888 Boylston team was not looking to replicate sustainable designs. To create something truly unique, FXFOWLE’s architects of the past dug deep into the commercial and retail markets to find examples of buildings at the forefront of sustainability. They then set their sights on exceeding those standards.

“This not only needed to be the best performing building in Boston and New England, but we benchmarked it against some of the best projects across the country, in New York and out west,” says Jim Bushong, FXFOWLE’s senior project designer for 888 Boylston Street. “We started to pull in technologies that were on the cutting edge for speculative office buildings and that aren’t widely used [in that market].”

What kinds of technologies? For starters, the building has a renewable energy power plant on its roof, a 134-kw, energy-efficient system that includes 14 vertical axis wind turbines and an array of solar photovoltaic panels. Together, the technologies produce enough energy to power 15 Massachusetts homes. They also achieve every available LEED Energy & Atmosphere credit for onsite renewable energy and green power.

An active chilled beam HVAC with dedicated outdoor air system (DOAS) uses 100 percent fresh air—instead of recirculated air—to condition occupants’ spaces. While the technology is not uncommon in Europe, it is still relatively new to the U.S. market and an unusual feature in speculative office design. The system significantly reduces the overall energy used to cool the building, and its design increases thermal and acoustic comfort.
Also mitigating the building’s energy use are high-efficiency chillers that eliminate ozone-depleting refrigerants, earning LEED credits for enhanced refrigerant management. Heat recovery wheels transfer waste heat energy to the supply, keeping the building comfortable in winter while reducing energy use and heating costs.

At its shell, 888 Boylston Street has a high-performance thermal envelope, including double-paned glass with insulated glazing. The unitized curtain wall has an extremely low solar heat gain coefficient that reduces the rate of heat transfer at the building’s skin and saves on cooling costs. Some 70 percent of the building’s overall façade is comprised of glass, reducing artificial lighting runtime by 60 percent. And LED lighting in all common areas further reduces the building’s electrical load.

All of these features are forecast to reduce 888 Boylston’s energy consumption by 34.6 percent compared to a code-compliant baseline building. That translates into utility cost savings of $650,000 annually. To monitor energy consumption and adjust the building’s systems for optimal efficiency, it has 46 individual meters in operation (which also achieve LEED credits for energy measurement and verification). The first year of data is still coming in—along with post-occupancy evaluations—but all indications point to impressive savings. “It’s been sipping energy in the hottest months,” says Bushong.
But energy savings are just part of 888 Boylston Street’s sustainability profile. A state-of-the-art rainwater harvest system irrigates the building’s green roof, which is populated by native plants and beehive colonies. The vegetation reduces the building’s heat island effect, earning LEED Sustainable Sites credits. It also absorbs carbon dioxide and diverts runoff that would otherwise enter the storm sewers.

Beyond irrigating the rooftop garden, rainwater is funneled through drainage points and sent to an underground storage tank, where environmental pollutants are removed. The water is then used in the building’s cooling tower, further reducing the amount of water used in the building’s thermal systems.

All together, rainwater provides 20 percent of the building’s total water use, and low-flow fixtures reduce potable water consumption by 44 percent. The water technologies help 888 Boylston earn LEED credits for Water-Efficient Landscaping, Water Use Reduction, and Stormwater Design—Quantity Control.

Of course, many of the building’s sustainable designs are not as apparent and not easily measured with meters.

From sustainable materials to access to alternative transportation, 888 Boylston Street takes a holistic approach to sustainability that addresses its carbon footprint and the well-being of people in and around the built environment.
“The Lives Inside”

BXP’s emphasis on going beyond energy and water efficiency to improve the lives of tenants—what the firm fondly refers to as “the lives inside”—aligns with LEED’s progressive benchmarks for sustainable design.

In 888 Boylston Street, the developer achieved nearly every available LEED Indoor Environmental Quality credit, including Increased Ventilation; Outdoor Air Delivery Monitoring; Low-Emitting Adhesives, Sealants, Paints, and Flooring; Thermal Comfort—Design; and Access to Daylight and Views.

With 100 percent fresh air circulating throughout tenant spaces, 888 Boylston is well ahead of the curve; the typical building’s HVAC system uses around 75 percent stale (recirculated) air. By comparison, the typical building’s HVAC system uses around 75 percent stale (recirculated) air.

FXFOWLE also designed biophilic elements—features that improve occupants’ visual and physical access to nature and the outdoors. In addition to a rooftop amenity space, there are two common-area living walls: 13-foot displays of plants that grow beneath a flood of incoming natural light. To increase the amount of daylight in the building—and increase views of the Charles River and the outdoors generally—888 Boylston’s designers sought more than just a high window-to-floor-area ratio. Floor-to-ceiling glass creates a “vision zone” of more than 13 feet—145 percent larger than the typical building’s window views. On the north side, where direct sun is less abundant, upward curving glass offsets the deficiency and allows more light to penetrate to the building’s interior.

The architects also eliminated interior columns that could impede occupants’ views of the outdoors, meaning 120-foot clear spans and a direct line of sight to the outdoor environment in 90 percent of regularly occupied areas. And every tenant’s space includes a unique floorplate that can be converted to an optional “skygarden,” says Ilana Judah, FXFOWLE’s director of sustainability.

“If the tenant decides they want a common lounge space, they can essentially have a balcony within the thermal envelope of the building,” says Judah. “The curtain wall would have an operable element to create a semi-outdoor space when the weather is nice.”

The immediate result of these design choices is a more pleasant indoor environment for workers and retail customers alike, which could have a significant and measurable impact on each tenant’s bottom line.
There are two common-area living walls—13-foot displays of plants that grow beneath a flood of incoming natural light. The interior design choices result in a more pleasant indoor environment for workers. Photo: Anton Grassl/Esto
That’s according to a 2015 study by Harvard University titled, “The Impact of Green Buildings on Cognitive Function.” Researchers at Harvard’s Center for Health and the Global Environment found that workers in indoor environments with low levels of volatile organic compounds (VOC) and high levels of circulating outdoor air performed 101 percent better on cognitive function tests than workers in conventional workplaces. That boost in cognition can mean as much as a $6,500 increase in productivity per worker per year.

“Because this study was designed to reflect indoor environments encountered by large numbers of people every day, these findings have far-ranging implications for worker productivity, student learning, and safety,” the study concluded.

And the benefits of 888 Boylston Street’s sustainable features don’t stop at the building’s envelope. The site itself is “the last piece of the Prudential complex puzzle,” says Judah, so FXFOWLE focused on redesigning a central plaza that had been disengaged from the sidewalk below. The new pedestrian-friendly plaza features ample green space for tenants and visitors, landscaped bioswales, lighting elements, and several new retail entryways at street level. A redesigned and expanded entryway to the Prudential Center provides additional pedestrian access.

Getting to and from 888 Boylston is also made easy thanks to transit-oriented design. The site is located near three subway stations, and tenants have access to onsite bicycle racks and shower facilities, meaning workers can ditch their cars for more sustainable forms of transit. All together, these outdoor sustainable design features help 888 Boylston Street achieve LEED Sustainable Sites credits for community connectivity and alternative transportation, and significantly reduce the development’s impact on its urban landscape.

“A Living Laboratory”
Achieving LEED Platinum requires both holistic vision and holistic processes. To ensure that green designs yield green outcomes and savings, Boston Properties considers every link in the chain, from design to construction to operation and maintenance.

For 888 Boylston Street, that meant early and ongoing meetings between the developer and the project’s architects, engineers, and construction crews. As a speculative office building, tenants are also links in that chain. So, Boston Properties includes information in its tenant guidelines to help companies realize peak energy efficiencies and utility savings.

But while Boston’s most sustainably designed building is officially complete and has achieved LEED Platinum, Boston Properties sees 888 Boylston as an ongoing opportunity to foster greater sustainability in its home city. The firm uses the building as a living laboratory, hosting educational tours for architectural students and universities’ sustainability departments. The development team is also continually measuring and studying the building’s data feeds, looking for new ways to innovate and advance sustainable design in Boston and beyond.

Not every developer is taking that same route, but it’s not the first time Bostonians have led the charge.

“Sustainability means long-term prosperity—which is the only direction for Boston,” says Myers.

888 Boylston Street, Boston

SUSTAINABILITY FEATURES

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The city of Boston is working with outside agencies, private businesses, and area universities to use data to improve quality of life for residents.

WRITTEN BY CALVIN HENNICK
In 2007, Eric Gordon, the founding director of the Engagement Lab at Emerson College in Boston, partnered with another professor from MIT, William Mitchell, to speak to the Boston Globe about what the city might look like in 10 years. The resulting article, titled “See the Future,” contained more hits than misses. Although commuters don’t use swipe cards to check out stackable rental cars, they can, in fact, use their smartphones to track public transit vehicles, look up nearby restaurants, and check into physical locations that their friends can follow on social media.

Today, Gordon is hesitant to give an encore fortune-telling performance. “I think I’m older and wiser now,” he jokes. But, Gordon says, one need not be a futurist to see that data-driven solutions are becoming more and more prominent.

“The data of the physical objects and the places around us will be accessible to us in a more ready fashion,” Gordon says. “Every object, every person, the movements of objects and people—all of that leaves a data trace. What I am most interested in, what I think is a positive development, is the ability to track environmental conditions within cities, the ability to look at water levels and air quality, and what that can mean for everyday decision making. I think that stuff is extraordinary, and I think we’re going to see that more and more, especially as Boston deals with needing to adapt to climate change.”

Over the past several years, the IT and government sectors have buzzed about “smart cities”—a term used to describe municipalities that draw on data-intensive solutions (with the help of sensors, mobile apps, and other IT tools) to improve operations and better serve their citizens. In Boston, city departments are partnering with outside organizations to incorporate data into public life—and especially into public planning—like never before.

Already, the city’s BOS:311 mobile app allows residents and visitors to report nonemergency issues like potholes and graffiti. With the ParkBoston app, motorists can skip fishing for quarters, and instead pay for parking with their smartphones and receive alerts when their meters are about to expire. Other city apps allow Bostonians to “adopt” a fire hydrant to shovel out in the winter, to track their children’s school buses, and even to better plan for trash pickup.

Much of Boston’s “smart” work, however, is centered on ways to improve the city in the years to come. Officials are gathering data—and brainstorming new ways to gather more in the future—to inform plans that they hope will prepare the city to cope with climate change, deliver utilities more efficiently, and transform the city’s streets to make them safer and less congested.

Nigel Jacob, co-founder of the Mayor’s Office of New Urban Mechanics, says that city officials are interested in data-powered solutions not for the sake of whiz-bang mobile apps that dazzle journalists and tech bloggers, but for the tangible impact those solutions can have on residents’ lives. New Urban Mechanics bills itself as a “civic innovation incubator and research and development lab” within City Hall, and yet Jacob eschews the language of “smart cities,” instead preferring to discuss specific solutions and the ways that people interact with them.

“A lot of the products that are built with that [smart cities] concept in mind are about efficiency only,” Jacob says. “It’s ‘faster, better, cheaper,’ which obviously is not a bad thing. But they don’t really have anything to say about humans or human behavior.”

“It suggests to me that those technologies are separate from the rest of the city,” Jacob adds. “That doesn’t make a lot of sense to me. We would rather lead with an urban agenda that is enhanced through technology. That’s how we’re thinking about the future of Boston.”
Freedom to Fail

Kari Hewitt, director of sustainability for the professional services firm VHB, says that, even if local officials shy away from the phrase “smart cities,” Boston is a leader in the area, due to its people-centered approach, its willingness to experiment, and its partnerships with outside organizations.

“They’re one of a growing number of cities that have an open data platform,” Hewitt says. “One of the things I appreciate about the way that Nigel and others are approaching this is, they’re not just in the game of adopting new technologies for the sake of new technologies. It’s not about making a big splash. They want ideas that are going to better help them serve the needs of the community.”

“The existence of New Urban Mechanics is particularly innovative for the city,” Hewitt adds. “Their whole purpose is to test new things to improve the city, to be okay with failures, and to work with other departments to leverage the things that are working well.”

Indeed, Jacob sees failure as central to his office’s mission. “In local government, failure is generally not much of an option, but that’s largely because there has been no way of managing risk,” he says. “If someone wants to do something new, they’re often afraid of what will happen if it doesn’t work. So if you’re a mid-level manager, and you have a new idea for something, you may not want your department or your budget attached to it, because if it fails, you’ll get an ugly phone call from the press. We see that as very much our job.”

This attitude has resulted in a spirit of playfulness and experimentation in city initiatives. For example, a public art project called Pulse of the City placed five solar-powered, heart-shaped devices around Boston—each equipped with handles that measured participants’ heartbeats and then played music in sync with their pulse—as a fun way to start conversations about public health. The Boston’s Safest Driver competition used a smartphone app to track safety metrics, which resulted in a 47 percent reduction in phone use while driving and a 35 percent reduction in speeding for the top quartile of users. The city has also explored dynamic pricing for parking, an app that collects data on street bumps, side guards on public works vehicles to reduce risks for cyclists, and solar-powered park benches that charge mobile devices and collect environmental data.
Climate Readiness

Being “smart” is more than running data through mobile apps that give users real-time information. It also involves planning for the future. With its “Climate Ready Boston” report, released in December 2016, the city has compiled and analyzed all of the best available data on the likely impacts of climate change, and created a 300-page document that lays out the city’s vulnerabilities and how to address them.

“Through this process, we identified $80 billion in assets that will be in the FEMA floodplain by the end of the century,” says Austin Blackmon, chief of environment, energy, and open space for Boston. “If you annualize the risk for the severity of the storms that we could anticipate, by the end of the century the annualized damage would be about $1.4 billion. That’s in today’s dollars, against a budget of $3.1 billion for the entire city. That really puts in perspective the size of the challenge that we’re facing.”

The report breaks down vulnerabilities and potential solutions by neighborhood, going into great detail about specific assets in different parts of the city and how to protect them. In the Charlestown peninsula, for example, near-term impacts are likely limited to a few water-adjacent and low-lying pockets, the report notes. But the report’s writers predict that significant flooding is likely in the neighborhood later in the century.

By the 2050s, the report says, the city will need to address two key locations: North Charlestown, where a flood entry point exists near I-93, and the new Charles River Dam, where future overtopping and flanking is a concern. “We need to start thinking through right now how we’ll protect those different neighborhoods, particularly in some of the neighborhoods that are going to be impacted sooner rather than later,” says Blackmon.

This fall, the city will kick off a data-driven initiative called Carbon Free Boston—an effort to find cost-efficient ways of hitting the city’s goal of being carbon neutral by 2050.

Smart Utilities

In partnership with the Boston Planning & Development Agency, the city is studying how to improve the way public utilities are maintained and delivered. In particular, the organizations are seeking to address two key issues: the stifling of innovation due to the lack of an integrated utility planning framework, and business downtime and inconvenience stemming from repetitive street openings related to utilities.

In a 2016 study, the planning and development group explored the potential for local energy generation, district energy, microgrids, and utility corridors.

Blackmon says that district energy—a system that supplies thermal energy to multiple buildings via underground pipes—could not only reduce the amount of building space dedicated to utility systems, but could also make the city more resilient by decreasing the number of systems that need protecting.

“If you have an area where you have ten buildings, instead of having to make those 10 boilers all resilient in each building, you could have them centrally located, and have one piece of centralized infrastructure and make the investment in making it more resilient,” he says.

“We really used this planning project as a means of getting all the actors involved in this type of process to think comprehensively,” says Travis Sheehan, a senior fellow with the planning and development group. “That was our big win. We found allies in industry that will help us champion these types of resiliency investments. Now, we are interested in partnering with the private sector to understand what the governance and financial vehicles are to actually getting them built.”

Already, Boston—along with Massachusetts as a whole—is a national leader in energy efficiency. In both 2015 and 2017, Boston topped the list of all U.S. cities on the City Energy Efficiency Scorecard published by the American Council for an Energy-Efficient Economy.
Elevated Mechanical Systems
Solar Panels & District Microgrids
Climate Ready Zoning
Adaptation as a Tool for Economic Development
Small Business Preparedness Program
Elevated First Floor
Resilient Building Design
Green Infrastructure Bioswale
District Scale Flood Protection
Potential Harbor Barrier Protective & Floodable Waterfront Park
A Climate Ready Boston
CLIMATE READY STRATEGIES
Adaptable buildings, reliable transit, resilient infrastructure, and energy and other critical systems.

- Adapted Buildings
- Resilient Infrastructure
- Prepared and Connected Communities
- Protected Shores

Education/ Engagement Initiative

Potential Harbor Barrier

District Scale Flood Protection

Temporary Flood Barrier

Protective & Floodable Waterfront Park

Expanded and Maintained Urban Tree Canopy
Penni Conner, senior vice president and chief customer officer at Boston-based Eversource Energy, says the high ranking is partly a result of data-driven programs that help identify potential sources of large energy savings. At the 200 Clarendon skyscraper alone (still known to most Bostonians by its former name, the Hancock Tower), operators reduced the building’s annual energy usage by 3 million kilowatt-hours due to changes stemming from data analysis.

“In the past three years, we’ve saved enough energy [statewide] to equate to [a] 750-megawatt power plant,” says Conner. “It is significant, what we’re doing here. That is driven by industrial and commercial partnerships, and it requires constant innovation.”

Streets of the Future

Transportation represents a unique opportunity—and unique challenge—for cities embracing “smart” solutions. On the one hand, private companies (rather than cities) are very likely to produce the technology that will most dramatically transform the ways people move through urban areas in the coming years. But on the other hand, the streets and sidewalks are publicly owned, and cities have a huge role to play in shaping the policies that will determine which solutions will best support both residents and the municipality.

“The reason we need to be active in these areas is that we know there are things that our residents want, and it’s important for us to explore new ways of being able to achieve that,” says Chris Osgood, Boston’s chief of streets. “Our role is to allow for experimentation, and to help shape that experimentation toward the things that our residents most want.”

Boston’s work around “smart” transportation solutions includes both aggressive experimentation and deliberate long-term planning. In addition to testing dynamic pricing models, the city is looking to equip traffic signals with sensors and tools that will automatically adjust stoplights according to traffic flows, and has dedicated space for the testing of autonomous vehicles. At the same time, officials are using data to plan out how these emerging tools will be incorporated over the span of decades, as evidenced by the city’s “Go Boston 2030” plan.

The plan envisions a future in which more people commute via environmentally friendly modes of transportation that would also reduce congestion. Public transit use, according to the plan’s “aspirational” goals, would rise by one third, while bike commuting would quadruple, walking would increase by nearly 50 percent, and solo driving would drop by half. In the plan, the city takes ownership over metrics that previously might have been considered simple, unalterable facts of life—for example, by adopting a goal to shrink commute times by 10 percent.

While autonomous vehicles are widely predicted to have an enormous impact on the way people move through cities in the coming years, the technology also represents a bit of a question mark. Driverless cars have the potential to reduce or even eliminate traffic fatalities and injuries, but they might also encourage sprawl and congestion and displace workers. And, of course, these vehicles pose unknown safety risks until the technology
powering them is proven and mature. Boston is proactively addressing these issues by making space in the South Boston Waterfront district available to three autonomous vehicle companies for testing.

“It’s been a great partnership,” says Karl Iagnemma, chief executive officer at nuTonomy, a software company for driverless cars that has been testing its products in Boston. “It’s been very positive. I believe it’s been a two-way street in terms of the benefits. We’ve been able to improve our software, and we’ve shared a lot of valuable information and learning, so [the city] can be thoughtful about how [the technology] should be regulated in the future. I see this as a really nice success story.”

Osgood says that the city is being careful to consider all likely impacts of new technologies, rather than simply jumping to adopt flashy technologies that might benefit wealthy Bostonians at the expense of others. This balance can be more complex than it first appears. While improvements to downtown driving and parking will disproportionately benefit affluent residents and suburbanites, Osgood notes that those improvements may also reduce congestion, which would benefit people who rely on public buses.

“One of the things that we’ve been very interested in is to really understand the impact [changes have] on businesses, on residents, and on people who are looking to go in these areas,” Osgood says. Through rigorous testing, and also through resident surveys and interviews, the city continues to collect the thing that will help it to answer those questions: more data.

Far left: Penni Conner is the senior vice president and chief customer officer at Boston-based Eversource Energy. Left: A future in which more people commute via environmentally friendly modes of transportation is a major goal.

Smart Cities Across the Country

All across America, cities are using big data analytics to improve safety and quality of life for residents.

New Orleans: The city’s Office of Performance and Accountability looked at Census Bureau data to identify city blocks most likely to contain homes without smoke detectors. The fire department then targeted those areas for its smoke detector distribution program.

Chicago: Using 11 different variables, the city’s Department of Innovation and Technology developed an algorithm to help the city’s three dozen health inspectors prioritize Chicago’s more than 15,000 food establishments. The new system has resulted in a 15 percent increase in the number of critical violations found.

Kansas City: Sensors on streetlights along a 2.2-mile light-rail line gather information about traffic and available street parking. Residents can go online for real-time information about traffic volume and open parking spots.

Louisville, Ky.: Through a public-private partnership, the city provided more than 1,000 sensor-equipped asthma inhalers to residents, helping to gather data on where poor air quality is triggering breathing problems.

Mobile, Ala.: Building code inspectors used Instagram to take photos of blighted buildings and track the properties on a map—allowing them to create an inventory of 1,200 blighted properties in only eight days.

Washington, D.C.: In two areas of the capital, the city plans to deploy sensors that will gather information on waste management practices, with the goal of better tracking and enhancing the waste management process and reducing carbon emissions from unnecessary trash pickups.
Functioning bathrooms are taken for granted in the United States, but in many parts of the developing world, sanitation infrastructure is often patchy or nonexistent, and relieving oneself can be a matter of life and death.

“The basic problem is that all over the world there are hundreds of millions of people who don't have access to a safe toilet,” says Rob Zimmerman, director of WASH (water, sanitation, and hygiene) and sustainability for Kohler, the Wisconsin-based plumbing fixture company and Platinum level member of the U.S. Green Building Council (USGBC). “The alternative is that people openly defecate.”

In many parts of the world, the familiar method of using water to transport waste through a sewer system to a treatment plant isn't feasible because of lack of infrastructure. In places like India, for instance, flushing a toilet might discharge the human waste into an open channel or ditch outside the building instead of to a wastewater treatment facility. This leads to countless health, economic, and environmental problems, from spreading devastating infectious diseases to polluting water supplies.

“The question is, how do you create a gracious toileting experience—or even an acceptable toileting experience—in remote locations or rapidly urbanizing areas without infrastructure but millions and millions of people?” Zimmerman says. “Sanitation really affects all aspects of human development and economic development, so in places without proper sanitation, it's clear a different model is needed.”
That's why Kohler is busy working on a different approach, one that doesn't rely on plumbing infrastructure to deliver a clean, safe, bathroom experience. In India, the company is currently testing prototypes of a standalone Closed-Loop Advanced Sanitation System (CLASS), which is supported through a collaboration with the California Institute of Technology and a grant from the Bill & Melinda Gates Foundation through its Reinvent the Toilet Challenge.

CLASS is "a self-contained, turnkey wastewater treatment system in a box," says Mike Luettgen, senior principal engineer for Kohler, who is leading the technical aspects of CLASS. The box in question is about six feet wide, nine feet long, and six feet high. It is connected to all the toilets in an apartment building, and powered using the local utility grid. Wastewater enters the box, gets treated until it's safe, hygienic, and aesthetically acceptable, and is reused in the same toilets, over and over again.

So how does it work?
"That's kind of where the magic comes in, I suppose," Luettgen says. "We don't like to think of it as magic, but good science."

The system treats the water electrochemically: Water goes into an electrolysis cell, which breaks down the waste products in the water into compounds that off-gas, such as nitrogen and carbon dioxide. In addition, some of the chlorides that are naturally present in urine break down, become chlorine gas, and dissolve, disinfecting any bacteria that may still be in the water.

The box is designed to handle 20–25 people living in five or six apartments. Ideally, it would need to be stocked with water only once—rooftop water tanks are
common in the developing world—since “people tend to bring more water into the restroom than they leave with, so to speak,” Luettgen says. If anything, excess water might need to be siphoned off occasionally.

Three prototypes were installed at apartment buildings in India in 2015. The team installed the systems in modern apartments that were already connected to large-scale water treatment plants that could act as backups should the systems fail or need to be taken offline.

“It’s still experimental,” Luettgen says. “We’re still working with prototypes, but we’re working with real people also, so we need to be careful about how much inconvenience we ask them to endure.”

Kohler has also partnered with a research firm to gather feedback from residents, which has so far been positive. “In an environment like India, where water is in short supply, droughts occur often, and water shortages are fairly frequent, they like the idea of reusing water,” Luettgen says.

But the Kohler team has also discovered that how things work in the lab isn’t always how they work in real life. “We’ve encountered many challenges we didn’t anticipate,” Luettgen says. “Things get flushed down toilets you might never imagine…Closed loop is ideal from a water standpoint, but it creates issues when people put things in there they shouldn’t!”

For instance, although toilet paper doesn’t create a problem because it breaks down easily, the Kohler team has discovered that some people in India often flush newspaper down the toilet. What’s needed next are devices to remove other items that get flushed along with water, human waste, and toilet paper.

Another issue is water quality: The source water in the test region is very mineral heavy, and although the CLASS electrolysis system is an extremely effective water softener, all those minerals are precipitating into the treatment tanks, leading to clogs. That’s why two of the three prototype systems are currently being rebuilt to deal with these issues. They should be back online within a couple of months. “That’s the point where it becomes grinding out one improvement after another,” Zimmerman says.

Its partner in making those improvements is Caltech, where the treatment technology was first developed. Kohler first became involved with Caltech’s work as an industry partner, bringing to life the technologies developed at the university. Now, Kohler is a Gates Foundation grantee itself for the CLASS project and has its own design team, but still collaborates with Caltech to troubleshoot problems unique to the Indian market, says Michael R. Hoffmann, Ph.D., Theodore Y. Wu Professor of Environmental Science at Caltech.

“I’m happy that Kohler got involved,” Hoffmann says. “They want to see a reasonable business in the future.”

Indeed, making CLASS economically viable is one of Kohler’s main goals, in addition to ensuring that the system works on a technical level. “The idea is to develop a solution around which an economic ecosystem can develop and thrive,” Luettgen says.

That means everyone along the system’s entire value chain can make money on it—including the equipment manufacturers, installers, and maintenance workers—and still present a better and possibly cheaper alternative for the end user.

“If it’s done as a donation, charity or nonprofit, there’s a limit,” Zimmerman says. “If there’s a market where people can make a living from getting involved with this, then it actually has a chance at becoming scalable and becoming a new normal.”

To that end, the Kohler team also believes there are potential applications for CLASS in the developed world, too, which is why they’ll be talking about it this year at Greenbuild.

“It’s your own, onsite waste treatment system with water recycling, so you can’t get much greener than that,” Hoffmann agrees. “It’s pretty much as green as you can get.”

Top: Rob Zimmerman is the director of WASH (water, sanitation, and hygiene) and sustainability for Kohler. Above: Mike Luettgen, the senior principal engineer for Kohler, is leading the technical aspects of the Closed-Loop Advanced Sanitation System (CLASS).
“My family has been in the lumber business for four generations and we’ve been committed to sustainable forest management since 1940. I’ve been a lumber grader, a forester, a management trainee and a project specialist. As a land-based company, we’re committed to the places where we operate. By nurturing the forests and communities that provide our natural and human resources, we intend to serve our customers for generations to come.”

Terry Collins, Forester, Collins Almanor Forest

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We Care About Places
Lately, it seems we are deluged with bad news about climate change and the rate at which the Earth is warming. Science tells us that humans are accelerating the process, and observed changes ranging from lower snow totals, glacial melt, increased extreme weather events, wildfires, drought, and rising sea level show how climate change poses risks to the communities and places we care about. These predictions threaten our lives and way of life made real most recently by the three hurricanes that devastated areas of the U.S. and its territories this fall. While it’s hard to pinpoint the effect of climate warming on any specific weather event, scientists believe storms and flooding will be more extreme and frequent.

For some, climate change may seem overwhelming and detached from everyday life. For others, the prospect of taking action comes with worry; what will these changes mean for me and my business? How can I act without hurting my livelihood or my family’s quality of life?

The reality is that we have solutions—and increasingly, they save money and deliver valuable co-benefits.

Solutions Front and Center at COP 23
Solutions are the focus of the 23rd annual Conference of the Parties to the UN Framework Convention on Climate Change (COP 23), taking place in November in Bonn, Germany. COP 23 marks the second meeting since the conference achieved the first-ever global consensus for climate action through the Paris Agreement, which remains a groundbreaking accomplishment. With Paris, 180 countries acknowledged that humans are a cause of climate change and that collective action should be undertaken to keep the planet’s warming to well below 2 degrees Celsius.

This will also be the first COP since the United States government announced its intent to withdraw from the agreement. There is tangible evidence of this: There will be no U.S. Center at the Conference for our country’s scientists, engineers, businesses, and policy makers to share knowledge and exhibit leadership. The U.S. government will be present at a reduced capacity, and its influence in the agreement is uncertain.

What’s exciting is that across the U.S., governors, mayors, and business leaders are working hard to fill this void and demonstrate progress. More than 2,300 leaders from cities, states, businesses, and universities, representing more than 127 million Americans and $6.2 trillion of the U.S. economy, have signed the We Are Still In statement, pledging to “pursue ambitious climate goals, working together to take forceful action and to ensure that the U.S. remains a global

Climate Action: Time to Make It Real
A look at COP 23 and action items to combat climate change.

By Elizabeth Beardsley, USGBC Senior Environmental Policy Counsel

The Park Shops building on the north campus of NC State University is a historic, three story masonry structure originally constructed in 1914 now transformed into a 21st century, multi-functional building that exemplifies reuse and architectural adaptation.
Adding to this, a bipartisan coalition of 15 states and territories, representing 40 percent of the U.S. GDP, have joined together in the U.S. Climate Alliance, pledging to meet their share of the Paris Agreement. Significantly, they are investing and adopting policies to realize these pledges, from building codes to renewable portfolio standards.

The U.S. Green Building Council (USGBC) is participating in the U.S. Climate Action Pavilion—sponsored by the We Are Still In coalition—where state, city, and private sector entities will affirm their commitment and share specific actions to accelerate the U.S. low carbon economy. Engaging in side events, representing our members and our mission, and collaborating with partners, USGBC’s goals at COP 23 are to advance solutions, and to reassure the party-nations that U.S. businesses, states, cities, and individuals remain dedicated to doing our part.

**Meaningful Actions You Can Take Right Now**

Now is a great time to consider the ways you can contribute to the collective climate action effort. Consider the menu of options below to help support a local, regional, and global transition to a low carbon society.

1. **Measure Up**
   The starting point for improvement is understanding where you are. Measuring the carbon contribution of your project, building, product, or portfolio is a crucial exercise. For operations, tools like Arc and ENERGY STAR can help benchmark performance and prioritize improvement. For projects, in addition to energy-carbon modeling, whole building or product life cycle analysis for carbon is an underutilized opportunity to support decision making, and tools are increasingly available. If a comprehensive analysis is out of reach, consider what you can. This exercise alone can identify opportunities to reduce impact, such as selecting local materials that avoid carbon-intensive transportation or selecting products that sequester carbon. For building-scale projects, the Carbon Leadership Forum offers resources on life-cycle carbon assessment; for operations-scale, the Carbon Disclosure Project has guidance on measuring and disclosing emissions of portfolios.

2. **Make a Commitment**
   Make a company commitment to climate action or adopting carbon emission reduction targets. According to We Are Still In, nearly half of the U.S.’s largest companies have at least one climate or clean energy target. Interest in climate commitments has risen in the building sector too. For example, many diverse companies have joined the Building and Real Estate Climate Declaration that USGBC initiated with Ceres and the Carbon Leadership Forum.

Green rooftops provide extensive environmental air quality benefits through the ability to absorb not only greenhouse gases such as carbon dioxide, but also pollutants and dust.
With the Paris Agreement in force, commitment platforms are gaining steam and specificity. The Climate Group’s RE100, under which companies commit to 100 percent renewable energy, is attracting businesses from all sectors including tech, finance, and investors. EP100 is a similar initiative seeking commitments to doubling energy productivity. For those in the design field, consider the AIA 2030 Commitment or the Structural Engineers 2050 commitment. The nonprofit Science Based Targets also supports companies in setting greenhouse gas emission reduction targets in line with climate science.

3. Use Less
The concept is simple: Less consumption reduces your carbon footprint. Look at ways to use space effectively. “Use less” extends to land as well: Think about core strategies of infill and densification over greenfields. Can you say Yes in My Backyard (YIMBY)? Resources are available from organizations such as Congress for the New Urbanism and the American Planning Association.

   The corollary to using less is that reuse at all scales is beneficial. Put this into action by working with an existing building, rather than tear-down or new construction. Some estimate embodied carbon savings of 50 to 75 percent by renovating rather than building new. Reuse, and use recycled materials and products where possible, to avoid the energy consumption required to create new materials and those associated with transport and disposal of discarded materials.

4. Go Broader and Deeper
New construction and major rehabilitation can achieve deep energy efficiency and may have the opportunity to become net-zero carbon or close to it. New Buildings Institute, Rocky Mountain Institute, and USGBC offer lots of resources to help you get there. Key steps include reducing load and demand; meeting loads efficiently; and producing renewable energy on site.

   Explore the options to reduce carbon impact from your project and look beyond energy in operations. Examples include enhanced refrigerant management and measures that directly reduce the use of potable water, nonpotable water, or raw materials.

5. Store It
Carbon, that is. There are now more ways than ever before for your project to provide long-term carbon storage. Consider the many Greenbuild exhibitors that bind carbon, such as cement substitutes and siding. Check out the Greenbuild Expo floor, showcasing more of these innovations each year.

   Beyond the building wall, managing the site and landscape can also help. Avoiding soil and tree loss and disturbance helps reduce carbon release to the atmosphere; green roofs, new trees, and living walls can mitigate urban heat islands, thus reducing building cooling needs, and potentially sequestering carbon.
6. Maximize Your Project's Positive Influence
Pay attention to how your project or building influences choices for food and transportation. Those non–energy categories really do influence the total carbon impact of a building on the community.

Stopping food waste in the U.S. could become a significant solution, cutting carbon emissions associated with food production, distribution, and waste disposal.

According to National Geographic, if food waste were a country, it would be the world's third largest emitter of greenhouse gases. Leading cities are starting to offer municipal food composting, and private companies are starting to serve restaurants and commercial entities—leading to benefits like new jobs and industries, and developing high-quality fertilizer. You can design your spaces to make food composting easier, purchase locally produced crops, and adopt responsible policies for catering. Check out TRUE Zero Waste certification to get started.

Transportation is also a key factor. In the U.S., reducing carbon emissions from transportation remains a big challenge. In Massachusetts, for example, after implementing policies over the past decade to drive aggressive energy efficiency and renewable energy uptake, the state now identifies transportation as its biggest hurdle to decarbonizing.

USGBC has long recognized the role buildings can play in influencing employee transportation. Siting decisions are important, and company support for alternative transportation can help sway employee choices. Building managers and companies can support availability and convenience for alternatives—with electrical vehicles charging in parking facilities, secure bike storage and showers, shuttles to mass transportation, and public transit subsidies.

7. Engage with Others and Get Inspired
Your project, building, or company can have a big influence on employees and the supply chain. Start a conversation with your peers, suppliers, and customers. Understand where they stand on climate mitigation and find areas of mutual interest and opportunity. Learn what your city is doing and support climate-smart policies.

Many climate-aiding strategies have big co-benefits—for local economies, water resources, public health, occupant comfort, and saving money. Find those touchpoints that resonate, and hone your elevator speech on what you're doing and why. For tips, see EcoAmerica’s guide to effective climate change communication.

Challenge yourself to learn something new through a course, podcast, or book. Renew your arsenal of strategies. Talk to others and see the issue through their eyes; it is sure to make you think. Ask them to join you in taking one step toward climate mitigation, whether personally or as a company.

Above all, do something. Make it personal, because ultimately it is. You are part of the solution.
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Dr. Atyia Martin is a Certified Emergency Manager (CEM) with a diverse set of experiences in public health, emergency management, intelligence, and homeland security. In 2015, Mayor Martin J. Walsh appointed her as the Chief Resilience Officer for the City of Boston as part of the 100 Resilient Cities initiative pioneered by the Rockefeller Foundation. In this role, she is responsible for leading the development and implementation of Boston’s Resilience Strategy. Boston will focus on advancing racial equity as the foundation of the Resilience Strategy process to increase our shared ability to thrive after emergencies.

What is your greatest fear? Not leaving a legacy for my children to build upon, so they do not have to start from scratch. Which living person do you most admire? My husband Roy Martin. What is your greatest extravagance? My photography. What do you consider the most overrated virtue? Acceptance (I am no longer accepting the things I cannot change. I am changing the things I cannot accept). What is the quality you most like in a person? The ability to see themselves as part of something greater. Which talent would you most like to have? Engineering. What do you consider your greatest achievement? My family and our culture.

If you were to die and come back as a person or a thing, what would it be? Myself. What is your most treasured possession? My family. What is your favorite occupation? Entrepreneur. What is your most marked characteristic? Connecting with other people. What do you most value in your friends? Mutual support to accomplish personal and professional goals. Which historical figure do you most identify with? Harriet Tubman. Who are your heroes in real life? My husband and my great-grandmother (she had 13 children and was a nurse and evangelist). What is it that you most dislike? Passive aggressiveness. What is your motto? Most people do not recognize opportunity because it comes disguised as hard work.
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