

75
YEARS

Land Lines

QUARTERLY MAGAZINE OF THE LINCOLN INSTITUTE OF LAND POLICY

JULY 2021

Aerial Views of Urban Agriculture
Integrating Land and Water Planning
The High Costs of High Rent
New Colorado River Basin Map

Land Lines

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THE LINCOLN INSTITUTE OF LAND POLICY

seeks to improve quality of life through the effective use, taxation, and stewardship of land. A nonprofit private operating foundation whose origins date to 1946, the Lincoln Institute researches and recommends creative approaches to land as a solution to economic, social, and environmental challenges. Through education, training, publications, and events, we integrate theory and practice to inform public policy decisions worldwide.

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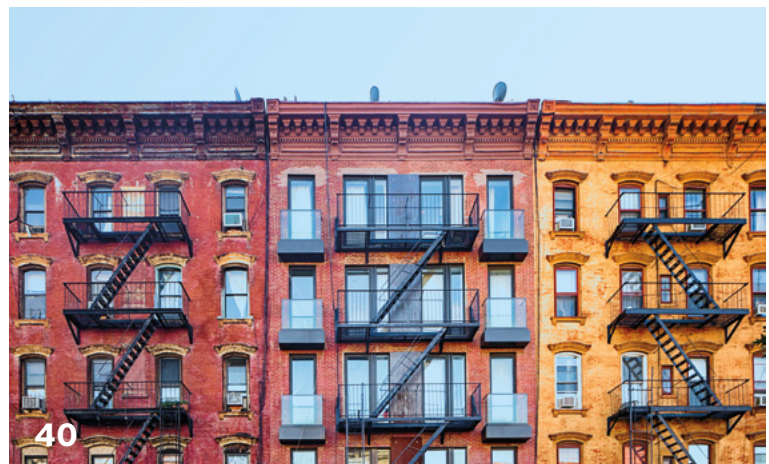
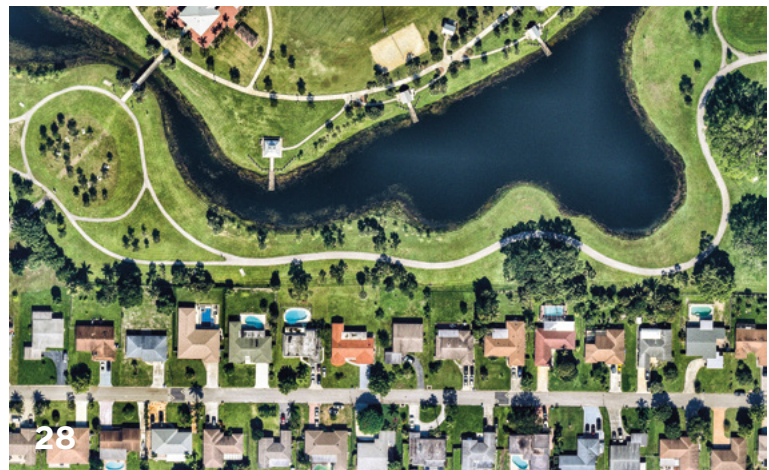
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LINCOLN INSTITUTE
OF LAND POLICY

Contents

FEATURES



14 Urban Abundance

An Aerial Survey of Metro Boston Reveals a Regional Food System on the Rise

From freight farms tucked under interstates to community gardens in vacant lots, new models of regional agriculture are increasingly visible in the metro area around Boston, Massachusetts.

By Alex MacLean

28 Bridging the Divide

Why Integrating Land and Water Planning Is Critical to a Sustainable Future

In the face of drought, floods, and population growth, planners and water managers are emerging from their traditional silos—and finding ways to support sustainable growth while protecting resources.

By Heather Hansman

40 Excerpt: *Through the Roof*

What Communities Can Do About the High Cost of Rental Housing in America

As the housing affordability crisis continues, local governments can take an active role in implementing solutions across a wide variety of market conditions, explains our recently published Policy Focus Report.

By Ingrid Gould Ellen, Jeffrey Lubell, and Mark A. Willis

DEPARTMENTS

2 Letters to the Editor

75th Anniversary Greetings

4 President's Message

Expanding Upon a Legacy of Learning

By George W. McCarthy

7 City Tech

Latin America and the E-Bus Revolution

By Rob Walker

10 Mayor's Desk

Sumbul Siddiqui

Cambridge, Massachusetts

By Anthony Flint

38 A Cartographic Meditation

Mapping the Colorado River Basin in the 21st Century

By Zachary Sugg

44 New Publication

Equitably Developing America's Smaller Legacy Cities



Worcester Street Community Garden, South End, Boston, Massachusetts. Credit: Alex MacLean.

75th Anniversary Greetings

We welcome letters to the editor. Letters may be edited for length and clarity. Please send your thoughts, ideas, and inquiries to publications@lincolnst.edu.



Congratulations! The 75th anniversary of the Lincoln Institute is an event to be very proud of, and the special anniversary issue of *Land Lines* (January/April 2021) tells the story excellently. I am glad the history of the Lincoln family is included. It is an inspiring story, and it helps explain the deep roots of commitment that underlie the Lincoln Institute.

— **Phil Hocker, Alexandria, Virginia**

I am originally from Cleveland. My great uncle worked for Lincoln Electric and he was the envy of the family. They took good care of their employees. What I am personally most grateful for are the annual employee picnics they had at Euclid Beach amusement park. As our whole extended family would go, it was a summer family reunion. Who'd have thought I would become a land use planner and continue benefiting from the Lincoln family in my professional life.

— **Maria Rudzinski, Senior Planner
Ontario County Planning Department,
Canandaigua, New York**

I celebrate this 75th anniversary of the Lincoln Institute of Land Policy, recognizing its great work educating professionals in Latin America about land policies that can promote the good development of the cities of our countries; I want your mission to reach the century mark and more. Greetings to all the collaborators of the Lincoln Institute, and a special one to the great teacher [Senior Fellow] Martim Smolka.

— **Jorge Gallegos Contreras, Mexico City, Mexico**

We wish to extend our most sincere congratulations on the 75th anniversary of the Lincoln Institute. It is a joyful occasion to celebrate John Cromwell Lincoln's dream. Today, the Institute's work is a great legacy for the Americas. For IFAM [Institute for Municipal Promotion and Assessment], as well as for the rest of the institutions of the Territorial Management and Human Settlement sector of Costa Rica, it has been a great honor to work with the Lincoln Institute of Land Policy in the promotion of sustainable, efficient, and inclusive urban development.

Your support in the advancement of workshops and courses for our public officials and collaborators, as well as on the important multisector dialogues and planning tools, has been of immense value . . . We wish to reiterate our support on any endeavor on which we could be of value to you. Once again, thank you for all the joint work we have done together over the past years.

— **Patricio Morera Víquez, President, IFAM
Costa Rica**

I graduated from the University of Papua New Guinea in public policy and joined the Department of Lands and Physical Planning of the government of Papua New Guinea as principal physical planning research officer. I had no knowledge of physical planning and land matters and badly needed specific training. The Lincoln Institute of Land Policy came to my rescue by sponsoring me to attend a short course on Land Management and Informal Settlement Regularization at IHS [Institute for Housing and Urban Development Studies,

Erasmus University, Rotterdam, Netherlands]. This course was the entry point for me to become a land and planning expert. I later studied for a Master's in Urban Management and Development at Erasmus University. Now I am contributing a lot to land and planning issues in this part of the globe. That's why I hold the Lincoln Institute of Land Policy before my heart. I am one of the frequent surfers of your website and regular receiver of your emails. I read most of your publications and your newsletters. I have complex land issues in my country and wish to work with your institution to help us address them. I trust you more than others.

— **Vincent Pyati**, Papua New Guinea

Congratulations on your anniversary! I'm grateful to the Lincoln Institute for your support of *Building Suburbia: Green Fields and Urban Growth, 1820–2000*. [Vice President of Programs] Armando Carbonell advised my work. May you continue to help authors whose research connects land use to social equity.

— **Dolores Hayden**, Professor of Architecture, Urbanism, and American Studies Emerita
Yale University, New Haven, Connecticut

The Lincoln Institute's longstanding commitment to promoting sound tax policy and providing annual education opportunities for state tax decisionmakers deserves to be celebrated and congratulated—cheers to the tax team admirably led by [Senior Fellow] Joan Youngman. Thank you! Here's to another 75 years of outstanding achievements attributed to a team of dedicated and innovative professionals.

— **Jill Tanner**, Oregon Tax Court (retired)
Portland, Oregon

It was lovely to see all of you in the celebration videos. [Editor's note: Our 75th anniversary video, *Life of an Idea*, is available at www.lincolninst.edu/75.] Since we first started to work with the

Lincoln Institute in the late 1990s, it has always been an organization that is evolving and growing in new ways. It was remarkable how much we did not know about Lincoln's work, which was also part of the enjoyment of watching the programs. The values that the founders made foundational to the Lincoln Institute and the work are as important if not more so today.

So glad you took time to celebrate. We look forward to supporting you in the challenges and work ahead.

— **Georgie Bishop**, President
Public Sector Consortium
Cambridge, Massachusetts

Land, the common ground we all live on, pertains to all kinds of human activities such as agriculture, urban development, and taxation. Social grievances or even upheavals often follow the unjust distribution of the benefits derived from it. It takes a man of vision and perseverance like John C. Lincoln to contribute to the endeavors in changing that fate. I am respectful of what he did for the world through the Lincoln Institute of Land Policy, which he created 75 years ago. On this significant moment of its 75th anniversary, I am pleased to offer my hearty congratulations . . . Since the creation of the ICLPST [International Center for Land Policy Studies and Training], the Lincoln Institute has played an important role in sharing its expertise and resources to help make the ICLPST a successful organization in the education of agriculture and land. Its courses benefit not only government officials and experts from around the world, but also their countries . . . To improve quality of life through various programs is our common goal. I am happy to enjoy the celebration and also anticipate our relationship to grow stronger and strive harder to better serve the world in our areas of expertise in the future.

— **Dr. Chin-chen Huang**, Chair, ICLPST Board
Deputy Minister, Council of Agriculture
Taiwan



Expanding Upon a Legacy of Learning

"The mind that is not baffled is not employed."

– Wendell Berry

OVER THE COURSE of my career, I've had the opportunity to teach in many different places and contexts, from a vocational high school on the South Shore of Massachusetts to undergraduate and graduate classrooms in New York, North Carolina, England, Italy, and Russia. Though the students and subjects have differed, one thread has emerged: teaching is the best way to learn.

There's no better way to discover the gaps in your own knowledge than by trying to convey that knowledge to someone else; no better way to understand how people absorb and act upon information than by actively engaging in that process with them. This isn't a novel concept: the Latin phrase *docendo discimus*, often attributed to Seneca, means "by teaching, we learn"; the Germans promulgated a pedagogical approach called *Lernen durch Lehren*, or "learning by teaching."

What you learn by teaching, first and foremost, is that teaching is more than a "sage on stage" waltzing into a classroom to deliver information from on high. Yes, it requires command of your subject, but it also requires being mindful and present—with an open mind, willing to experiment, and most importantly, listening in order to reframe the discussion when your words aren't landing well.

Those qualities abounded in our founder, John C. Lincoln. From the earliest days of the Lincoln Foundation, he made education and experimentation a priority. Lincoln was motivated by a fervent belief that the value of land belongs

to the community and should be used for the community's benefit, a concept he first encountered at a lecture by the political economist and author Henry George. He disseminated this idea through his own prolific writing—pamphlets, articles, even a monthly "Lincoln Letter"—and by funding educational institutions.

In 1949, just three years after establishing the Lincoln Foundation, Lincoln penned a letter on behalf of the Henry George School—whose work he funded and whose board he chaired for 17 years—to promote a 10-week discussion course based on George's work. "The course offers no ready-made panaceas or medicine-man formulas," Lincoln cautioned. "It attempts, through open discussion and stimulating analysis, to make clear the underlying causes of the problems that face the modern world and to discover the means for solving them."

There's no better way to discover the gaps in your own knowledge than by trying to convey that knowledge to someone else; no better way to understand how people absorb and act upon information than by actively engaging in that process with them.

That commitment to discussing problems and discovering solutions remains central to our mission. Though we face global challenges John Lincoln could not have foreseen, from climate change to COVID, some of the problems of his era

are all too familiar: economic inequality, soaring housing costs, social injustice, and overuse or abuse of natural resources, to name a few.

After John Lincoln's death in 1959, David Lincoln took the helm of the family foundation. It didn't take long for David to expand his father's commitment to education, providing grants to the Claremont Men's College in California, the University of Virginia, New York University, the University of Chicago, and the Urban Land Institute. A decade later, the Lincoln Foundation established the Land Reform Training Institute in Taipei, now called the International Center for Land Policy Studies and Training and still a partner of the Lincoln Institute. David and his wife, Joan, were also generous supporters of Arizona State University and other institutions.

Even as he supported education in other venues, David dreamed of establishing a freestanding organization that could conduct its own research on land policy—a place that could develop and deliver courses in partnership with like-minded institutions without being in thrall to them. The establishment of the Lincoln Institute of Land Policy in 1974 represented a bold step, a foray into the active pedagogy that powers our work today and that would, in turn, accelerate our own learning.

In the nearly five decades since David Lincoln took that leap, we have taught—and learned from—students around the world, from undergraduates grappling with the basics to seasoned

urban practitioners eager to expand their skills. We've delivered courses about land value capture and land markets in Latin America; about valuation and the property tax in Eastern Europe and Africa; about municipal finance and conservation in the United States and China; and much more. During the past decade, our courses and trainings have reached nearly 20,000 participants.

Along the way, we've learned a few important lessons. We learned, for instance, that when it comes to land policy education, critical gaps exist. As we prepared to launch a municipal fiscal health campaign in 2015, we conducted a straw poll with the American Planning Association to determine the number of graduate planning schools that required students to take public finance courses. The answer? None. To address this puzzling oversight, we developed a curriculum on public finance for planners, which we have since delivered in Beijing, Chicago, Dallas, Taipei, and Boston, in formats ranging from a three-day professional certificate program to a full-semester course for graduate students.

We've also learned that professionals working on land policy have a huge appetite for practical training, and we've learned how much people value credentialed courses. As the pandemic set in last year, our staff tried out some new virtual approaches that heightened participation and engagement. These ranged from prerecording presentations that could be viewed prior to live sessions to spreading what would have been a



The Lincoln Institute is launching its first degree-granting program, delivered in partnership with Claremont Lincoln University (CLU), an online graduate university with a focus on socially conscious education. At left, CLU's Claremont, California, headquarters. Credit: CLU.

tightly packed, in-person schedule across multiple days. In some cases, we reached more people; a virtual seminar on taxation in Eastern Europe, for example, reached 500 people instead of the 40 who would have attended in person. In other cases, we reached a more geographically diverse pool while intentionally keeping enrollment low to foster engagement and active learning. Even as we begin making plans to return to in-person learning, we have become more adept at leveraging the possibilities afforded by virtual instruction and look forward to enhancing those offerings.

This year, building on what we've learned and honoring the Lincoln family tradition of taking leaps, we're launching our first degree-granting program in partnership with Claremont Lincoln University (CLU), a nonprofit, online graduate university dedicated to socially conscious education. Together we've created online, affordable Master in Public Administration and Master in Sustainability Leadership programs, and we are working on a third option—the first Master in Land Policy in the United States—which we hope will follow soon.

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These degree programs, which can be completed in 13 to 20 months, represent a way of rethinking advanced education from the ground up. They are specifically designed for working professionals who need to gain practical skills they can implement in their daily lives, while they do their jobs. They are both comprehensive and streamlined. Lincoln Institute staff will design and deliver several courses, using real-world case studies and cross-sector analyses to tackle topics ranging from public finance to civic engagement. This fall, I'll teach a course on Urban Sustainability, helping students acquire the knowledge and skills they need to diagnose urban challenges, design interventions to make cities sustainable, and mobilize resources to implement those solutions—and I have no doubt that I'll learn a great deal along the way.

The students who enroll at CLU won't be there simply to get an advanced degree; they'll be there to explore issues, discover solutions, and become part of a national movement of lifelong learners. With the climate crisis bearing down in alarming new ways, infrastructure crumbling, and affordable housing an increasingly endangered species, public officials are facing seemingly insurmountable challenges with fewer resources at their disposal. This program will build a growing network of informed, hands-on problem solvers who can use land policy to address our thorniest environmental, economic, and social challenges.

At the Lincoln Institute, we are intent on “finding answers in land.” We don't claim to have all the answers. We are committed to finding them through our research and through collaborations with partners around the world. Through initiatives like our new CLU partnership, we will continue to teach, to learn, and to experiment—and we will seek to shed, as John Lincoln wrote in 1949, “some new, searching light on the vital questions that concern us all.” □

Learn more about the Claremont Lincoln University–Lincoln Institute of Land Policy partnership and current fellowship opportunities by visiting www.claremontlincoln.edu/lincolninstitute75.

Latin America and the E-Bus Revolution



Electric buses at a charging station in Santiago, Chile. Credit: Courtesy of C40 Knowledge Hub.

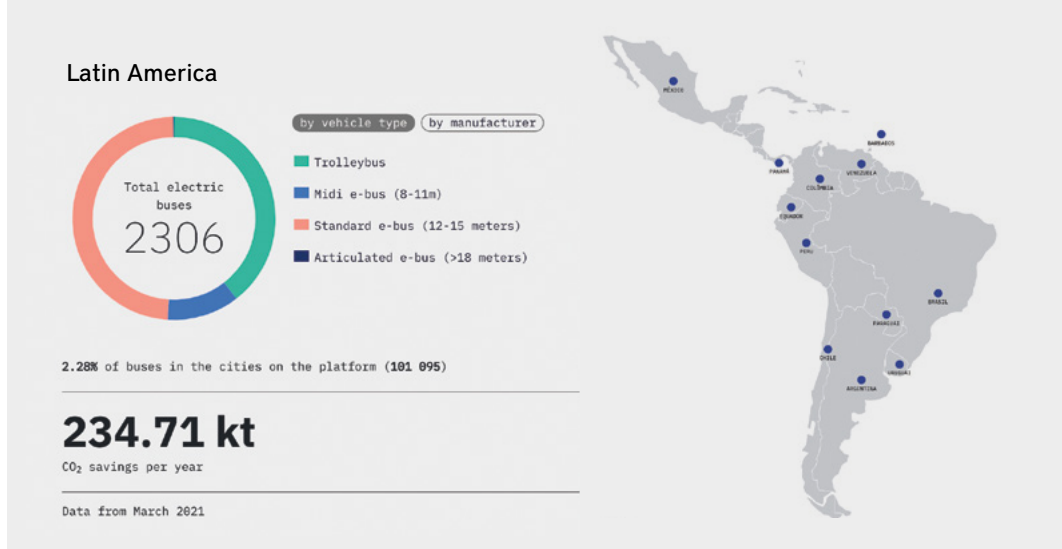
AT SOME POINT in the last few years, it was like a switch flipped: it became clear that the electric vehicle technology revolution is real and could have significant planning and land use impacts. For the last decade or so, the spotlight has often focused on how this cleaner energy alternative could power new ridesharing and autonomous vehicle schemes, or micro-mobility innovations such as electric bikes or scooters. But some of the most illuminating electric vehicle experiments currently underway involve mass transit, including trains, trolley systems, and that most humble vehicle category, the city bus.

While China is by far the global leader in building and using electric mass transit due to its state industrial policy and carbon reduction plan, Latin American cities are emerging as significant players in this growing market. By one estimate, more than 2,000 e-buses were operating in at least 10 countries across Latin America by the

end of 2020. That number is expected to rise: one analysis predicts that by 2025 the region will add more than 5,000 electric buses a year.

The push for electric buses is motivated by the urgent need to reduce the diesel emissions that cause air pollution and contribute to climate change. Widespread adoption is likely to have a significant impact, given that per capita public transit ridership is reportedly higher in Latin America than in any other region of the world.

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An online platform launched in 2020 tracks the deployment of electric buses in Latin America, calculating the annual carbon emissions saved as a result. Credit: Laboratório de Mobilidade Sustentável (LABMOB)/E-BUS RADAR Platform.

A recent report from the International Finance Corporation (IFC), a global development organization that is part of the World Bank Group, and C40 Cities, a climate action coalition, pointed to two notable examples of cities investing heavily in electric buses. Santiago, Chile’s capital city, has a fleet of more than 700 e-buses and growing, the largest outside of China. (By comparison, there were about 650 e-buses in the entire United States in 2020, although political momentum seems to be building for an investment in the sector.) Santiago is aiming for a zero-emission fleet by 2035. In Colombia, Bogotá has undertaken an ambitious effort to put more than 1,000 e-buses into service, tied to Colombia’s larger effort to cut carbon emissions 20 percent by 2030.

Both cities are using innovative public-private funding arrangements. As the IFC/C40 report points out, the majority of municipal transit systems are owned either by a public agency or by a private operator with a municipal concession of some sort. But newer arrangements “unbundle” ownership and operation—essentially using the kind of leasing strategies familiar in, say, commercial airlines (where one set of companies makes planes, and a different set leases and operates them). “Asset owners own, and operators operate,” as the report put it.

In Bogotá, for instance, the municipal transportation entity, Transmilenio, contracted

with Celsia Move, an energy-focused subsidiary of multinational conglomerate Grupo Argus, to deliver the bus fleet. In turn, Celsia Move made a 15-year agreement with Grupo Express, a separate company, to operate and maintain that fleet. As John G. Graham, a principal industry specialist in the IFC’s global transport group, explains, this unbundling makes each entity more attractive to different sets of potential investors. An owner entity can expect fixed payments, and its assets can be collateralized; an operator takes much less capital risk.

Electric buses and trains entail a much steeper up-front investment than their fossil fuel rivals—double the cost or more, by some estimates. But these recent public-private partnerships have reportedly attracted commitments from more than 15 investors and manufacturers, raising approximately \$1 billion to juice the deployment of 3,000 more e-buses in various cities. International financing in support of e-bus and other green projects across Latin America has come from heavyweights like the InterAmerican Development Bank and the Partnering for Green Growth and the Global Goals 2030 Initiative (P4G), whose initial funding came from the government of Denmark.

As Graham of the IFC points out, the underlying economics are also evolving. An electric bus can be cheaper to maintain over

time, meaning that as battery technology improvements lower that up-front expense, the so-called “total cost of ownership” over a vehicle’s lifetime should soon approach parity with internal combustion engine alternatives.

Still, finding sustainable sources of support will be critical, given that financing major transportation projects—including electrification upgrades—is invariably a challenge. One option could be land-based financing. In Costa Rica, for example, the Lincoln Institute of Land Policy has worked with policy makers to explore land-based finance options to help offset the \$1.5 billion cost of an expansion and electrification of a major train line serving the capital, San José. Throughout Latin America, notes Martim Smolka, a Lincoln Institute senior fellow and director of its Program on Latin America and the Caribbean, land value capture strategies have been used to help fund major projects, such as redeveloping former factory and industrial zones. The value capture model ensures that a portion of the increase in land values that results from municipal actions is returned to the municipality to help offset the costs for other projects, such as improving local infrastructure.

“Transportation does help structure the value of land,” Smolka says, but capturing that value can be trickier than with a more straightforward redevelopment project, given the scale of most transit projects. One effective approach, he notes, is to increase density around particularly busy transit stops, encouraging fresh development but requiring developers who benefit from

rezoning to in effect pay for the opportunity. He adds that an economic impact study commissioned by Costa Rica suggested the expansion of the electric train will have a positive effect on land values, and the project dovetails with a pledge to reach carbon-neutral status by 2050.

Electric transit is still a sliver of all mass transit in Latin America, and the pandemic created new challenges. But the Latin American market may be particularly suited to capitalize on and expand this trend. Smolka observes that the region is known for embracing transit innovation, from electric trams in the 1950s to today’s Bus Rapid Transit, propane taxis, and cable car lines that serve dense, hilly informal settlements. With relatively sophisticated transit authorities and a track record of financing major projects, “they are among the best transit systems in the developing market,” says Graham.

Electric transit is still a sliver of all mass transit in Latin America, and the pandemic created new challenges. But the Latin American market may be particularly suited to capitalize on and expand this trend.

Among other things, that means lots of data on existing routes that can support the efficient deployment of new electric buses. It’s much harder, Graham says, to “leapfrog” an electric system into a municipality with little transit track record than it is to phase the technology into an existing setup. Latin America also has an increasingly strong trade relationship with China, which manufactures an estimated 98 percent of the world’s total e-bus fleet. All of this may be putting Latin America in a leadership lane for a transition that, in time, will happen globally. As Graham says: “Electrification is coming.” □

Santiago, Chile, has invested heavily in electric transit, amassing a fleet of 700 e-buses and growing. Credit: Juan Carlos Jobet via Twitter.



Rob Walker is a journalist covering design, technology, and other subjects. He is the author of *The Art of Noticing*. His newsletter is at robwalker.substack.com.



Credit: Courtesy of Sumbul Siddiqui.

Mayor Sumbul Siddiqui immigrated to the United States from Karachi, Pakistan, at age two, along with her parents and twin brother. Raised in affordable housing in Cambridge, Massachusetts, and educated in the city's public schools, she graduated from Brown University and served as an AmeriCorps fellow at New Profit, a nonprofit organization dedicated to improving social mobility for families. After earning a law degree from Northwestern University, Siddiqui returned to Massachusetts to work as an attorney with Northeast Legal Aid, serving the postindustrial cities of Lawrence, Lynn, and Lowell. Siddiqui was elected to the Cambridge City Council in 2017 and elected mayor in 2020. She is an advocate for the city's most vulnerable residents, striving to create affordable housing, prevent displacement, and promote equitable access to education. During the pandemic, she helped increase Internet access for low-income families and expanded free COVID testing for all Cambridge residents. Her agenda includes the promotion of clean and climate-resilient streets, parks, and infrastructure as part of making Cambridge a more equitable and civically engaged community.

Affordability and Equity in Cambridge, Massachusetts

Mayor Siddiqui recently spoke with Anthony Flint for a series of interviews with mayors of cities that have played an especially significant role in the 75-year history of the Lincoln Institute. An edited transcript of their conversation follows; the full interview is available as a *Land Matters* podcast at www.lincolninst.edu/publications/podcasts-videos.

ANTHONY FLINT: Cambridge has been gaining quite a lot of attention lately for a new policy that allows for some increases in height and density at appropriate locations—if the projects are 100 percent affordable. Can you tell us about that initiative and how it's playing out?

SUMBUL SIDDIQUI: The passing of the affordable housing overlay was an important moment for me and for many on the city council. The proposal was to create a citywide zoning overlay to enable 100 percent affordable housing developments in order to better compete with market-rate development . . . the goal is to have multifamily and townhouse development in areas where they are not currently allowed . . . We have a city that has a widening gap between high- and low-income earners, and we always talk about diversity as well, as a value, and how do we maintain that diversity? For me and others it's all about creating additional affordable housing

options so more people can stay in the city. So far we're seeing many of our affordable housing developers, like our housing authority and our other community development corporations, doing community meetings around proposals where they are in some cases able to add over 100 units to the affordable housing that they were already going to build.

AF: Changes like this really do seem to percolate up at the local level. I'm thinking, for example, of Minneapolis banning single-family-only zoning to allow more multifamily housing in more places, and several other cities followed suit. Is the 100 percent affordable overlay something that other cities might adopt, and did you anticipate that this might become a model for other cities?

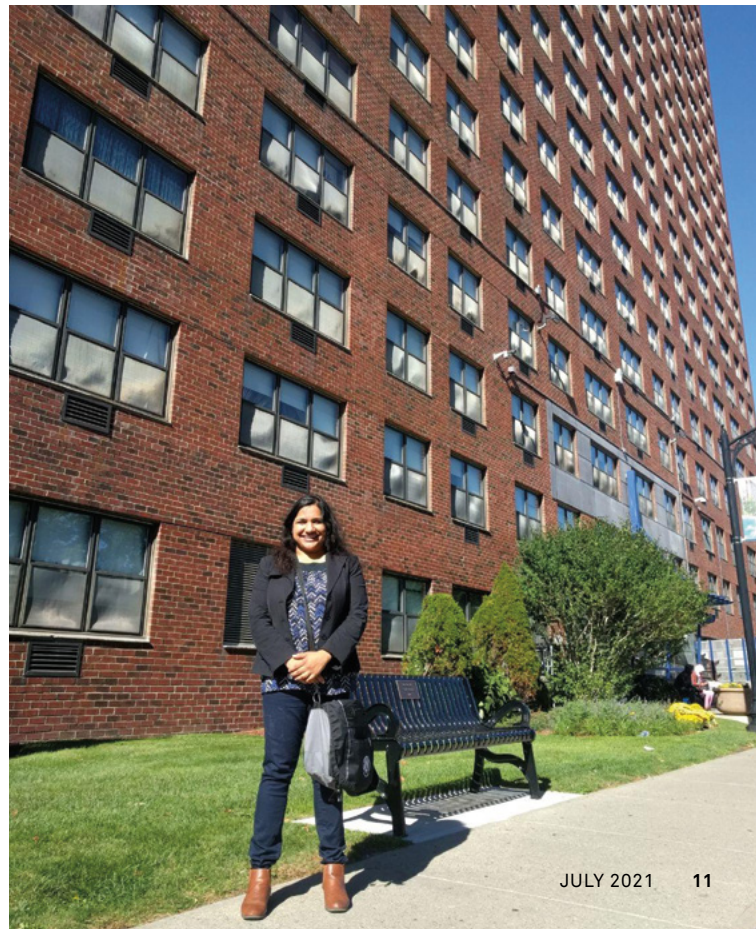
SS: We certainly think that this can be a model. We know that our neighboring sister city, Somerville, is looking at it . . . I think it's all part of the overall mission for many cities to make sure that they are offering and creating more affordable housing options. You know, this is housing that's affordable to your teachers, to your custodians, to your public servants, legal aid attorneys—you name it, to stay in the city that they maybe have grown up in, and maybe they've moved out and want to come back, and we want there to be that opportunity. I think we still see such stark inequality in our city, and as someone who's grown up in affordable housing in Cambridge . . . I would not be here without it. This is an important initiative and policy, and I do hope it [serves] as a model for other cities across the country.

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AF: Cambridge has been such a boomtown for the last several years, and there has been a lot of higher-end housing development. Can you tell us about a few other policies that are effective in maintaining more of that economic diversity?

SS: One of the ways we've been able to have the affordable housing stock that we do is through the city's inclusionary housing program . . . under these provisions, developments of 10 and more units are required to allocate 20 percent of the residential floor area for low- and moderate-income tenants, or moderate- and middle-income home buyers. So it really has been an important way to produce housing under these hot market conditions . . . the more people we bring to the city, the more we'll have that insatiable housing demand.

Mayor Siddiqui at Rindge Towers, the affordable housing development in Cambridge where she grew up. Credit: Courtesy of City of Cambridge.





Cambridge and the Charles River. Credit: Amy Li via iStock/Getty Images Plus.

Another thing we really want to focus on is how we use city-owned public property that is available for disposition to develop housing We've done a lot of work around home ownership options for the city and making sure that we have a robust home ownership program for residents to apply to Preservation is also a big part of the policy around affordability. We this year have been working on the affordability of about 500 units in North Cambridge near the buildings I grew up in, and we've put in—probably it's going to be over \$15 million to help preserve these market-rate buildings. Essentially these are expiring use properties. So it's a little technical, but there's so many tools—and there's a long way to go.

AF: How did the pandemic reveal the disparities and racial justice issues that seem to be ingrained, in a way, in the economic outcomes of the city and the region?

SS: The pandemic has revealed a lot of the fault lines . . . and we saw firsthand the disproportionate impact COVID has had on the Black and brown community. It's highlighted longstanding issues around health care equity, and we've seen how so many of our low-income families have been unable to make ends meet. Many of them lost their jobs because of the public health crisis, but still needed to pay rent, [pay] utilities, and purchase food for themselves and their

families. A lot of the issues we saw during the pandemic have been issues all along, but as I've said, the pandemic has revealed those ugly truths even in our city . . . and you know, we can't turn a blind eye anymore.

And we have to do things in a manner that is much more urgent. I always use the example of schools that had to close. We quickly got kids laptops and hotspots. Before the pandemic, we knew kids didn't have Internet at home, we knew kids didn't have computers, but we said, 'Oh, you know, we're going to study that' We should have been doing these things all along. And so I think the one good part of it has just been [that] we've been able to figure out solutions really quickly We can make our city more accessible and affordable and we have to really call out the injustices when we see them.

AF: The pandemic also arguably has been an opportunity to do some things with regard to sustainability, reconfiguring the public space. I wondered if you could talk about that and other ways you're helping to reduce carbon emissions and build resilience.

SS: This is an area of work where there's so much going on, and yet sometimes it feels like we're not moving fast enough, given what we know. We are committed to accelerating the transition to net zero greenhouse gas emissions for all our buildings in the city. We have a goal of net zero

There's a big push to incorporate green infrastructure into city parks and open spaces and street reconstruction projects. It's all hands on deck.

emissions by 2050. There are various types of incentives, regulations, and various working groups that are looking at how do we procure 100 percent of our municipal electricity from renewable sources; how do we streamline existing efforts to expand access to energy efficiency funding and technical assistance.

We're revising our zoning ordinance to make sure that the sustainable design [standards] require higher levels of green building design and energy efficiency for new construction and major renovations. We're a city that loves our trees, right? So we are constantly looking at ways to preserve our tree canopy. We have a tree protection ordinance on the books that we are going to continue to strengthen this term. We continue to install high-visibility electric vehicle charging stations at publicly accessible locations. There's . . . a big push to incorporate green infrastructure into city parks and open spaces and street reconstruction projects. It's all hands on deck.

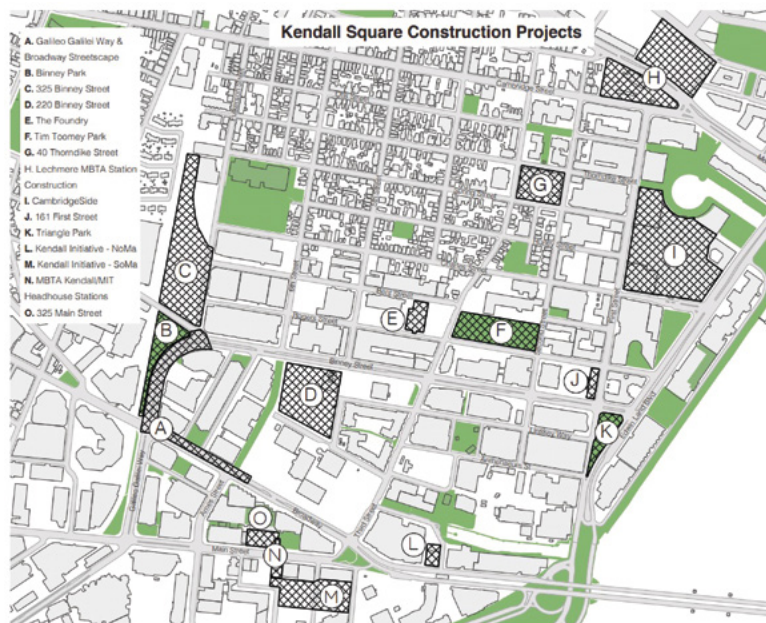
AF: The Lincoln Institute of Land Policy has called Cambridge home since 1974, when David C. Lincoln, son of our founder, chose to locate in a place with world-famous universities and other nonprofit organizations. Can you reflect on that distinctive feature of Cambridge—that is, the nonprofit, educational, medical, and other institutions being such a big part of the community?

SS: I think the universities in particular play a huge role. With the pandemic, I've seen a really

The current construction boom in Cambridge includes parks, streetscapes, and commercial, residential, and institutional buildings. Credit: City of Cambridge.

important collaboration between our educational institutions, community organizations, small businesses, and residents to work collaboratively to address some of the most pressing issues The Broad Institute of Harvard and MIT, working with the City of Cambridge Public Health Department, was the first in the state to offer COVID testing for residents and workers and all of Cambridge's elder facilities. Now, we have seven-day-a-week testing in Cambridge. So that's the direct result of this partnership and having them here in our space. Both have made contributions to the Mayor's Disaster Relief Fund . . . we were setting up an emergency shelter for unhoused individuals and each of the universities contributed funding toward that; they gave rent relief to their retail and restaurant tenants; [and] they do a lot in the schools. So I think the partnership has strengthened this year as the pandemic's hit, and they've been a key partner in the work that we've done in the city. They are such a big part of the community . . . and they have risen to the occasion whenever I've called on them. □

Anthony Flint is a senior fellow at the Lincoln Institute and a contributing editor to *Land Lines*.



An aerial photograph showing a dense urban area with a large farm in the foreground. The farm features several large greenhouses and rows of crops. The city skyline is visible in the background under a clear blue sky.

URBAN ABUNDANCE

Wilson Farms in Lexington, Massachusetts, 10 miles from Boston, has 20 acres of planted fields and five adjacent greenhouses that help supply an on-site storefront. The farm also grows produce on 500 acres of cropland 35 miles northwest, along the Merrimack River in southern New Hampshire. Together, the properties produce over 125 varieties of fruits, vegetables, and herbs.

GUIDANCE

An Aerial Survey of Metro Boston
Reveals a Regional Food System on the Rise

By Alex MacLean

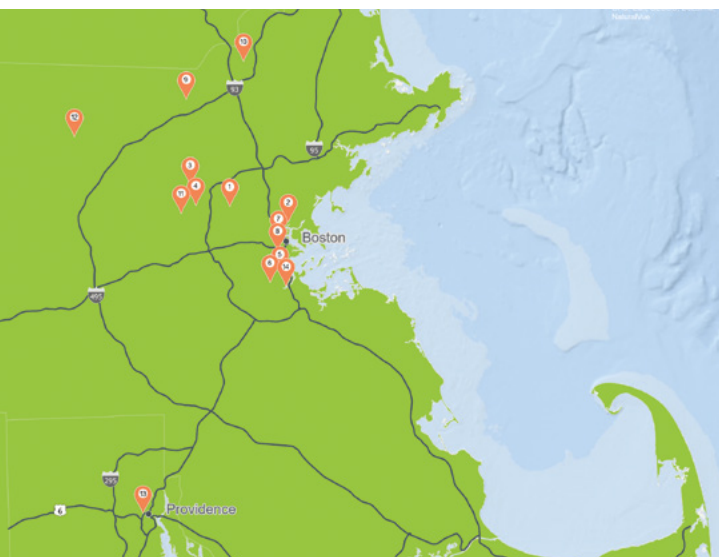
ACROSS FOUR DECADES as an aerial photographer, I have been drawn to documenting agriculture for the way it reveals important clues about region, climate, topography, soil, and the passage of seasons and time. This work has increasingly focused on the connections between land use and climate change, as attention to shortening food miles—reducing the distance between producers and consumers, with the goal of lowering carbon emissions and minimizing supply chain disruptions—visibly plays out across rural–urban transects. The images in these pages represent the first steps in an inquiry into how food production in and around urban areas in the United States is changing.

In recent years, the intensification of small-scale growing in the region around Boston, Massachusetts, has been increasingly apparent. From the air, I’ve seen hoop houses spring up on small farms seeking to meet demand and expand productivity; I’ve seen drab commercial and residential rooftops become vibrant gardens; I’ve seen historically nonproductive urban land like vacant lots and lawns become cultivated spaces.

When added up, these small-scale operations seem to hold real potential for productivity gains through the power of increments. Green spaces in and near urban areas don’t just provide people with fresher, more accessible food; by filtering stormwater, absorbing carbon dioxide, and providing other environmental benefits, they can also make cities healthier, more resilient places.

Despite these promising changes, what is commonly understood as the locavore movement has done more to create a sense of place, build community, and educate around food than it has to increase food security or shorten food miles at the scale necessary to confront climate change. While demand and enthusiasm for local food has grown over the last decade, an estimated 90 percent of food in the Boston metro area comes from outside the region, according to Food Solutions New England (FSNE), a regional network based at the nearby University of New Hampshire. But policy makers, investors, farmers, and entrepreneurs in the area are working to change that, and FSNE is advocating for “50 by 60”—referring to the percentage of food that could be regionally sourced by 2060.

One trend that could help reach that goal, also visible from the air, is indoor farming. Most commonly located in undervalued industrial neighborhoods, indoor farms use technologies like hydroponics and LED lighting to enable year-round cultivation. The companies behind them are increasingly demonstrating that a lack of open space does not have to be a constraint on food production. The indoor farming industry attracted \$1.9 billion in global venture capital in 2020, three times the amount committed in 2019.



The locations on this map and in these pages represent just some of the places where urban agriculture is sprouting in the Boston area. Credit: Center for Geospatial Solutions.



The Boston metro region imports 90 percent of its food from outside the region. Above, box trucks and refrigerated trailer units line the New England Produce Center warehouses in Chelsea, just north of downtown Boston. Among the largest wholesale produce markets in the world, the complex receives shipments from across the United States and internationally. Produce is then redistributed to food outlets throughout New England and southeastern Canada.

Boston is home to some of the companies gaining the most momentum. Freight Farms, for instance, further democratizes proximity to production through the use of retrofitted shipping containers that can be tucked beneath elevated highways or squat next to school cafeterias. In 320 square feet, these containers yield as much produce as two cultivated acres. Such innovative solutions give insight into what alternative growing can look like as climate change degrades farmland and shrinks water supplies. However, indoor farming has its drawbacks; it can be energy intensive and, although its yields are often marketed as “local,” in some senses it replicates the centralization and corporate influence against which local and regional agriculture advocates have long chafed.

As an aerial photographer, I hope some form of outdoor food production will always be

integrated into our landscapes. Whether viewed from the ground or from the air, farms and fields help us understand the key elements of the natural world that sustain us, providing a connection to the planet and an impetus to protect these places. But from above, it is increasingly apparent that a reimagining of agricultural systems is underway, and that we will need many different approaches for “local food” to evolve into an equitable model of regional food sovereignty. □

Alex MacLean is a pilot and internationally exhibited photographer whose work has appeared in *Land Lines* and the Lincoln Institute book *Visualizing Density*. He specializes in documenting changes to the land brought about by human intervention and natural processes.



The renowned Fenway Victory Gardens along the Muddy River in Boston's Back Bay are made up of over 500 plots that remain on land that was dedicated to food production during World War II. Fenway was one of over 20 million victory gardens across the country that contributed to growing roughly 40 percent of the nation's produce at the height of the war. The history speaks to the potential to adapt and to grow local produce on a large scale.



The community garden at the First Parish Church in Lincoln, Massachusetts, seen in four seasons. Changes in the garden throughout the year are a time marker that affirms our awareness as we transition through seasons. Parishioners grow individual plots and collectively grow a donation plot that provides an average of 600 pounds of food each year to Boston-area homeless shelters and soup kitchens.



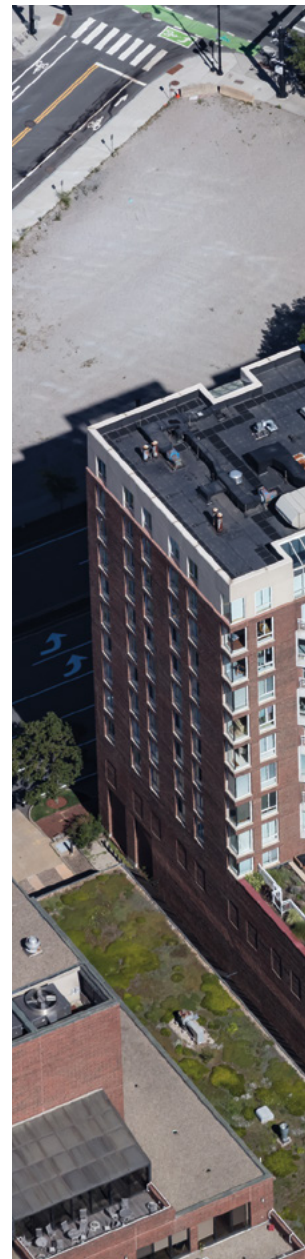


POSTINDUSTRIAL AGRICULTURE

In postindustrial cities like Lawrence and Lowell, urban agriculture provides healthy produce for the community. Mill City Grows manages four farms, including 2.8 acres leased from the city of Lowell (top), and distributes produce through mobile markets, a Community Supported Agriculture program, and donations. In nearby Lawrence, the city helped establish the Cross and Cedar Street Garden (middle) in 2011. The garden, which is tended by local residents, occupies two vacant lots where dilapidated housing once stood. Raised beds help protect against the hazards of contaminated soil.



The Nightingale Community Garden in Dorchester, Massachusetts, owned by statewide conservation organization The Trustees, is part of a citywide initiative to increase access to local produce, and to make community gardens a prominent feature of unbuilt urban spaces.



From above, it is increasingly apparent that a reimagining of food systems is underway, and that we will need many different approaches for “local food” to evolve into an equitable model of regional food sovereignty.



Planted terraces on top of The Esplanade, a condominium complex in Cambridge, Massachusetts, demonstrate the potential for commercial roof spaces to accommodate urban agriculture.



COMMON PLACE

Boston's community gardens have created a stronger sense of place within city neighborhoods. The Worcester Street Community Garden in Boston's South End is one of 56 community gardens owned by The Trustees. Managed by volunteers, the Worcester Street garden has over 130 plots available to Boston residents on a first-come-first-serve basis.





Chicken tractors and containment pens are moved each day at Codman Community Farms in Lincoln, Massachusetts, one of the sustainable practices that goes into producing 800–1200 eggs per week. Located 15 miles northwest of Boston and dating back to 1754, the farm sits on 18 acres. An additional 120 acres of fields and pastures scattered throughout the town provide hay for livestock and open spaces for those living in the surrounding area.



SCALABLE SUCCESS

Over 95 percent of greens consumed on the East Coast come from California and Arizona, often spending over a week in transit. Little Leaf Farms is working to disrupt reliance on West Coast produce through year-round hydroponic growing in a 10-acre greenhouse in Devens, Massachusetts, 40 miles west of Boston. The growing process is entirely automated; greens are planted and harvested without touching human hands. The company's success thus far has brought in \$90 million in debt and equity financing to expand operations down the East Coast, beginning in Pennsylvania and North Carolina.



Freight Farms manufactures vertical hydroponic greenhouses inside 40-foot shipping containers. Equipped with precise climate control and optimized lighting for select plants, the containers can yield up to two acres of conventionally grown produce in 320 square feet. The mobile greenhouses can be placed anywhere, such as beneath highway underpasses or adjacent to schools.



Built on what was once a contaminated brownfield site in Providence, Rhode Island, Gotham Greens—the white structure at bottom left of image—provides New England with year-round hydroponically grown greens and herbs. The greenhouse is powered by renewable electricity and uses 95 percent less water and 97 percent less land than conventional agriculture.

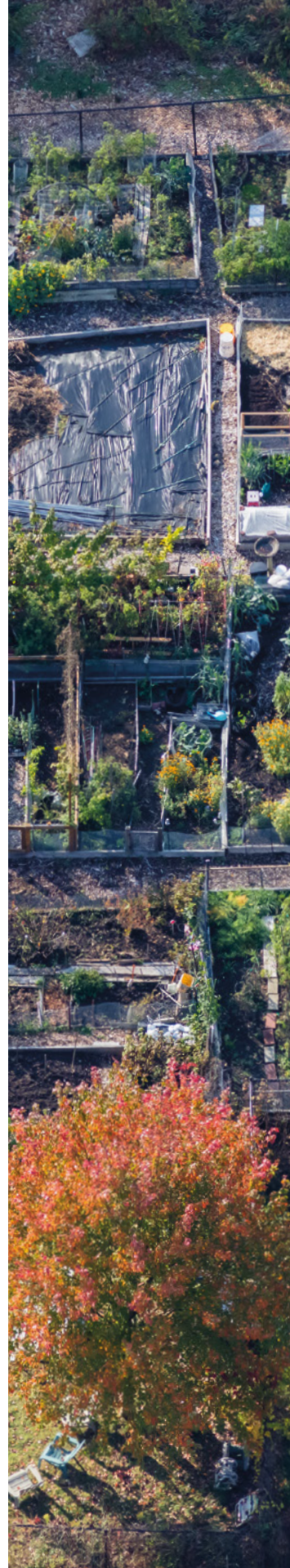


PHOTO ESSAY

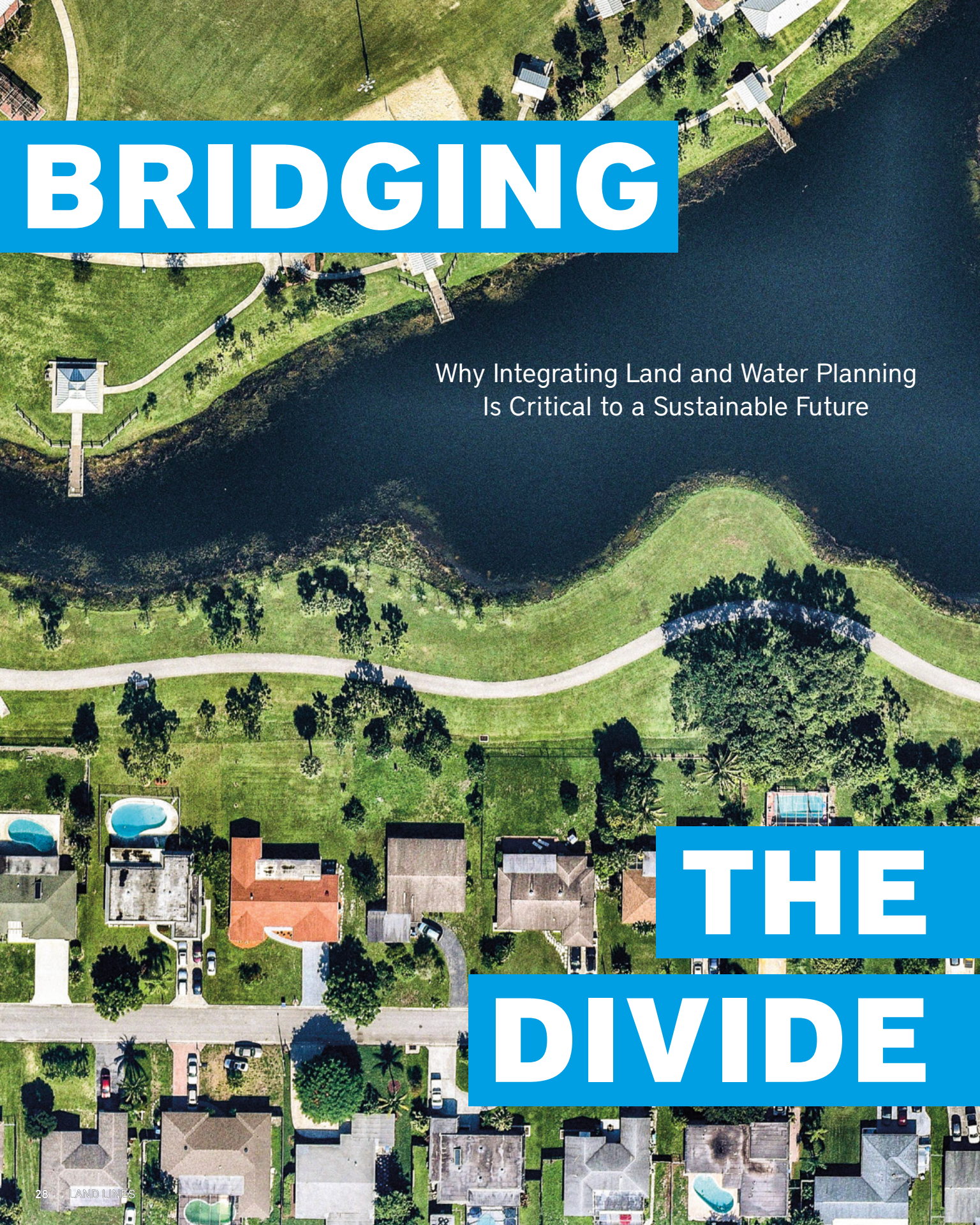
CHANGES OVER TIME

Gaining Ground Farm in Concord, Massachusetts, grows produce for Boston-area shelters and food pantries. Using high tunnels, hoop houses, row covers, and soil nourishment, Gaining Ground has increased production by over 100 percent over a four-year period. In 2020, Gaining Ground grew and donated 127,429 pounds of produce, compared to 61,764 in 2016. The top photograph, taken in 2016, shows the farm's early adoption of hoop houses; the bottom photograph, taken in 2020, shows the intensification of production.

Opposite: This community garden in Allston-Brighton, Massachusetts, is on land owned by the state Department of Conservation and Recreation. The mid-October foliage foretells the end of the growing season and the onset of winter.







BRIDGING

Why Integrating Land and Water Planning
Is Critical to a Sustainable Future

THE

DIVIDE

By Heather Hansman

RICK SCHULTZ doesn't hate grass outright. He can see the use for it in some places—kids should be able to play soccer somewhere, sure—but there's no need for it in road medians or sweeping lawns in arid places, says Schultz, a water conservation specialist at the municipally owned utility in Castle Rock, Colorado.

Located on the southern fringes of the Denver metro area, Castle Rock is one of the fastest-growing communities in the country. Its population has skyrocketed from 20,224 in 2000 to nearly 72,000 today. Seventy percent of Castle Rock's water supply comes from non-renewable groundwater, so as the town grew, officials had to figure out how to stretch that supply. In 2006, the water utility and the planning department started collaborating to address that issue.

The community created a water master plan that set guidelines—like where it made sense to have grass—to delineate how and where they could conserve water while still accommodating growth. Schultz says they had to think outside of traditional land use regulations and water supply patterns to work toward long-term sustainability, steering disparate parts of the planning process toward smart growth: “We needed to push the boundaries a little if we wanted a better outcome.”

Since then, Castle Rock has introduced financial incentives, regulatory changes, and even behavioral science strategies to ensure that water supply is actively considered as part of every planning and development process. From offering incentives to developers who install water monitoring systems to requiring landscapers to pursue professional certification in water efficiency, Castle Rock has become a leader in this area, recognized by the state of Colorado for its efforts and for sharing best practices with other organizations.

In communities across the United States, water managers and planners are emerging from the silos they've traditionally operated in and finding new ways to work together. This is in part because climate change is causing turbulence for the water sector nationwide, in the form of prolonged droughts, damaging floods and wildfires, severe storms, and sea-level rise.

The urgency of developing resilience in the face of these threats is becoming increasingly clear. Collaboration is also increasing because, although communities face many different challenges and operate with countless variations on municipal structures, many are rediscovering a singular truth about land and water: when you plan for one, you have to plan for both.

In communities across the United States, water managers and planners are emerging from the silos they've traditionally operated in and finding new ways to work together.

“Water engineers are beginning to recognize they cannot provide sustainable services without involving those in the development community—including planners, architects, and community activists,” explains the American Planning Association's *Policy Guide on Water* (APA 2016). “Leading edge planners are reaching across the aisle to water managers to help advise on their comprehensive plans, not only to meet environmental objectives, but also to add value and livability, rooted in the vision of the community.”

Credit: Nearmap via Getty Images.

How We Got Here

Picture the view from an airplane as you fly over rural areas or the outskirts of any major city: the way the right-angled boundaries of agricultural fields and housing plots contrast with the twisting braids of river channels and the irregular shapes of lakes and ponds. Land and water are very different resources. They have been managed differently—and separately—as a result.

The divide between water and land planning has deep roots. Although water is connected to all parts of sustainable growth, from ecosystem health to economic viability, planners and water managers have long worked separately. From volunteer planning boards in rural communities to fully staffed departments in major cities, planners focus on land use and the built environment. Water managers, meanwhile, whether they are part of a municipally owned utility, private water company, or regional wholesaler, focus on providing a clean and adequate water supply.

“I can’t think of a single city where [planning and water management] are contained within a single division,” says Ray Quay, a researcher at Arizona State University’s Global Institute of Sustainability who has served as both assistant director of land planning and assistant director of water services in Phoenix, Arizona. Quay says regional and watershed-wide development choices about growth often don’t line up with water supply.

The divide between water and land planning has deep roots. Although water is connected to all parts of sustainable growth, from ecosystem health to economic viability, planners and water managers have long worked separately.



Rick Schultz, second from left, inspects a landscape watering system in Castle Rock, Colorado. The community has earned statewide recognition for its integration of land and water planning. Credit: Jerd Smith, *Fresh Water News* (www.watereducationcolorado.org/fresh-water-news).

“A typical divide would be that planners plan for growth while assuming the water utility will be able to supply water, while water utilities don’t participate in decisions about community growth, they just build infrastructure to serve the new growth that comes to them,” adds Jim Holway, director of the Babbitt Center for Land and Water Policy, which was created by the Lincoln Institute of Land Policy in 2017 to advance the integration of land and water management.

Ivana Kajtezovic, planning program manager at Tampa Bay Water, a regional wholesale drinking water utility in Florida, confirms that lack of alignment. “Tampa Bay Water doesn’t have a say in growth in the counties and cities we serve,” says Kajtezovic. “Our only mission is to provide drinking water, no matter the growth or the speed of growth. Land use decisions are made by the counties and cities we serve.”

In a 2016 APA Water Working Group Water Survey, 75 percent of land use planners felt they were not involved enough in water planning and decisions (Stoker et al., 2018). “We know that land and water are connected, and no one ever argues that they’re separate,” says Philip Stoker, assistant professor of planning at the University of Arizona, who conducted the APA survey. “It’s only people who have separated them.”

This divide is partly a result of historical regulatory structures. “Water is very much state law-based, with some federal hooks into various

aspects of it,” says Anne Castle, former assistant secretary for water and science at the U.S. Department of the Interior. Federal management involves regulations such as the Clean Water Act and agencies such as the U.S. Bureau of Reclamation, and water rights are allocated at the state level. Meanwhile, although there is federal and state oversight of some public lands, most of the regulation and planning related to private land happens locally or regionally, reflecting individual and community rights and desires. While there are state-level initiatives to “put more emphasis on the consideration of water in developing land,” Castle says—including in Colorado, where she is based—there are still wide gaps in priorities and responsibilities.

Communities across the country are dealing with unique issues, of course, but Stoker’s survey suggests the barriers to solving them are similar: lack of time and lack of resources; fear of losing jurisdictional power or surrendering control; and differences in education, experience, and technical language. It can be hard to surmount those issues. “Logically it should be easy, but when institutions grow up with a single focus, it’s hard to change their mission and expand into other places,” says Bill Cesanek, cochair of the APA Water & Planning Network. Cesanek says things work better when planners share the responsibility for determining where the water to meet future demands will come from.

Land and water planners have to work together, agrees Quay, and need to be realistic about where, how, and whether their communities can grow. “One of the really critical factors is political will,” he says. “We should be thinking about what’s most important for our community, and we should be allocating our water to that.”

According to Holway of the Babbitt Center, that’s becoming more common. “With growing demand for water in the face of increasing challenges to acquiring new water supplies, utilities and land planners are having to figure out how to work together to maintain a balance between supply and demand.”

A recent Lincoln Institute working paper (Rugland 2021) provides a framework called a Toolbox Matrix for better defining the ways land and water can be integrated in practice. The Babbitt Center developed this framework with input from land use and water management experts across the United States. The framework identifies several primary ways communities can better integrate land and water:

- **collaborative processes:** setting up administrative and procedural priorities that encourage or incentivize collaboration;
- **planning:** engaging in plan making, public outreach, and implementation;
- **regulations, codes, and ordinances:** institutionalizing integrated land use and water management;
- **development review:** ensuring compliance for integrated action, as well as providing incentives and collaborative solutions with developers and builders;
- **water supply and infrastructure:** managing the physical aspects of water service, including source water protection and stormwater management;
- **post-occupancy demand management:** implementing programs that encourage residents and business owners to use water wisely and prevent pollutant discharge.

To explore the framework further, visit www.lincolninst.edu/publications/working-papers/integrating-land-water.

Erin Rugland is a program manager for the Babbitt Center for Land and Water Policy.

“Too Much, Too Little, Too Dirty”

According to the APA *Policy Guide on Water*, water-related threats often fall along familiar lines: not enough water, thanks to population growth and climatic stress on top of already fully allocated or overallocated water supplies; too much water, due to flooding and rising sea levels; or water quality compromised by agricultural and urban runoff. In every case, the urgency is growing:

Not enough water. In the Southwest—especially the overtapped Colorado River Basin, which serves over 40 million people in seven U.S. and two Mexican states—persistent drought means diminishing snowpack, dwindling supplies in natural aquifers, and shrinking reservoirs. Researchers predict that Colorado River flows will decline by 20 to 35 percent by 2050 and 30 to 55 percent by the end of the century (Udall 2017).

The drought also has cascading impacts on water systems. For instance, increasingly frequent and large wildfires in dry western forests are causing watershed contamination in areas that haven’t previously dealt with it, like the headwaters of the Colorado. During fires and for years afterward, according to the Environmental Protection Agency, water can be polluted by ash,

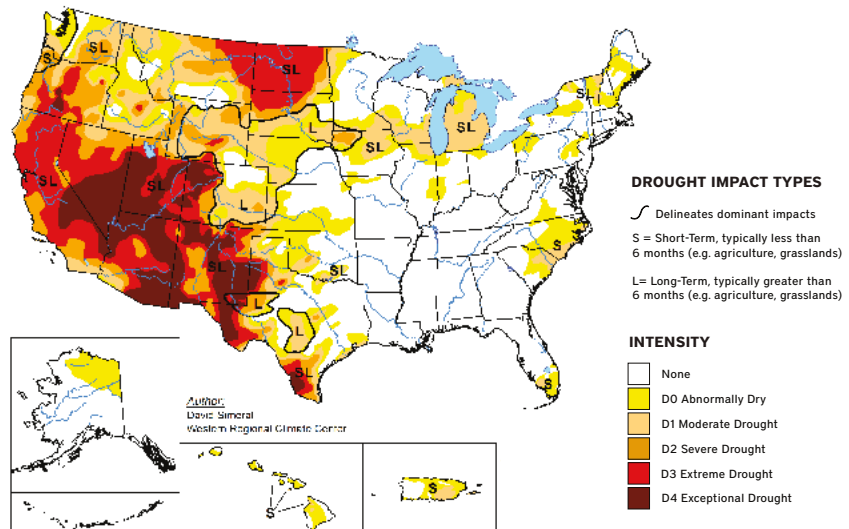
sediment, and other contaminants, which forces water managers to scramble for solutions. “I do think there’s a much greater trend of land use planning and water management collaboration occurring fastest in places that are facing scarcity,” Stoker says.

Too much water. Over the last 30 years, floods in the United States have caused an average of \$8 billion in damages and 82 deaths per year (Cesaneck, Elmer, and Graeff 2017). As climate change fuels more extreme weather events, Quay says, floods are exceeding parameters defined by the Federal Emergency Management Agency that have traditionally guided planning decisions. Quay says it’s hard to adapt because our stationary planning guidelines and laws aren’t set up for those extremes.

Places like low-lying Hoboken, New Jersey—where rising sea levels and superstorms like Hurricane Sandy have inundated sections of the city—are building water system resilience into their planning. The city is incorporating features like artificial urban sand dunes that work as physical barriers and can divert storm surges to newly built flood pumps.

“The stormwater system is at the same level as the river—[stormwater] has nowhere to go, so they’ve had to build a really innovative resilience planning program,” Cesaneck says.

Map of drought conditions across the United States, May 2021. Credit: The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska–Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC.





Planners and water managers in the City of Milwaukee worked together to redevelop an abandoned railroad manufacturing area into Menomonee Park, which serves as both a public recreation area and a stormwater management tool. Credit: Menomonee Valley Partners, Inc.

Infrastructure and Equity Issues

The U.S. population is projected to reach 517 million by 2050, with the fastest-growing cities in the South and West (U.S. Census Bureau 2019). You can't keep people from moving to Tempe or Tampa Bay, but this growth is occurring in regions where the pressure on water quality and quantity is already high. In some places, rapid growth has forced the hand of planners and water managers, who have implemented water conservation and reuse measures to ensure there will be enough water to go around.

To complicate matters, our nation's water infrastructure hasn't kept up with changing demographics. Old lead pipes are disintegrating, and water treatment plants are overwhelmed by the amount of water they need to process. In 2017, the American Society of Civil Engineers gave the nation's drinking water a D grade, estimating a cost of \$100 billion for all the necessary infrastructure upgrades (ASCE 2017).

There is also a divide between places that can afford to upgrade their infrastructure and those that cannot. Addressing that inequity is crucial to securing future water supplies for everyone, says Katy Lackey, senior program manager at the nonprofit US Water Alliance, a national coalition of water utilities, businesses, environmental organizations, labor unions, and others which is working to secure a sustainable water future.

"We believe water equity occurs when all communities have access to clean, safe, and affordable drinking water and wastewater services, infrastructure investments are maximized and benefit all communities, and communities are resilient in the face of a changing climate," she says. Reaching that goal will require new ways of working.

Contaminated water. During heavy rains, which are increasingly frequent due to climate change, the combined sewer system in Milwaukee, Wisconsin, overflows into neighboring rivers and Lake Michigan, polluting the waterways, compromising the ecosystem, and affecting the water supply. "Stormwater gets into our combined and sanitary systems. Nothing is watertight," says Karen Sands, director of planning, research, and sustainability at Milwaukee Metropolitan Sewerage District (MMSD). Sands says MMSD has had to align at-odds geographic and jurisdictional layers to find solutions that protect the watershed. One of those solutions is the construction of 60-acre Menomonee Park, built in conjunction with city planners, which is expected to treat 100 percent of stormwater runoff from nearby industrial and commercial areas. It ensures a clean water supply now, and preemptively manages demand for the future.

Chi Ho Sham, president of the American Water Works Association (AWWA), a nonprofit international organization for water supply professionals, says one of the group's biggest concerns is water quality, particularly protecting water at the source, limiting pollutant use, and creating barriers to slow or prevent contamination. "From my point of view, our job is to work very collaboratively with landowners," he says. "Water managers cannot do it alone."

How to Work Together Well

Integrated planning starts with getting people in the same room to understand the needs of their community, the gaps in current processes, and how they can better work together, says Holway of the Babbitt Center. From there, formalizing goals around planning and water is critical, whether those goals are reflected in a comprehensive or master plan for community development, in a more specific plan based on conservation and resilience, or in zoning and regulatory changes.

“We are focused on identifying, evaluating, and promoting tools to better integrate land and water, with input from a diverse group of practitioners and researchers,” Holway says, noting that Babbitt Center Program Manager Erin Rugland has produced several publications for practitioners, including a matrix of available tools for integrating land and water (Rugland 2021) and two manuals focused on best practices (Rugland 2020, Castle and Rugland 2019).

Those who are focused on the importance of integrating land and water say there are several steps planners and water managers can take to ensure successful collaborations, including:

Formalizing goals around planning and water is critical, whether those goals are reflected in a comprehensive or master plan for community development, in a more specific plan based on conservation and resilience, or in zoning and regulatory changes.

Build relationships. Stoker found that getting people out of their silos is an important first step. “In the places that have been the most successful at integrating land and water planning, the utilities and planners were friends. They knew that if they worked together, they would benefit,” he says. Stoker cites Aiken, South Carolina, where water managers helped build the comprehensive plan, as an example, adding that this kind of collaboration is important at every scale.

In Westminster, Colorado, water managers participate in preapplication meetings for any new development. From the beginning, they have a chance to advise on how choices made about things like plumbing and landscaping will impact a project’s water use and fees.

The questions outlined here can help determine which issues to consider as part of a comprehensive planning process. To explore these categories further, visit www.lincolnst.edu/incorporating-water-comprehensive-planning. Credit: Babbitt Center for Land and Water Policy.

Water Management	Future Projections	Water Efficient Land Use
Where does our water come from?	What is our population, housing, and employment growth?	Are we collaborating on water issues?
How much do we have?	What are our development expectations?	How does our development process consider water?
How much water do various land use sectors use?	What water challenges do we face as a result of a changing climate?	How does our urban form impact our water use?
How do we pay for water system repairs and improvements?	How much water will we need?	Is water used efficiently outdoors?
How is water used or conserved?	Do current water supplies line up with projected demand?	Is water used efficiently indoors?
Is our water system sufficient, safe, and reliable?	How can water and land use be equitably managed?	How does land use impact our watersheds?



Participants in a Growing Water Smart workshop, which brings land use planners and water managers from the same community together for facilitated discussion and to create a local action plan. Credit: Sonoran Institute.

Westminster is one of 33 western communities that have participated in the Growing Water Smart program, a multiday workshop run by the Babbitt Center and the Sonoran Institute with additional funding from the Colorado Water Conservation Board and the Gates Family Foundation. Growing Water Smart brings small teams of leaders together to communicate, collaborate, and identify a one-year action plan.

“The heart of Growing Water Smart is getting land use planners and water managers from the same communities together to talk to each other, sometimes for the very first time,” says Faith Sternlieb, senior program manager at the Babbitt Center, who helps facilitate the program. “Once they start sharing resources, data, and information, they see how valuable and important collaboration and cooperation are. It isn’t that they didn’t want to work together, it’s that they truly thought they had everything they needed to do their jobs. But they don’t often have the time and space needed to think and plan holistically.”

“What has worked in my experience is to form relationships with the planners making decisions,” confirms Kajtezovic of Tampa Bay Water. “To the extent possible, I communicate with them and explain the importance of source water protection.”

Be creative and flexible. Once relationships are formed, creativity and flexibility are key. Because every community is facing different planning challenges, “context is incredibly important,”

says Quay. This is true not just among different regions, but within regions, and sometimes even from one community to the next. “What works in Phoenix won’t necessarily work in Tempe [which is located just east of Phoenix], so we can’t just adapt best management practices, we have to think about best for who.” He recommends identifying a broad, flexible set of tools that can be used and adapted over time.

Be willing to learn. Because of specialization, planners and water managers “don’t speak the same language,” says Sham, who says the AWWA has been working on collaborative education about source water protection for members and landowners. Sometimes it feels like added work on the front end, and he says people can be reluctant to take on work that’s not in their purview, but developing a shared language and understanding is crucial for long-term sustainability.

John Berggren helps communities coordinate land and water planning as a water policy analyst for Western Resource Advocates. He says one of his first steps is to educate local leaders and get them excited about including water in their comprehensive plans. “We get them interested and concerned about conservation, to create top-down support for planning departments and water utilities,” he says. Once water is codified in a comprehensive plan, he says, that allows planners and utilities to come up with creative, progressive solutions.

Be comprehensive. The integration of land use and water planning works best when it is included in state-level regulations or in comprehensive plans at the community level. According to the Babbitt Center, 14 states formally incorporate water into planning in some form, and that number is growing. For example, the 2015 Colorado Water Plan set a goal that 75 percent of Coloradans will live in communities that have incorporated water-saving actions into land use planning by 2025; communities across the state are working on that process, and 80 communities would have to take action to hit the 2025 deadline. Colorado also recently passed state legislation that outlines water conservation guidelines for planning and designates a new position in the state government to support the coordination of land and water planning.

Since 2000, when Arizona passed the Growing Smarter Plus Act, the state has required communities to include a chapter in their comprehensive plans that addresses the link between water supply, demand, and growth projections. It's happening in less dry places, too. The Manatee County, Florida, comprehensive plan matches water quality with need to make the best use of non-potable water. It includes codes for water reuse and alternative water sources to increase

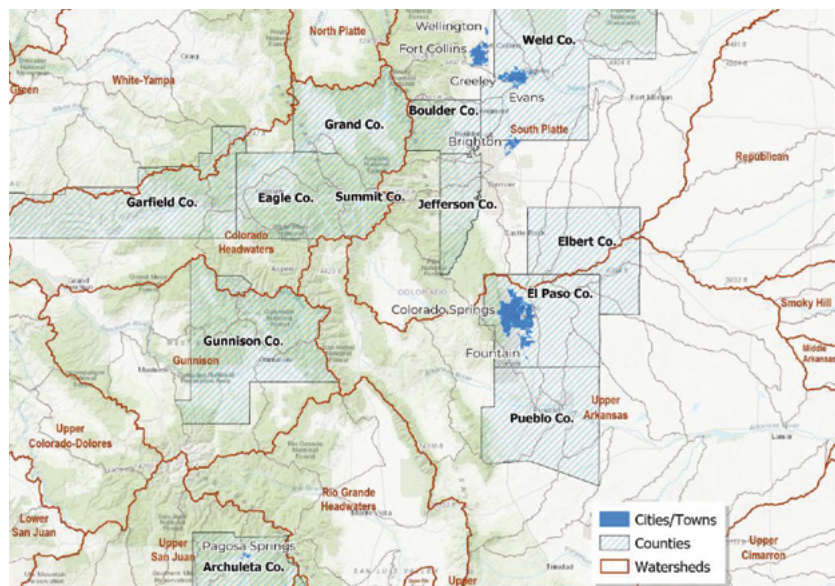
availability, and to make sure that water gets to the most appropriate destination.

To incorporate water into comprehensive plans, Quay says, communities need a concrete idea of the type and amount of their available resources. Water managers and planners can then work together to identify new and alternative water sources like treated wastewater and graywater (household water that has been used for things like laundry and can still be used for flushing toilets); to identify projected demand; and to outline how to meet it.

Embrace the power of local action. Even if water-related planning is not mandated by the state or incorporated in a community's comprehensive plan, water managers and planners can still find ways to collaborate. More specific local plans can include water supply and wastewater infrastructure plans; hazard mitigation and resilience plans, like floodplain and stormwater management; demand management; watershed processes and health; and plans for interagency coordination and collaboration. If those variables feel overwhelming, Berggren suggests that planners look to their peer communities for best practices. Although each community is different, he says, "no one needs to reinvent the wheel."

The integration of land use and water planning works best when it is included in state-level regulations or in comprehensive plans at the community level. According to the Babbitt Center, 14 states formally incorporate water into planning in some form, and that number is growing.

Growing Water Smart has trained and provided support for communities representing 62 percent of Colorado's population. The program has recently expanded to Arizona and expects to hold workshops in California and Utah within the next year. Credit: Sonoran Institute.



Local policy shifts can also include form-based codes that outline water-related aspects of the built environment. In Milwaukee, Sands says best practices for managing flooding and pollution include “updating municipal codes and ordinances to encourage green infrastructure and more sustainable practices.” That green infrastructure, which mimics natural processes at the site level through things like bioswales and stormwater storage, can make communities more resilient to climate change, while restoring ecosystems and protecting water supply.

Water-wise policy shifts can also come in the form of zoning ordinances, like smaller lot sizes. Planners can use subdivision and land development regulations to promote on-site capture, infiltration, and slow release of stormwater. Some communities have adopted plumbing codes that require high efficiency fixtures, or building codes that permit water recycling, or submetering to increase efficiency in multifamily residences. Fountain, Colorado, has conservation-oriented tap fees, which incentivize developers to meet water efficiency standards beyond the building code. Developers can pay lower tap fees if they agree to options like using native landscaping or including efficient indoor fixtures across a development.

The benefits of integrating land and water planning are myriad, from measurable results like adapting plans for development to ensure an adequate water supply to more indirect, long-term effects like reducing conflict between water users as supplies shrink. Back in Castle Rock, Schultz and his colleagues have observed that water-focused land use ordinances can have a big impact, and can benefit quality of life as a whole. It hasn't always been easy, Schultz says, but the new way of doing things seems to be paying off: “We've shown that we can do better if we provide a good foundation.” □

Freelance journalist **Heather Hansman** is *Outside* magazine's environmental columnist and the author of *Downriver: Into the Future of Water in the West* (The University of Chicago Press 2019).

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Detail from Colorado River Basin map. Credit: Babbitt Center for Land and Water Policy/Center for Geospatial Solutions.

A Cartographic Meditation

Mapping the Colorado River Basin in the 21st Century

By Zachary Sugg

WHERE IS the Colorado River Basin? A novice attempting a cursory Google search will be surprised—and perhaps frustrated, confused, or a little of both—to find that there is no simple answer to that question. Winding through seven U.S. states and two states in Mexico—and supporting over 40 million people and 4.5 million acres of agriculture along the way—the Colorado River is one of our most geographically, historically, politically, and culturally complex waterways. As a result, creating an accurate map of the basin—the vast area of land drained by the river and its tributaries—is not a simple undertaking.

Commonly used maps of the region vary widely, even on basic details like the boundaries of the basin, and most haven't kept up with changing realities—like the fact that the overtapped waterway no longer reaches its outlet at the sea. At the Babbitt Center, we began to hear a common refrain as we worked on water and planning integration efforts with stakeholders throughout the West: people frequently pointed out the flaws in available maps and suggested that addressing them could contribute to more effective water

management decisions, but no one seemed to have the capacity to fix them. So, with the help of the Lincoln Institute's newly established Center for Geospatial Solutions, we embarked on a mapping project of our own.

Our peer-reviewed Colorado River Basin map, newly published and included with this issue of *Land Lines*, seeks to correct several common errors in popular maps while providing an updated resource for water managers, tribal leaders, and others confronting critical issues related to growth, resource management, climate change, and sustainability. It is a physical and political map of the entire Colorado River Basin, including the location of the 30 federally recognized tribal nations; dams, reservoirs, transbasin diversions, and canals; federal protected areas; and natural waterways with indications of year-round or intermittent streamflow. We are making the map freely available with the hope that it will become a widely used resource, both within the basin and beyond.

Even though they have few words,
maps still speak.

Challenges, Choices, and Rationale

Even though they have few words, maps still speak. All maps are somewhat subjective, and they influence how people perceive and think about places and phenomena.

During the peer review process for our new map, one reviewer asked whether our purpose was to show the “natural” basin or the modern, aka engineered and legally defined, basin. This seemingly simple question raised several fundamental questions about what a “natural” basin actually is or would be. This struck us as akin to a perennial question facing ecological restoration advocates: to what past condition should one try to restore a landscape?

In the case of the Colorado, this question becomes: when was the basin “natural”? Before the construction of Hoover Dam in the 1930s? Before Laguna Dam, the first dam built by the U.S. government, went up in 1905? The 18th century? 500 years ago? A million years ago? In an era when the human–natural binary has evolved into a more enlightened understanding of socioecological systems, these questions are difficult to answer.

We struggled with this quandary for some time. On the one hand, representing a prehuman “natural” basin is practically impossible. On the other hand, we felt an impulse to represent more of the pre-dam aspects of the basin than we typically see in conventional maps, which often privilege the boundary based on governmental contrivances of the 19th and 20th centuries.

Ultimately, after multiple internal and external review sessions, we agreed on a representation that does not attempt to resolve the “natural” versus “human” tension. We included infrastructure, clearly showing the highly engineered nature of the modern basin. We also included the Salton Basin and Laguna Salada Basin, two topographical depressions that were formed by the Colorado. Both are separate from the river’s modern engineered course, and often excluded from

maps of the basin. We didn’t choose to show them because we expect the Colorado River to jump its channel any time soon, nor because we presume to accurately represent how the delta looked prior to the 20th century. But from our research, we learned that the 1980s El Niño was of such magnitude that river water from the flooded lower delta reached back up into the dry bed of the Laguna Salada, making commercial fishing possible there. Environmental management of the heavily polluted Salton Sea, meanwhile, is a contested issue that has figured in recent discussions about future management of the Colorado. These areas are not hydrologically or politically irrelevant.

Our map doesn’t attempt to answer every question about the basin. In many ways, our contribution to Colorado River cartography highlights the unresolved tensions that define this river system and will continue to drive the discourse around water management and conservation in the Colorado Basin.

There is no simple definition of the Colorado River Basin. That might be the most important underlying message of this new map. □

Zachary Sugg is a senior program manager at the Babbitt Center for Land and Water Policy.

FEATURED MAP

To order a map or download the PDF, visit www.lincolinst.edu/publications/maps-infographics/map-colorado-river-basin. To explore our Colorado River StoryMap, visit www.lincolinst.edu/research-data/data/co-river-storymap.



Through the Roof

What Communities Can Do About the High Cost of Rental Housing in America

By Ingrid Gould Ellen, Jeffrey Lubell, and Mark A. Willis

This is an excerpt from a new Policy Focus Report. To download a PDF of the full report, visit www.lincolninst.edu/through-the-roof.

OVER THE PAST half-century, U.S. households, especially renters, have seen a dramatic shift in their budgets. Rents have risen, incomes have not kept pace, and, as a result, renter households are spending a growing portion of their incomes on shelter. The share of renters who are rent-burdened—paying more than 30 percent of their income on rent—rose from less than a quarter in 1960 to nearly half in 2016. Even more striking, the share of renter households that are severely rent-burdened—paying more than half of their income on rent—rose from 13 to 26 percent during this same period. Housing costs have also risen for homeowners. Although many observers focus on affordable housing shortages in coastal cities like San Francisco and New York, housing cost burdens have risen throughout the country.

Evidence demonstrates that these cost burdens matter. Experimental studies show that federal housing choice vouchers, which pay part of a household's rent and significantly reduce the

likelihood of homelessness, also lead to improvements in standardized test scores (Schwartz et al. 2020). Children living in public housing are more likely than other poor children to be food secure and classified as “well” on a composite indicator of child health, perhaps because their parents can better afford nutritious food (March et al. 2009). Even small increases in disposable income can improve educational and health outcomes (Duncan, Morris, and Rodrigues 2011).

This report reviews the root causes and consequences of the growing lack of affordable housing. One reason current households spend so much more of their budgets on shelter is that we simply cannot supply enough units to meet the rising demand in many cities where strict land use regulations and growing local NIMBY (not in my backyard) opposition make building difficult and expensive. But lack of innovation and risk aversion in the building sector also likely play a part. So does the lack of buildable lots in



many of the places where people want to live. Other possible factors include the shrinking number of entities involved in housing development and property ownership, the growing flow of global investment, and the increasing involvement of large financial firms in the housing industry; these trends shape the type of construction that is built and contribute to higher housing costs and burdens. Building trends that favor larger housing units, the changing structure of the economy, and growing income inequality also widen the gap between marketplace rents and the budgets of low- and moderate-income families who need shelter.

Given the broad market forces at work, some may ask whether government can do anything to make a difference. This report argues that the answer is yes: government at all levels can take critical steps to substantially improve affordability. Local governments, given their powers over land use, building codes, permitting, and property taxes, are particularly well positioned to build broad-based, effective housing strategies that increase supply and affordability. Local governments rely on federal and state housing subsidy funds, but they typically have some discretion to determine how best to structure the programs and policies that use those funds.

The most effective local housing strategies are both comprehensive and balanced, making them more likely to garner political support from the wide coalition of interests needed to advance desired policy changes. They must incorporate the full set of tools available to local governments, including subsidies, tax incentives, land use regulations, and permitting reforms. They also advance four mutually reinforcing objectives: create and preserve dedicated affordable housing units; reduce barriers to new supply; help households access and afford private market homes; and protect against displacement and poor housing conditions.

Affordability Trends

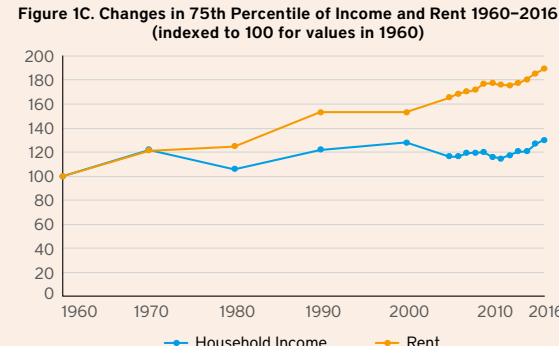
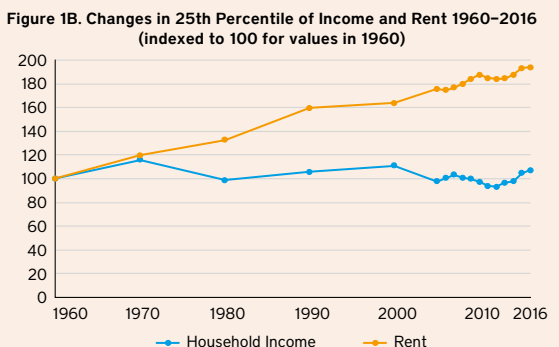
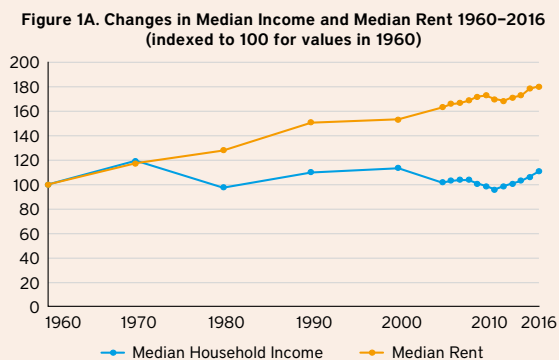
The current affordability crisis has deep roots. Since 1970, median rents have risen substantially more than median incomes (see figure 1A next page). Between 1960 and 2016, median income rose by about 11 percent in real terms while the real value of median gross rents (which include utility costs) rose by 80 percent. That's cruel math. Moreover, rents seem to have risen inexorably, even in the 1970s and in the first decade of the 21st century when the median income fell in real terms.

Figure 1B (next page) shows that the difference between rent and income growth was even sharper at the lower end of the distribution, with 25th percentile rents rising by 94 percent between 1960 and 2016, while 25th percentile incomes rose by just 7 percent. But rents outstripped incomes across the distribution. Figure 1C shows the same pattern, albeit less pronounced, for the 75th percentile of income and rents. The sharpest jumps in rent burdens occurred during the 1970s and the 2000s. In short, all renters are paying more of their income on rent now than they were in earlier decades. For those with below-median income, this translates into less money left over for other goods.

Evidence shows that rent-burdened households spend less on critical goods and services. The 2018 “State of the Nation’s Housing” report from Harvard’s Joint Center for Housing Studies shows that renters in the bottom income quartile who were rent-burdened spent almost \$650 less in 2016 on nonhousing goods and services (including food, health care, and transportation) than bottom-quartile households that were not rent-burdened (Harvard Joint Center for Housing Studies 2018). Similarly, Sandra Newman and Scott Holupka (2014) find that low-income families with higher housing cost burdens spend less on enrichment activities for their children.

Rents have risen, incomes have not kept pace, and, as a result, renter households are spending a growing portion of their incomes on shelter.

All renters are paying more of their income on rent now than they were in earlier decades. For those with below-median income, this translates into less money left over for other goods.



Role of Local Government

Given the power of local government action to address the housing affordability crisis, the local role is surprisingly undefined and inadequately supported. There is no consensus on what a local housing strategy entails or even that every community should have one. In contrast to the broad network of advocates, think tanks, and researchers focused on federal housing policy, only a handful of organizations focus on helping local governments develop more effective local housing strategies. There is also very little formal research evaluating which local housing strategies are most effective.

In an attempt to better define the local government role and develop evidence-based guidance for local leaders, in 2015 the authors convened a community of practice on local housing policy consisting of 14 leading experts from around the country, most of whom work in high-cost cities. The core working group included a city council member, current and former city housing commissioners, private and nonprofit developers, lenders, community development intermediaries, consultants, and community leaders. The community of practice identified six big-picture principles to define and guide local policy makers, all of which are described in more detail in the full report:

- **Local housing policy matters.** There is much that localities can do to improve affordability. Indeed, local governments are better positioned than other levels of government to lead the efforts to address their housing challenges.
- **Every community should have a local housing strategy.** While nearly all cities and counties have one or more policies that affect housing affordability and other housing outcomes, most have not developed a formal housing strategy . . . The important thing is to begin the process of developing a formal strategy with clearly articulated goals, policy tools, and metrics for measuring progress.

- **Localities should develop comprehensive approaches that reflect the policies of multiple local agencies.** Coordination can be difficult, but because the housing challenges in most jurisdictions are multifaceted and complex, local governments that bring to bear multiple tools in tackling their housing issues are likely to make more substantial progress.
- **Local housing strategies should be balanced.** Focusing on the full range of needs is important for maximizing both the political acceptance of a local housing strategy and the likelihood that a strategy will succeed.
- **Engage a diverse group of stakeholders to help localities develop effective, successfully implemented strategies.** Local officials should solicit input from community members—especially people of color, low-income people, and marginalized groups—at the start of the process; their inclusion will produce a stronger local housing strategy and help prevent delays during implementation. Investment in community engagement also improves the long-term government-community relationship for future planning processes.
- **Local housing strategies should include measurable goals and a process for reporting to ensure accountability.** Some cities have adopted goals tied to the overall number of housing units created or affordable units produced. Such big-picture numerical goals help measure and describe progress and are simple for policy makers and the public to understand. But they often miss important nuances such as the size of the units, the specific income levels of the households that can afford to live in them, and the proximity of the units to high-performing schools and public transportation . . . Adopting a set of goals rather than a single target provides a clearer picture of a community's progress. □

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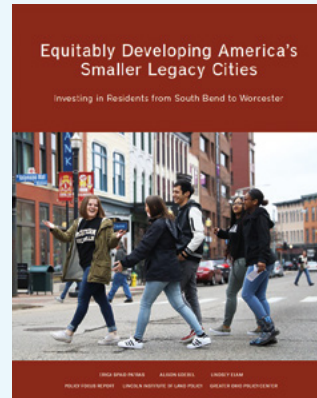
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- The authors of this report worked together to build and manage the National Community of Practice (CoP) on Local Housing Policy. To learn more about promising new housing policies and the policy framework the CoP developed, visit www.lincolninst.edu/through-the-roof.

Equitably Developing America's Smaller Legacy Cities

By Erica Spaid Patras, Alison Goebel, and Lindsey Elam



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To order or download: www.lincolnst.edu/equitably-developing-legacy-cities

FORMER INDUSTRIAL and manufacturing hubs like Dayton, Ohio, and Gary, Indiana—known as legacy cities—need not choose between economic growth and equity. Growth is most durable when it benefits everyone, according to a new Policy Focus Report and accompanying Policy Brief published by the Lincoln Institute of Land Policy in partnership with the Greater Ohio Policy Center. Legacy cities can promote long-term growth while addressing racial and economic inequities laid bare by COVID using strategies mapped out in *Equitably Developing America's Smaller Legacy Cities: Investing in Residents from South Bend to Worcester*. Using case studies of successful initiatives, the report guides practitioners through equitable investment in both physical projects and people. The report focuses on small to mid-size legacy cities with populations between 30,000 and 200,000 residents. Though they share many characteristics with their larger counterparts, these cities face unique challenges and require tailored approaches to revitalization.

Promising policies and strategies have emerged—as outlined in the 2017 Policy Focus Report *Revitalizing America's Smaller Legacy Cities* and in the digital library of the Lincoln Institute's Legacy Cities Initiative (legacycities.org)—and some legacy

cities have seen populations grow or stabilize. As the new report shows, durable revitalization requires explicit efforts to address stark social and economic inequities.

“Leaders in America’s smaller legacy cities are uniquely positioned to test, refine, and innovate equitable development practices,” write authors Erica Spaid Patras, Alison Goebel, and Lindsey Elam of the Greater Ohio Policy Center, a statewide nonprofit organization with a mission to improve Ohio’s communities through smart growth strategies and research. “A robust commitment to equity is a powerful tool that can lead to a brighter future for these communities.”

Drawing on years of experience conducting research, advocacy, and outreach on behalf of Ohio’s 20 legacy cities, the authors begin the report with an explanation of how greater equity can both improve access to opportunity and support the economic prospects of cities. For example, by providing better job training for longtime residents, a city can increase disposable income and encourage businesses to hire locally and ultimately stay in the city. Reducing entrenched

poverty and increasing citizen engagement can improve a community’s long-term financial health.

The authors detail seven strategies that can lay the groundwork for a city’s equitable development agenda. Strategies are tailored to the unique challenges of small to mid-size legacy cities and also draw on their unique opportunities, such as a lack of market pressures that allows leaders more time to get plans right.

“The strategies outlined in *Equitably Developing America’s Smaller Legacy Cities* will be vital in rebuilding more racially and economically equitable legacy cities,” said Akilah Watkins, CEO and president of the Center for Community Progress. “Every municipal leader in the country should engage with this guide and be bold in their efforts to revitalize their communities in a post-COVID era.” □

“Every municipal leader in the country should engage with this guide and be bold in their efforts to revitalize their communities in a post-COVID era.”

—Akilah Watkins, CEO and president of the Center for Community Progress



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— Larissa Larsen, *Journal of the American Planning Association*

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