Land Lines

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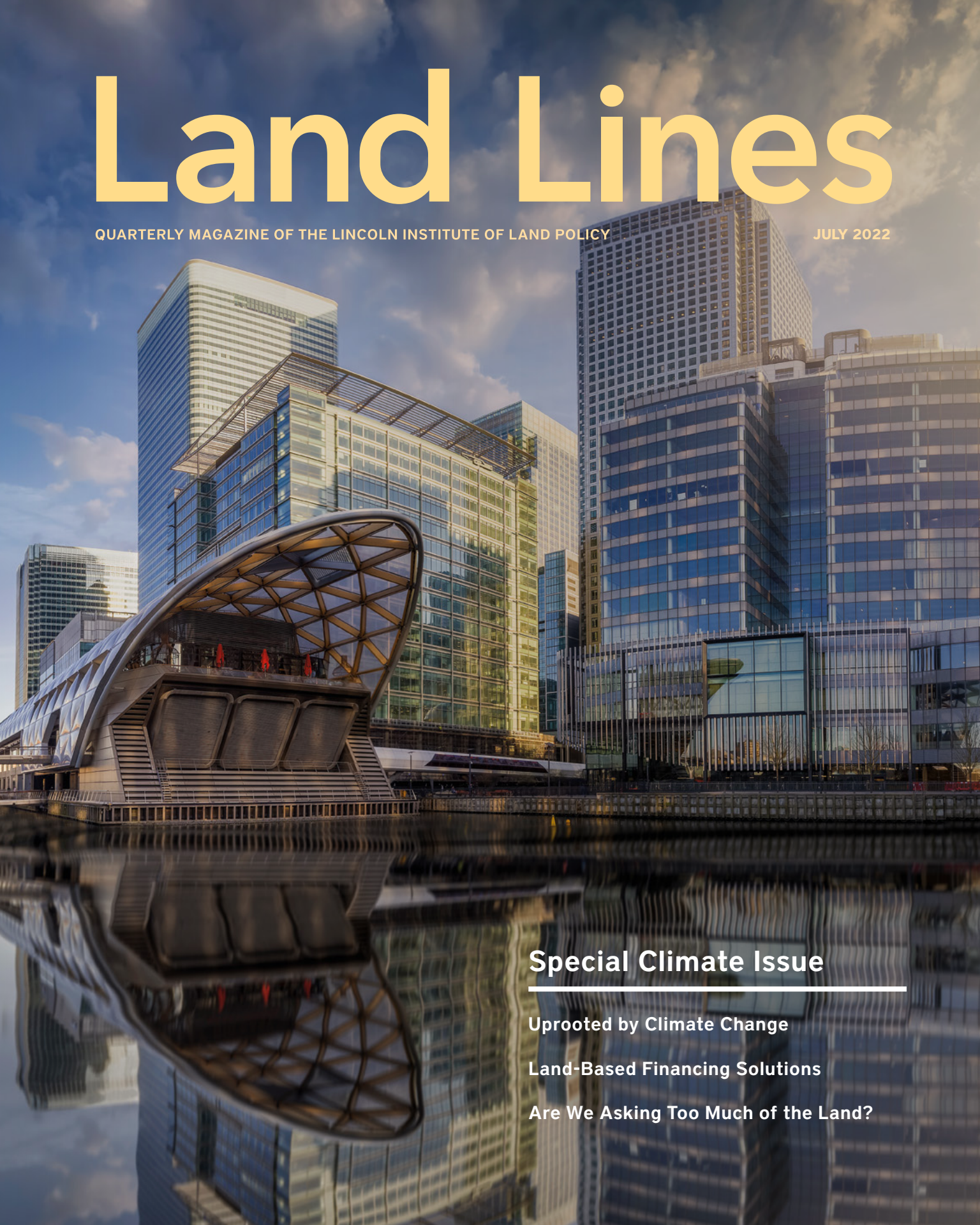

Special Climate Issue

Uprooted by Climate Change

Land-Based Financing Solutions

Are We Asking Too Much of the Land?

Land Lines

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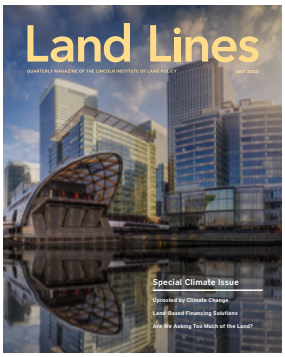


Canary Wharf railway station, London. Credit: SHansche via iStock/ Getty Images Plus.

How to Fend Off Land Speculation

CLIMATE CHAOS IS AFFECTING PEOPLE EVERYWHERE AROUND THE WORLD, including in the United States, and it is far past time to do something about it. To avert the most catastrophic impacts of this global crisis, we must transition to net-zero emissions by 2050 by investing in clean energy, electrifying our transportation, improving the energy efficiency of buildings, and removing greenhouse gases from the atmosphere.

The transition to net-zero emissions will require unprecedented changes in land use and encumber similarly unprecedented investments. For example, MIT estimates that it would take eight million acres of land to meet the 2050 electricity demands of the United States with photovoltaics—that's only three times the land area of all golf courses in the country, 40 percent of the total area of rooftops, or 16 percent of land area covered by major roadways. While we do not anticipate meeting all electrical power needs this way, these comparisons give us a chance to calibrate the challenge and our expectations about whether we can meet it. We can.

As to how we'll pay for it, the global consulting firm McKinsey recently estimated that the transition to net-zero emissions would cost around $275 trillion (about three times the global GDP) in public and private investment in new energy and land use systems over the next three decades, an increase of $3.5 trillion annually from current spending. For comparison, in today's dollars, we spent around $500 billion over six decades to build the U.S. Interstate Highway System, around $180 billion to rebuild OECD countries in the two decades after World War II, $675 billion to fund the New Deal in the 1930s, and $850 billion for the American Recovery Act in the decade after 2009. In other words, our additional annual investments will exceed the total of all these "once in a generation" undertakings, each of which took a decade or more to complete. But unlike those projects, this effort calls for significant private contributions to supplement unparalleled public investment.

Whenever we've encountered intractable financial challenges—like the infrastructure investment needed to serve two billion new urban dwellers in the next three decades—I've always responded with the same four words: the answer is land. Since our inception more than 75 years ago, the Lincoln Institute has obsessed over how land gets its value. In the last few years, we've tracked an exponential increase in interest in the potential of land value capture—the public recovery of the share of land value attributable to public actions. Places as diverse as Seoul, Korea, and São Paulo, Brazil, have shown how land value capture can pay for essential but seemingly insurmountable infrastructure needs. We know that investing in decarbonization can increase the value of land, and that the public can then recover a share of this value to pay for the investment itself.

But while the public sector strives to capture its rightful share of publicly generated land value, private landowners are walking away with even bigger spoils by arbitraging information, something that arguably exerts greater power in determining the value of land. Whether and how policy makers respond to the connection between information and land values will have a huge bearing on how much it will cost to reach net-zero carbon emissions by 2050, and how we pay for it. Which brings us to a slightly different

Hsinchu and other cities in Taiwan have used a land value increment tax, or LVIT, to counter land speculation. Credit: Sean Pavone via iStock/Getty Images Plus.

land-based financing tool that is proving effective in countering land speculation and could yield even more revenue than capturing publicly generated values: the land value increment tax (LVIT). Before we delve into that tool, let's explore the issue it's meant to address.

Whether and how policy makers respond to the connection between information and land values will have a huge bearing on how much it will cost to reach net-zero carbon emissions by 2050, and how we pay for it.

Information lies at the root of private land value capture, often called naked speculation, which has financed land development for centuries. Everyone knows the three biggest determinants of land value: location, location, location. The salient information for land speculation is advance knowledge of what will happen in specific locations. In the 1960s, the Walt Disney Company used shell companies to secretly purchase 27,000 acres of Central Florida swampland at an average cost of $200 per acre to build its Walt Disney World resort. Disney needed only 10,000 acres for the development, but it knew that news of its investment would drive up land prices for the whole region. The company kept its intentions under wraps to capture the land value increment for itself, while it also negotiated with the State of Florida for unprecedented private control of development on its lands. (That agreement is now in peril due to political conflicts with the state.) Once the future development was announced, the same land was valued at $80,000 per acre, a tidy windfall of more than $2 billion on an investment of just over $5 million. Disney leased the extra land to cover the costs of expanding its attractions to include the EPCOT center, among other things.

The climate crisis and the prospect of mass extinctions have opened a whole new area of land speculation. Reports like the Intergovernmental Panel on Climate Change's *Climate Change and Land*, which painstakingly documents both

positive and negative climate impacts on land around the globe, are like catnip to investors looking to acquire land that will benefit from climate change. Land with privileged access to scarce resources like water, higher ground for those retreating from rising seas, or critical habitats targeted for conservation are prime targets for speculators. Ironically, environmental advocates unintentionally fuel speculation by producing detailed analytics to guide conservation efforts or to build the political will to promote climate resilience, only to see private investors use the data for profit.

Leaving ethical considerations aside for a moment, the practical implications of land speculation are devastating. Conserving land to address the climate crisis or mass extinctions is already an expensive proposition. As Christoph Nolte, a social-environmental data scientist at Boston University, notes, the $4.5 billion Great American Outdoors Act of 2020 was designed to provide sufficient funding to protect the habitat for all endangered species in the United States. By his estimates, the funding will protect only 5 percent of the needed land, because land values are already much higher than estimated.

Every dollar gained by land speculators represents an additional dollar of public, private, or philanthropic investment that will be needed to protect critical habitat or mitigate the climate crisis. If policy makers are serious about mitigating climate change or conserving land and water resources, they cannot allow private investors to stay 10 steps ahead of the public.

There is one easy way to prevent the astronomical windfalls of land speculation. Among the many effective land policy instruments we've studied, the land value increment tax (LVIT)—a well-known and well-tested tool—is best for minimizing land speculation. A tax on realized unearned gains in land values, the LVIT has been applied at rates as high as 90 percent in places like Taiwan, where the tax now ranges from 40 to 60 percent. The revenues generated by the LVIT can be invested in climate resilience or habitat protection, ensuring that increases in land value are used for public benefit. Other land policies, like limitations on foreign ownership of land that minimize international speculation, are good supplements to the LVIT.

The revenues generated by the land value increment tax can be invested in climate resilience or habitat protection, ensuring that increases in land value are used for public benefit.

Mitigation of the climate crisis and the prevention of mass extinction will require unprecedented changes in land use across the globe. In past issues I've discussed ambitious efforts to protect 30 percent of Earth's land and water resources by 2030 and half of the planet by 2050. We'll also need to transform the landscape to accommodate climate migrants and renewable energy production. Without proactive measures to minimize the impact of private land speculation, we will bankrupt the public weal and drain philanthropic coffers before we can make a dent in reducing global warming or protecting any species—including *homo sapiens*. It is hard enough to build the political will to tackle existential threats. Why would we unwittingly allow others to inflate the cost of our efforts for their own private windfalls? We already know the remedy we need to chill land speculation—an aggressive LVIT. Can we summon the courage to use it?

A version of this article first appeared in Public Finance *magazine, the journal of the London-based CIPFA (Chartered Institute of Public Finance and Accountancy).*

Zhubei, Taiwan. Credit: Ren-Shiang Ye via iStock/Getty Images Plus.

New Tools for Managing Local Climate Goals

In Minneapolis, light rail offers a zero-emissions transit option. Regional planning agencies in the Twin Cities and Metro Boston are helping municipal leaders access and understand emissions data. Credit: Wiskerke via Alamy Stock Photo.

IN THE INCREASINGLY URGENT EFFORT to curb greenhouse gas emissions and slow the damaging effects of climate change, local policy makers and planners are playing a critical role. The good news is they have access to more data than ever. But wrangling, sorting through, and making sense of all this information can be a major challenge.

A new crop of technological tools is helping to capture data related to municipal greenhouse gas emissions, organize it comprehensibly, and make it easier for municipal leaders to access.

In Minneapolis–St. Paul, the Twin Cities Metropolitan Council is working on an ambitious new effort to support local climate decisions. According to the Environmental Protection Agency, Minnesota's emissions per capita as of 2016 were slightly above the national average of 16 metric tons of carbon dioxide per person. But breaking down the details behind that number can be complicated. Making it less complicated is a major goal of the council, a regional policy-making body, planning agency, and provider of essential services including transit and affordable housing for a seven-county region that includes 181 local governments.

In the works for about three years and set for release later this year, the Metropolitan Council's Greenhouse Gas Scenario Planning Tool grew out of the council's work to promote regional livability, sustainability, and economic vitality, and is ultimately intended for use by any municipality in the United States.

Intriguingly, the process began by assembling a team of partners including several leading academics (from Princeton University, the University of Texas at Austin, and the University of Minnesota) studying various aspects of climate change, as well as private-sector nonprofit partners—"giving us access to all the science and innovation that academia can bring, combined with the practical wisdom of government," says Mauricio León, senior researcher for the Metropolitan Council.

León's duties include greenhouse gas emissions accounting for the Twin Cities region, which makes him familiar with the complexities of both measuring emissions in the present and figuring out how to project that data under different future scenarios. The council recognized that this can be a time- and resource-consuming challenge for

local governments. That realization led to the idea of building a web application that draws on existing databases and is adjustable according to specific policy strategies.

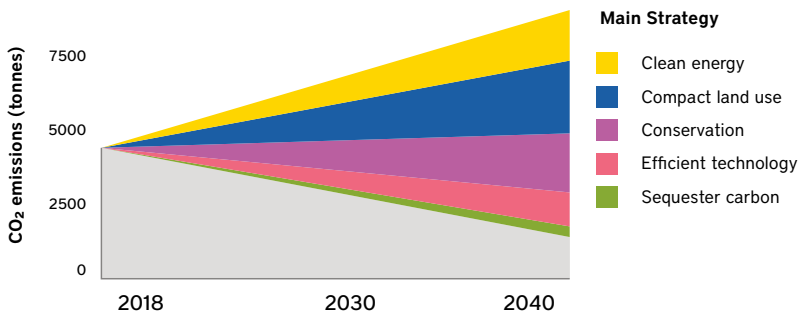
León and one of the council's academic partners, Professor Anu Ramaswami—a civil and environmental engineering professor at Princeton who has been the principal investigator in the project—emphasized that such public/academic partnerships don't happen often. "This is rare," says Ramaswami, who has worked with individual cities for years, but seldom on a project meant to serve such a broad range of municipalities and local governments.

Set for release later this year, the Metropolitan Council's Greenhouse Gas Scenario Planning Tool grew out of its work to promote livability, sustainability, and economic vitality, and is ultimately intended for use by any municipality in the United States.

In terms of the process, she says, scientists and policy makers jointly framed the relevant questions, then built the model together. The collaborators identified data sets related to the primary sources of emissions. In the Twin Cities area, for example, about 67 percent of direct emissions comes from "stationary energy" such as the electricity and natural gas used to power homes and buildings, while 32 percent comes from on-road transportation. The team also identified the most promising reduction and offset strategies and policies, including regulations, economic incentives, public investments, and land uses such as parks and greenways. With three focus areas or modules—building energy, transportation, and green infrastructure—the application is designed to show policy makers the potential outcomes of various mitigation strategies. The overarching framework is pegged to the goal of local governments achieving zero emissions by 2040, an aspirational target adopted by the Metropolitan Council.

In a preliminary conceptual demonstration of the tool at the Lincoln Institute's Consortium for Scenario Planning (CSP) conference earlier this year, León showed how different types of communities, from cities to rural areas, will have different impacts and strategy options. A city has a lot of transit options, for example, that a rural community doesn't have. Policy makers using the tool can also factor in other key considerations, such as the equity implications of greenhouse gas reduction strategies that may impact some segments of a community more than others. "You can use this tool to create a portfolio of strategies that's based on your values," León explained.

With similar goals but a different approach, Boston's Metropolitan Area Planning Council (MAPC) unveiled a localized greenhouse gas inventory tool several years ago. MAPC's tool focuses less on future scenarios and more on providing community-specific, accurate baseline data and estimates of the impacts of various activities and sectors. Guided in part by a greenhouse gas inventory framework developed by the World Resources Institute, C40 Cities, and ICLEI-Local Governments for Sustainability, it attempts to measure a municipality's direct and indirect emissions.



A sample chart from the beta version of the Metropolitan Council's greenhouse gas scenario planning tool shows the relative impact of various emissions reduction strategies. Credit: Courtesy of Met Council.

Officials in Natick, Massachusetts, used a tool developed by Boston's Metropolitan Area Planning Council to gauge the town's largest sources of emissions. Credit: Denis Tangney, Jr. via iStock/Getty Images Plus.

Jillian Wilson-Martin, director of sustainability for Natick, Massachusetts, says the MAPC effort furnished data and estimated impacts of car emissions, home heating, lawn care, and other factors that would be difficult for an individual town to collect. This helped Natick gauge its biggest sources of emissions, the starting point of devising strategies to reduce them. Paired with offsets, the town aims to reduce its net emissions from nine metric tons per capita to net zero by 2050. "It's making it easier for smaller communities with no sustainability budget to get this really important data so they can be more effective," Wilson-Martin says.

While MAPC provides guidance and training resources to the 101 cities and towns it serves in eastern Massachusetts, it's up to leaders in each municipality to customize how they measure their local emissions inventory, and how they might use that for planning. This may limit specific forecasting uses, but has another payoff, says Tim Reardon, director of data services for MAPC. "Ultimately, the value of having a nuanced and locally tailored tool is to gain credibility and buy-in with stakeholders at the local level," Reardon explained at the CSP conference. While big-picture data that doesn't apply to a particular community can be a turnoff, he said, local data brings the global climate crisis down to the ground and reduces a barrier to talking about what has to happen locally to ensure a resilient future.

Often, in discussions around greenhouse gas scenario planning, "there's this element of 'this is just too complex for us to even think about,'" León agrees. The council's simple web tool is meant to help counter that argument. It's designed to show in clear, graphic form the difference in emissions levels that would result from adopting various specific tactics, versus simply continuing the status quo.

One benefit of such an accessible tool, Ramaswami adds, is that it encourages wider involvement and thus "opens up more creative opportunities." In fact, she says, the Twin Cities project has had a similar effect on its academic partners: "It requires a different kind of research mentality, and a different kind of research group" to work directly with municipalities and respond to real policy options. When the tool is released, it will be accompanied by the publication of related academic research from Ramaswami and the group's other scholarly partners.

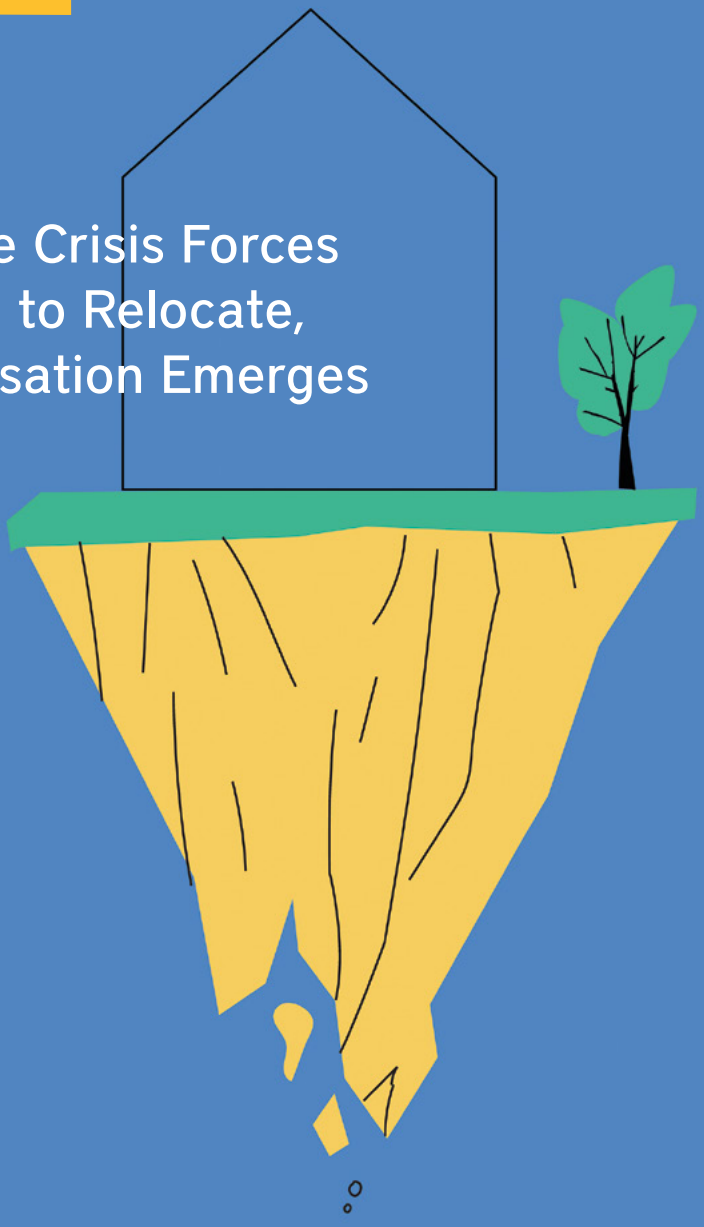
"It's making it easier for smaller communities with no sustainability budget to get this really important data so they can be more effective."

León acknowledges that the application will have its limits, and that ultimately more sweeping federal and global policies will have greater total impact than any single local initiative. But anything that boosts engagement is important, he says. And the web application is designed to encourage municipalities of all sizes to interact with the calculations and numbers the project team has compiled; they won't have to upload their own data. "It's really easy," León says, "and there's no excuse for them not to use it." □

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.

Uproot

As the Climate Crisis Forces U.S. Residents to Relocate, a New Conversation Emerges



ted

By Alexandra Tempus

EVEN THOUGH SHE'S EXPECTING IT, Frances Acuña screens my call. "I've been getting a lot of people trying to buy my house," she explains, after calling me right back. "Sometimes I get five letters in the mail. Five, six, seven, ten calls."

The Dove Springs neighborhood in southeast Austin, Texas, where Acuña has lived for 25 years, is just 15 minutes from downtown and right on the edge of the latest wave of gentrification. A decade ago, she says, outsiders wanted no part of the working-class community of modest ranch homes: "To them it was a ghetto area."

Then in 2013, the waters of nearby Onion Creek—burdened by nearly 10 inches of rain in a single day—poured into the streets. Five residents died, and more than 500 homes were flooded. Two years later, another historic flood swept in. The City of Austin, which had already begun to buy out and remove homes from this low-lying area with the help of federal grants, accelerated its efforts, eventually acquiring and demolishing more than 800 homes.

Property acquired through FEMA-funded home buyout programs is legally required to remain "open in perpetuity," allowing it to safely flood in the future. In this case, the city transformed hundreds of acres of land left behind near Dove Springs into a park. The area now boasts attractive amenities—a playground, a dog park, walking trails, and shady places to rest.

These urban improvements, explicitly driven by climate adaptation policy, have made the area even more appealing to the city's recent influx of newcomers. (With an estimated 180 new arrivals per day in 2020, Austin ranks among the country's fastest-growing metro areas.)

But for Acuña, the park is a painful reminder of neighbors who suffered losses—and of the fact that even well-intentioned efforts to move people out of harm's way can themselves cause harm. "To me, it's not a happy place to go to," Acuña says. "Maybe [new residents] don't even know, because all they see is green space."

How can climate relocation occur in a way that avoids gentrification and displacement . . . and ensures that those who relocate can find safe, affordable places to live?

As floods, wildfires, hurricanes, and other disasters escalate under the influence of climate change, experts from the Natural Resources Defense Council (NRDC) to the U.S. Government Accountability Office now widely recommend that municipalities move homes and infrastructure out of hazard-prone areas to save lives and money. But how can that kind of relocation occur in a way that avoids gentrification and displacement, honors the culture and history of the original residents, encourages a shift from reactive to proactive planning, and ensures that those who relocate can find safe, affordable places to live?

These are the kinds of questions Acuña and a growing web of other community leaders, planners, researchers, agency officials, and policy makers are coming together to address as part of the national Climigration Network.

Credit: Graphics created by Erika Diaz Gómez and Lina María Osorio for *Lead with Listening*, a guidebook produced by the Climigration Network and funded by the Doris Duke Charitable Foundation.

ESTABLISHED IN 2016 BY THE CONSENSUS BUILDING INSTITUTE, the Climigration Network aims to be a central source of information and support for U.S. communities experiencing or considering relocation due to climate risks. More than 40 percent of U.S. residents, some 132 million people, live in a county that was struck by climate-related extreme weather in 2021 (Kaplan and Tran 2022). Population growth in wildfire-prone areas doubled between 1990 and 2010, and continues to rise. And FEMA counts 13 million Americans living in the 100-year flood zone, while at least one prominent study says the figure is closer to 41 million (Wing et al. 2018).

The United Nations, the World Bank, and scholars alike recognize that most climate-driven migration occurs *within* national borders, not across them. But in the United States, conversations about the systems needed to support climate migration have been slow to coalesce, even as climate change bears down on riverine, coastal, and other vulnerable regions. A White House report on the issue released last year marked, by its own estimation, "the first time the U.S. government is officially reporting on the link between climate change and migration" (White House 2021).

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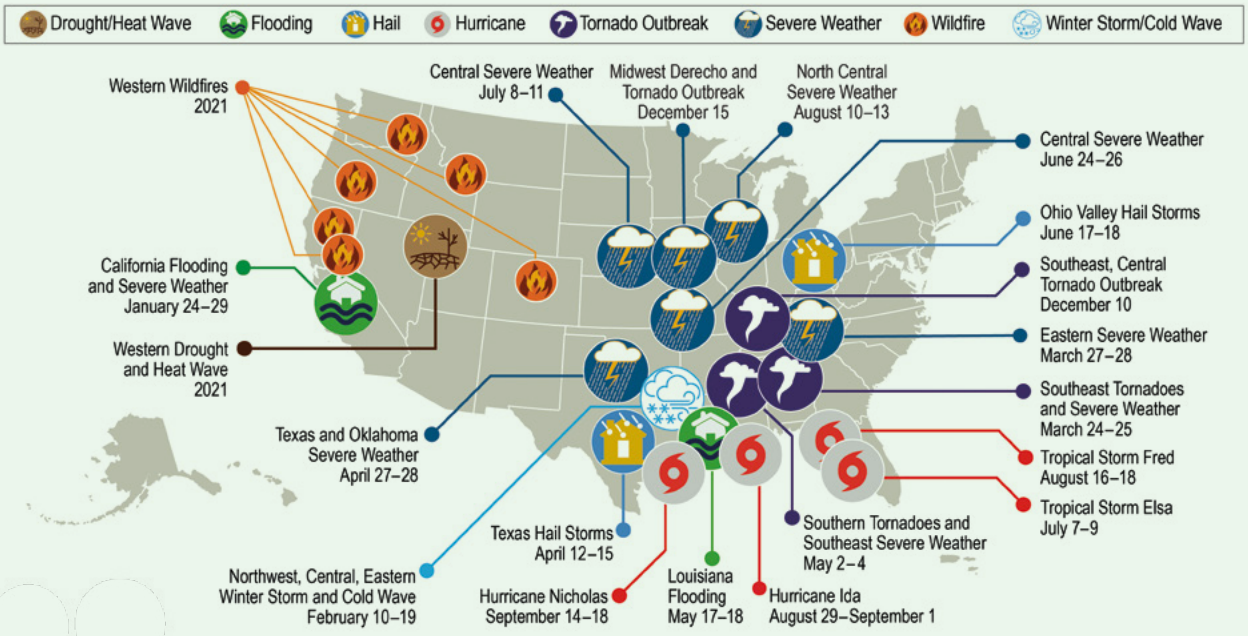
Currently, most climate-related relocation in the United States happens the way it unfolded around Dove Springs. After a disaster strikes, federal recovery money, usually through FEMA

Billion-Dollar U.S. Weather and Climate Disasters, 2021

The United States saw 20 weather and climate disasters in 2021 that each caused more than $1 billion in damages. The annual average was 17.8 such events from 2017 to 2021, and 7.7 events from 1980 to 2021 (cost estimates adjusted based on the Consumer Price Index).

*This map denotes the approximate location for each of the **20 separate billion-dollar weather and climate disasters that impacted the United States in 2021**.*



Source: NOAA National Centers for Environmental Information (NCEI).

In 2013, flash floods affected hundreds of homes in Dove Springs and other Austin, Texas, neighborhoods. The city has now purchased and demolished 800 properties vulnerable to chronic flooding. Credit: *Austin American-Statesman*/USA TODAY Network.

or the Department of Housing and Urban Development, is funneled to states and municipalities to buy out damaged homes. Individual homeowners sell their homes at prestorm market value to the government and move elsewhere. According to the NRDC, FEMA has funded more than 40,000 buyouts in 49 states since the 1980s.

Yet, despite federal buyout programs dating back decades, no official set of best practices or standards exists. Wait times for buyouts take five years on average. Costs for fixes and temporary housing stack up in the interim. Guidance for homeowners on navigating the buyout process is confusing or nonexistent, and relocation policies and funding focus on the individual, not on neighborhoods or communities that want to stay together.

At the local level, communities considering relocation face a range of social and financial barriers. Municipalities don't tend to encourage relocation, because they don't want to lose population or tax revenue. And residents—especially those reeling from a crisis—often lack the capacity and resources to find a new, safe place to live, even if they are willing to leave.

Despite those obstacles, some small towns have designed new neighborhoods and even entire new towns to relocate to. In the 1970s, a couple of Midwestern villages experiencing chronic flooding—Niobrara, Nebraska, and Soldiers Grove, Wisconsin—initiated some of the earliest community relocation projects. In the 1990s, Pattonsburg, Missouri, and Valmeyer, Illinois, among others, relocated to higher ground following the Great Flood of 1993 along the Mississippi River. As climate impacts escalate, towns and neighborhoods from the Carolinas to Alaska are developing similar plans. But knowledge sharing is rare, as is coordination that could help other communities to refine or even reimagine the process.

The Climigration Network, in partnership with the Lincoln Institute and others, is connecting climate-affected communities with one another and with professionals poised to help. One of its early concerns was how to introduce the concept of "managed retreat" as an adaptation option for communities facing substantial risk. Meant to convey strategic moves away from disaster-prone areas, the term had become common in the policy discussions that had followed hurricanes and major floods over the previous decade. Should New York City consider managed retreat from its coastline, instead of costly and potentially ineffective seawalls, after Superstorm Sandy? Should Houston, after Hurricane Harvey? Policy makers, planners, and researchers discussed these questions at length, often without input from the affected

A volunteer helps with flood clean-up in the Dove Springs neighborhood of Austin, Texas, in 2013. Credit: *Austin American-Statesman*/USA TODAY Network.

communities, which found the term and the concept alienating.

As the Climigration Network began its work, it was immediately obvious that a different kind of conversation was needed, says its director, Kristin Marcell. With funding from the Doris Duke Charitable Foundation, the network commissioned a Black and Indigenous–led creative team whose members hailed from or had worked with communities affected by the climate crisis. The team, helmed by Scott Shigeoka and Mychal Estrada, proposed reframing the discussion around the actual issues facing towns and neighborhoods that might relocate.

Project leaders invited more than 40 frontline leaders to share their post-disaster experiences, and the network compensated them for that work. The result was a set of real-world insights now compiled in a guidebook for discussing climate relocation.

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One clear takeaway: "managed retreat" suffers from more than bad branding. The word "managed," community leaders made clear to the researchers, calls to mind paternalistic, top-down government programs. In Black and brown communities, it conjures not-so-distant memories of forced removal—the slave trade, the Trail of Tears, internment camps, redlining. And the concept of "retreat" left a lot of questions unanswered.

"It creates a negative narrative that people are *fleeing from* something, instead of *working toward* something else," the researchers wrote in the guidebook. "The word communicates *what* we should do, but doesn't communicate *where* to go or *how* to do it" (Climigration Network 2021).

THE CLIMIGRATION NETWORK IS NOW DRAWING ON THOSE INSIGHTS IN CONVERSATIONS with three community-based organizations in the Midwest, Gulf Coast, and Caribbean that are supporting locals actively weighing adaptation strategies including relocation. Partners in these conversations include the Anthropocene Alliance, a coalition of flood and other disaster survivors across the United States, and Buy-In Community Planning, a nonprofit working to improve home buyout processes.

Network members have started using more empowering alternatives to "managed retreat," including "community-led relocation" and "supported relocation." But the goal isn't to come up with a single new term or a rigid plan that can be universally adopted. As Marcell notes, it can be "very offensive" when outsiders approach communities with nothing but models and templates.

"You can't expect to build trust in a community if you don't start with an open-ended conversation about how to approach the issue, because [each] context is so unique," she says.

Instead, the network aims to co-create, with each of the three community-based organizations, a method for identifying the specific needs and goals of each place. That includes identifying and interviewing community "influencers" and, with the help of Buy-In Community Planning, developing questions for a door-to-door survey.

"There's a lot more individual interaction and coaching that needs to be done with people who are at the hard edge of climate change," says

Osamu Kumasaka of Buy-In Community Planning. He first came to this conclusion while working as a Consensus Building Institute mediator in Piermont, New York, in 2017. The Hudson River town was experiencing the beginnings of chronic flooding: water in basements, swamped backyard gardens, denizens wading through streets on their way to work. A wealthy small town with its own flood resilience committee and access to world-class flood risk data, Piermont nonetheless found itself uncertain about how to move forward.

"We really struggled to figure out how to squeeze all the work that needed to be done with all these homeowners into public meetings," Kumasaka says. Each household had very specific factors influencing decisions to stay or leave: elderly parents with special needs, kids about to graduate from high school, plans to retire. Organizing surveys, small discussions, and individualized risk assessments was a more effective approach, Kumasaka says, in helping the community get a better picture of where it stands and where it wants to go.

In the end, the hope is that this type of legwork can help inform a community strategy, from identifying risk tolerance to submitting an application to a buyout program. The network and its partners hope this highly customizable approach will help communities navigate around barriers others can't see.

Just as the Climigration Network did when gathering input from frontline leaders for its guidebook, Buy-In Community Planning compensates members of the three community organizations for their time and insights. It's a key element of the process—helping to flip the dynamic from one in which outsiders dole out generic research and expertise into a true collaboration in which locals and professionals alike are paid to work toward a shared goal.

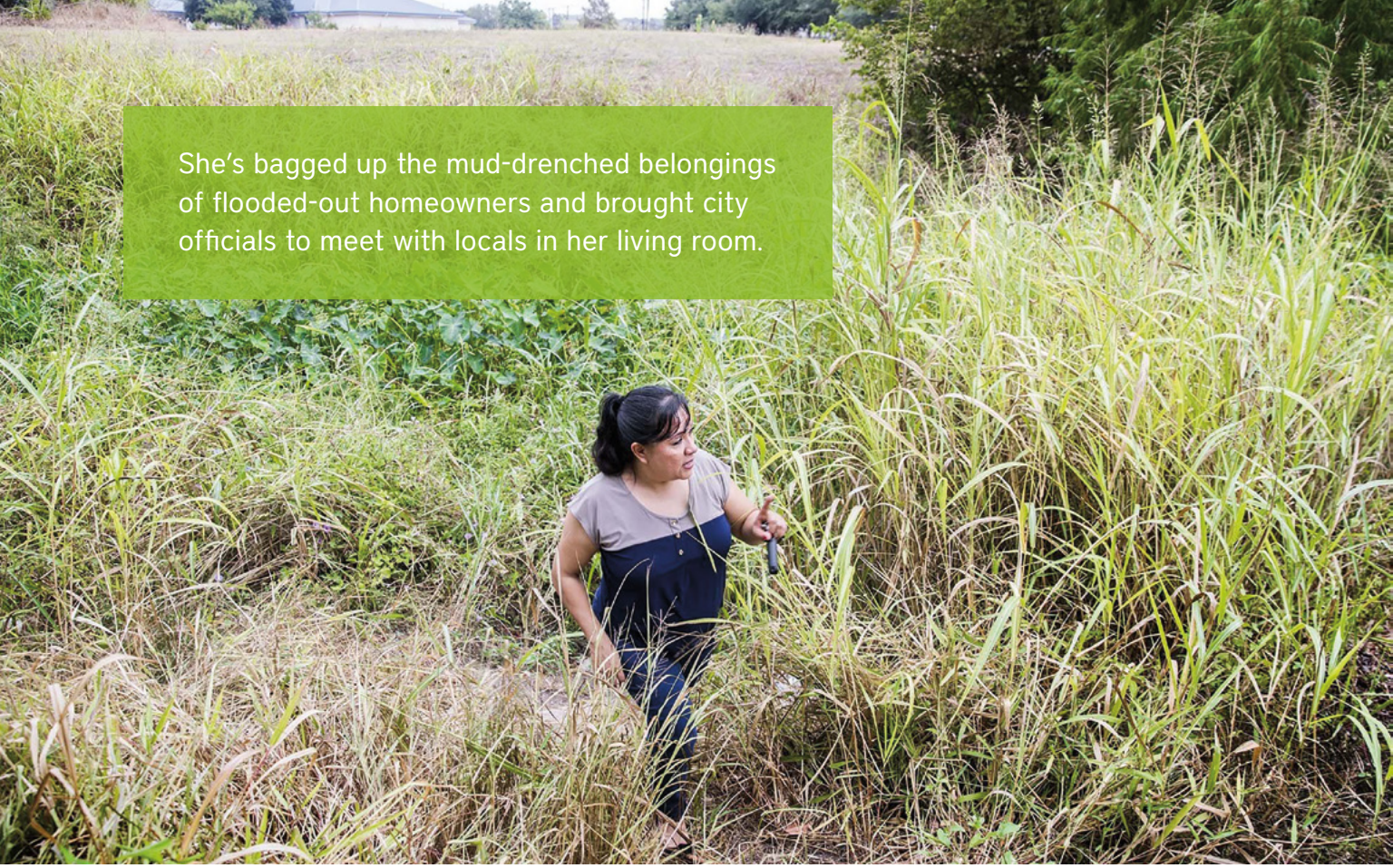
RELOCATION IS AN ESPECIALLY THORNY SUBJECT in low-income, largely Black and brown communities, because residents haven't historically been extended the same flood protections provided to those in wealthier areas. In discussions about home buyouts, as Kumasaka puts it, there tends to be a "feeling that it's not fair to jump right to relocation."

It's a fair point, and represents a vicious cycle. In 2020, the FEMA National Advisory Council endorsed research findings that "the more Federal Emergency Management Agency money a county receives, the more whites' wealth tends to grow, and the more Blacks' wealth tends to decline, all else equal." Because funding tends to go to larger communities better positioned to match and accept those resources, "less resource-rich, less-affluent communities cannot access funding to appropriately prepare for a disaster, leading to inadequate response and recovery, and little opportunity for mitigation. Through the entire disaster cycle, communities that have been underserved stay underserved, and thereby suffer needlessly and unjustly" (FEMA NAC 2020).

"Through the entire disaster cycle, communities that have been underserved stay underserved, and thereby suffer needlessly and unjustly."

The concept of voluntary relocation remains fraught, and the Climigration Network's three community partners preferred not to be interviewed or identified in this article. The stakes are high as this global crisis makes itself felt locally, and careful engagement can mean the difference between quite literally keeping a community together, or not.

With its focus on community voices, a project like this could signal a seismic shift in how the United States approaches climate migration, says Harriet Festing, executive director of the Anthropocene Alliance. Festing, who helped the Climigration Network build relationships with the three community organizations, which are all part of the Anthropocene Alliance network, underscores the emerging theme of this work: "Really the only people who can change that conversation [are] the victims of climate change themselves."



She's bagged up the mud-drenched belongings of flooded-out homeowners and brought city officials to meet with locals in her living room.

Frances Acuña walks through a detention pond area designed to help protect her Austin, Texas, neighborhood from flooding. Credit: *Austin American-Statesman*/USA TODAY Network.

BACK IN AUSTIN, FRANCES ACUÑA WORKS as an organizer with Go Austin/Vamos Austin, or GAVA, a coalition of residents and community leaders working to support healthy living and neighborhood stability in Austin's Eastern Crescent, which includes Dove Springs. One of her roles is helping her neighbors better prepare for disaster by taking steps like getting flood insurance, dealing with insurance agents, and learning evacuation routes. She's bagged up the mud-drenched belongings of flooded-out homeowners, brought city officials to meet with locals in her living room, and triaged emergency situations—like when an elderly couple that had been evacuated following a flood found themselves with three dogs, two cats, and nowhere to stay.

"I used to love thunder and lightning and pouring rain. It was like seeing God himself in the flesh," Acuña says. Now, she adds, she can't go long in a rainstorm before nervously checking out the window.

Austin's buyout program in her area provided relocation assistance for homeowners, who had the option to reject or counter the buyout offers they received. But many did not want to leave at all, lobbying unsuccessfully for the city to implement solutions such as a flood wall or channel clearing.

Despite nearby flooding and the calls and mail from realtors and developers, Acuña has no immediate plans to leave her home. Taking part in Climigration Network conversations with other local leaders guiding their communities through floods, fires, and droughts, she says, has provided a major release: "It was a very therapeutic process, at least for me."

In addition to the guidebook, the input from those frontline leaders—who hailed from 10

CLIMATE MIGRATION BY THE NUMBERS

20 million people are forced to relocate within their countries each year by increasingly intense and frequent extreme weather

216 million people will be forced to move within their countries in Asia, Africa, and Latin America by 2050, according to the World Bank

80% **of global climate migrants are women**

162 million U.S. residents are expected to experience a decline in their environment in the **next 30 years**

13 million Americans are expected to move away from submerged coastlines

It would cost an estimated **$250–$350 million** to restore and protect Tangier Island, Virginia, which lost **62 percent of its inhabitable area** between 1967 and 2019, or an estimated **$100—$200 million** to relocate its 436 residents

1% of the globe's land surface is currently experiencing extreme heat

19% is projected to experience extreme heat by 2070

3 billion people live in areas that are or will be affected by extreme heat

100,000 people were forced from their homes by California wildfires in 2020

Sources (top to bottom): UNHCR (1), World Bank (2), UNDP (3), Pro Publica (4, 8), Nature Climate Change (5), Frontiers Science News (6), PNAS (7).

low-income, Black, and Latinx communities from Mississippi to Nebraska to Washington—powered a strong statement acknowledging the "Great American Climate Migration" and calling for the creation of a federal Climate Migration Agency "to help plan, facilitate, and support U.S. migration."

Many of the group's suggestions—most of which are aimed squarely at government officials—are practical, if not straightforward to execute: provide information free from jargon. Streamline the FEMA home buyout process so money no longer takes five years to land in pockets. Reduce federal grants' local matching requirements for small, under-resourced communities.

Other recommendations tackle the larger context of racial inequity, acknowledging the findings that FEMA programs benefit wealthy homeowners more.

"People here are living in tents," says one testimonial included in the statement. "Thousands still don't have homes after the storms. It frustrates me because I know the government has the funding and the ability to help us. The reason we can't get the services we need is because of our zip codes."

The statement also urges authorities to back plans that allow tight-knit communities the option to relocate together instead of sending each homeowner off individually.

It's an option that Terri Straka of South Carolina would appreciate. Like Acuña, she's an active leader in her community who has participated in Climigration Network conversations and joined the call for a new climate migration office. She's lived in Rosewood Estates, a blue-collar neighborhood in Socastee, South Carolina, on the Intracoastal Waterway outside of Myrtle Beach, for nearly 30 years. For a long time, flooding

Terri Straka, left, with other members of Rosewood Strong, an advocacy group she cofounded in her South Carolina community. After years of flooding, a county-led buyout program began this year. Credit: Courtesy of Terri Straka.

wasn't an issue, but in recent years, that changed: since 2016, Straka's county has weathered at least 10 hurricanes and tropical storms. Average national flood insurance payouts there have increased fivefold in less than a decade, from a little less than $14,000 to just under $70,000. In the most recent flood, Straka's 1,300-square-foot ranch took on four feet of water, which didn't drain for two weeks.

"It's nothing fabulous, but it's home," Straka says. "I raised all my children in it. I know everyone." Her parents live in the neighborhood. Local high schoolers use the streets for driving school practice. "I've watched so many kids grow up."

These days, she says, "they call me Terri Jean the Rosewood Queen." It's a name she's earned following the neighborhood floods, as she advocated for her neighbors in visits to local FEMA and county housing offices, made phone calls to state recovery officials, and staged protests at county council meetings. Many of her neighbors would have moved after the first couple of floods if they'd been able to, Straka says. She and others pushed for a buyout program, but the federally funded offers were less than adequate by the time they came through in 2021; community members continue to push for better offers. A lot of her neighbors are service industry workers in Myrtle Beach's robust tourism trade. Others have retired on a fixed income. Many had already sunk money into repairing their homes. For others, buyouts would only pay off their current mortgages, falling far short of the amount needed to purchase comparable new homes, to say nothing of flood insurance. "You live on the outskirts of Myrtle Beach itself because, number one, you can't afford to live in Myrtle Beach," Straka says. "Even if you have the option, if the buyout would be financially beneficial, where do you go? And how do you do that?"

The Climigration Network and its partners are coming at these questions from several directions. The three community organizations now working with the network are on track to conduct their surveys and use the results to begin developing local strategies this summer. The network hopes to create a small grant program that could fund similar work in other communities. Meanwhile, members have formed six workgroups of technical experts and community leaders, with focus areas ranging from policy and research to narrative building and communications, that meet regularly to discuss how to identify and help dismantle the many roadblocks communities face. Taken together, these efforts are an attempt to lay the foundation for a whole new field of climate adaptation.

"Not everyone is trying to go out in the field and build a system for helping 13 million people move in the next 50 years," says Kelly Leilani Main, executive director of Buy-In Community Planning, chair of the Climigration Network's Ecosystems and People workgroup, and a member of

> "Not everyone is trying to go out in the field and build a system for helping 13 million people move in the next 50 years. We're building the bridge as we're walking across it."

its Interim Council. “We’re building the bridge as we’re walking across it.”

Doing so, Main and other network members agree, will require continuing to build trust and deep working relationships with residents on the ground. Like Acuña, Straka says that sharing the story of her own experiences with others in the Climigration Network has been a critical first step. “When we would have meetings, I was completely honest,” Straka says. “And they gave you that capability to be vulnerable, because you are vulnerable.”

The whole process was far removed from her experiences hitting walls with state and federal officials, she adds. The officials she’s dealt with “don’t get it. It’s a job to them, they go to work, they’ve got these projects to do,” she says. “The involvement on a personal level is what’s going to bring big change. That’s what’s needed.”

Alexandra Tempus is writing a book on America’s Great Climate Migration for St. Martin’s Press.

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Flooding from the Intracoastal Waterway inundated homes in Socastee, South Carolina, in 2020. Credit: Jason Lee/*The Sun News* via AP.

RETURN ON INVESTMENT

Research Links Climate Action with Land and Property Value Increases

By Anthony Flint

IN THE CHINESE CITY OF ZHENGZHOU, a manufacturing center located roughly halfway between Beijing and Shanghai, eye-stinging smog routinely put the metropolis on lists of the most polluted cities in the world. About 10 years ago, local leaders joined a comprehensive national clean air action plan, initiated by multiple central government departments and designed to reduce emissions from industry, energy production, land use, and other consumptive activities.

A few years later, the results were literally clear—nothing dramatic, but more blue skies, and enough of a difference to influence social behavior such as people's willingness to travel and be outside. And a team of researchers discovered something else: the air-quality improvements correlated with across-the-board increases in property values.

Using a spatio-temporal model that clearly quantified the association between cleaner air and land values, the researchers determined that improving air quality by 10 percent led to citywide increases in property values of 5.6 percent, said Erwin van der Krabben, professor at Radboud University in the Netherlands. Over time, that could translate to a potential uplift of $63 billion, Van der Krabben said.

"We can predict, if you further improve air quality, how much value you will get, and so on," said Van der Krabben, who is documenting the ramifications of climate action globally. He recently coauthored a Lincoln Institute working paper on air quality and land values in China with Alexander Lord of the University of Liverpool's School of Environmental Science and Guanpeng Dong, professor of quantitative human geography at Henan University (Lord, Van der Krabben, and Dong 2022).

The idea that environmental action leads to higher land and property values may seem obvious to some, but for the most part, it has not been well demonstrated. The kind of analysis done in Zhengzhou is important because it directly links environmental improvements to increasing value. Demonstrating that link is crucial in making the case for a financial tool that could be essential for addressing the climate crisis: land value capture.

The idea that environmental action leads to higher land and property values may seem obvious to some, but for the most part, it has not been well demonstrated. The kind of analysis done in Zhengzhou is important because it directly links environmental improvements to increasing value.

Once a little-known financial instrument, value capture is used around the world to help fund transit, affordable housing, open space, and other public infrastructure. The approach calls for developers and landowners to contribute a portion of the increases in property value, or land value increment, that are prompted by public investment and government actions. Municipalities use the resulting revenue for infrastructure or other projects that benefit the public (Germán and Bernstein 2020).

As the world prepares to spend trillions of dollars in a massive effort to transition from fossil fuels, reduce emissions, and build resilience, value capture could help close the global climate finance gap, particularly at the local level.

Establishing that what's good for the planet is good for the economy, Van der Krabben said, gets to the heart of the fiscal argument to use value capture. In China, where land is state owned and leased to developers, land value

Zhengzhou, Henan Province, China. Credit: Zhang mengyang via iStock/Gettty Images.

increases get built into the price developers pay. "So if Chinese cities act in a rational way, if they invest that additional income from land leases, if they continue investing that in cleaner air, then you have this kind of virtuous cycle," he said.

Accordingly, increasingly sophisticated valuation and assessment methodologies are being deployed to describe the impact of government action on land and property values—and not just detailing how a new transit station or a flood-resilient park creates uplift in a local neighborhood, but how broader policies, like clean air requirements or the promotion of walking, biking, and transit, can have a positive economic impact across a wider catchment.

The "virtuous cycle" analysis may make not only a powerful economic argument for a shared responsibility in financing climate action, but a moral one, too. In many places, private developers and landowners generally walk away with the windfalls created by public investments.

"There's a well-documented lack of funding for the action that's needed to address the climate crisis," said Amy Cotter, director of Climate Strategies at the Lincoln Institute. "Precious little of it operates like land value capture: created by the very action it enables, within local control." Land value capture "won't solve climate finance, but we see its significant potential to fill an important gap," Cotter said.

ONE COMPELLING FEATURE of the Zhengzhou air pollution case study is that the benefits were spread across an entire city. But a wide range of projects and policies that can contribute to climate resilience are manifesting themselves economically in urban contexts, whether at the scale of one city block or an entire neighborhood:

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LEARN MORE ABOUT LAND VALUE CAPTURE

The Lincoln Institute offers many resources for understanding the many forms land value capture can take, including an explainer video (https://www.lincolninst.edu/value-capture-explainer); a policy brief, *Land Value Return: Tools to Finance Our Urban Future*, by Lourdes Germán and Allison Ehrich Bernstein (https://www.lincolninst.edu/publications/policy-briefs/land-value-return); and a forthcoming Policy Focus Report, *Land Value Capture in the United States: Funding Infrastructure and Local Government Services*, by Gerald Korngold (September 2022).

www.lincolninst.edu/value-capture-explainer

1. Water Efficiency

2. Energy Efficiency

3. Technological, Urban, and Environmental Contributions

In Quito, Ecuador, land value capture is a key element of an effort to encourage greener buildings and high-density, transit-oriented construction. Credit: Secretaria de Territorio Habitat y Vivienda, Quito.

- The Eco Efficiency Ordinance for the Metropolitan District of **Quito**, which won a Guangzhou Award for Urban Innovation in 2021, incentivizes energy efficiency and density by selling developers the right to construct taller buildings if the projects have green elements and are near transit. Since the city adopted the ordinance in 2016, 35 projects have been approved that penciled out so well, developers had no issues returning a portion of their profits through this value capture tool. The city will invest the $10.7 million raised so far in improvements such as parks and affordable housing, and is making the ordinance part of its new land use and management plan.

- A study by the Center for Neighborhood Technology and SB Friedman Development Advisors found that green stormwater infrastructure installations in **Seattle and Philadelphia**, such as rain gardens and swales, resulted in statistically significant increases in sales prices of homes nearby (CNT and SB Friedman Development Advisors 2020). Doubling the square footage of rain gardens, swales, planters, or pervious pavement within 250 feet of a home is associated with a 0.28 percent to 0.78 percent higher home sale value, on average.

- In **Buenos Aires**, a similar assessment of proposed blue-green infrastructure projects in the Medrano Stream Basin found strong potential for positive land value impacts stemming from both the reduction of flood risk associated with traditional gray infrastructure, and the improvements in public green space (Kozak et al. 2022). The authors cite a project that improved public access to the Paraná River in Santa Fe, Argentina, as an example of how this can play out; the revitalization of that waterway led to an average land value uplift of 21 percent within a 10-block band of the waterfront.

- Major transit projects around the globe that are contributing to decarbonization goals, from **Tokyo's** Tsukuba Express transit extension to

The Canary Wharf Crossrail station in East London. Land value capture policies yielded more than $1.2 billion of the $23 billion capital costs for the rail network, also known as the Elizabeth line. Credit: Jui-Chi Chan via iStock/Getty Images Plus.

the modernization and electrification of the interurban passenger railway in **San Jose, Costa Rica**, to **London's** Crossrail project—the latter expected to achieve approximately 2.75 million tons of carbon savings over its lifetime—are being financed largely or in part by the assumption that property values will increase all along their corridors.

- Developers and homeowners alike seek safety from rising seas and other climate impacts, and are willing to pay for that sense of security. **Boston** has established a Climate Resiliency Fund, to which developers contribute to help the city coordinate the construction of seawalls and natural systems to keep prized urban land high and dry. Contributing toward adaptation is increasingly seen as a small price to pay to safeguard real estate assets and ensure their continued inherent value, said Brian Golden, the recently retired director of the Boston Planning and Development Agency.

The same appears to be true for individual homebuyers. They've always taken into account property characteristics and consumer preferences such as the number and composition of rooms or the quality of the local public schools. Now they want to know about—and might be willing to pay more for—features that make the home more resilient to climate change, according to Katherine Kiel, an economics professor at College of the Holy Cross in Massachusetts and author of a Lincoln Institute working paper on adaptation and property values (Kiel 2021).

WHILE THE CONNECTION between environmental interventions and an uplift in values is positive news for property owners and developers, it has a complicated relationship with gentrification and displacement. One prominent recent example of green improvements affecting local economics is the daylighting of the Saw Mill River in Yonkers, New York, which transformed a downtrodden business area so dramatically that housing

prices shot up all around the adjacent area, said Cate Mingoya, national director of Climate Resilience and Land Use at Groundwork USA. It was "the perception of a cleaner, greener space" that led to the increases, Mingoya said.

"There's nothing about the installation of trees or the daylighting of a river that forces landlords to raise rents so sharply. There's nothing that says that landholders must be entitled to maximize profit from a system that is highly, and unfairly, regulated to their advantage," she said.

But property owners can and do cash in on these kinds of public investments, said Mingoya, who facilitates cross-sector partnerships to implement climate adaptation measures in vulnerable communities. Some communities seeking to temper green gentrification deploy measures that are "just green enough . . . where a limited number of improvements are made to low-income neighborhoods in an attempt to ward off displacement." These efforts sometimes border on the absurd, Mingoya said: "Should they get 30 trees or 10 trees?" But they clearly demonstrate the growing awareness that green interventions and rising values are linked.

(Strategically designed land value capture policies can help mitigate cases where environmental interventions are associated with gentrification and displacement, with provisions to increase affordable housing, for example.)

Viewed from another perspective, bad environmental conditions that are unaddressed or only partially addressed have a negative economic effect. One recent report by researchers at several universities in Utah estimates that polluted air shortens life expectancy by two years and costs the state nearly $2 billion a year. Some local and state governments are keeping a running tally of the damage caused by climate change, according to the Pew Charitable Trusts, in preparation for litigation against fossil fuel companies.

The absence of climate action—in cases when municipalities can't or won't implement resilience infrastructure and other measures to halt flooding, sea-level rise, mudslides, and the like—drives down values precipitously. A study of land subsidence in Java, Indonesia, where homes have sunk into unstable soil, found that the local practice of rebuilding on sinkhole sites—sometimes two or three times, done in the hopes of salvaging economic viability—did nothing to halt the decline in property values. The only solution for plummeting values, says the study, which was also led by Van der Krabben, would be a massive overhaul of water and soil management—or to give up on the land entirely. Indonesia is moving ahead with the wholesale relocation of its capital city, Jakarta, largely for this reason.

The absence of climate action—in cases when municipalities can't or won't implement resilience infrastructure and other measures to halt flooding, sea-level rise, mudslides, and the like—drives down values precipitously.

In Java, Indonesia, a resident stands by a window that now serves as a door in a house affected by land subsidence. Credit: Willy Kurniawan/REUTERS/Alamy Stock Photo.

In Miami, a big part of the argument for private sector contributions to resilience infrastructure is that without speedy action, more real estate is virtually guaranteed to be underwater. Seen in this way, protective measures do more than enhance land and property values; they stop values from being less than zero, by keeping land from becoming uninhabitable.

EVEN AS EVIDENCE OF THE LINK between environmental action and economic uplift grows, many barriers must be overcome to make land value capture work. National urban development laws need to be reformed to authorize more local governments to mobilize land value increments and permit own-source revenue. Around the world, a pressing need remains to improve institutional capacity, good governance, land controls, and tenure systems.

Even as evidence of the link between environmental action and economic uplift grows, many barriers must be overcome to make land value capture work.

Governments will also need to keep in mind that land-based finance is just one way to fund climate and environmental initiatives, more suitable for closing gaps than for serving as the sole or primary source of revenue for a carbon-neutral world.

Policy makers may also have to guard against overreach. The benefits of a new transit station on adjacent properties are "plain as day," said Van der Krabben, so developers are more eager to contribute to such infrastructure. The ultimate payoff of an environmentally progressive citywide or regional policy—say, bans on fossil fuel heating and cooling systems in new construction, such as the natural gas bans enacted in major U.S. cities including Seattle, San Francisco, and New York—may be a tougher sell.

"What you really want is for developers to contribute to regional investments, but that's more difficult to negotiate. The benefits are more indirect," Van der Krabben said.

All the more reason, scholars say, to revisit the valuation and assessment practices that establish land and property value increases in the first place. More sophisticated valuation methods have improved assessment accuracy, said Lincoln Institute Senior Fellow Joan Youngman, citing the International Association of Assessing Officers (IAAO)'s technical standard on mass appraisal of real property designed to improve the fairness, quality, equity, and accuracy of valuation. Mass appraisal is defined in that standard as "the process of valuing a group of properties as of a given date and using common data, standardized methods, and statistical testing."

The assessment process may soon be aided by some technological wizardry. The International Property Tax Institute and IAAO both issued recent white papers on the potential use of Artificial Intelligence (AI) in property assessment. While AI poses some challenges and uncertainty, the hope is that it could produce more accurate values than those obtained by traditional approaches.

When it comes to identifying the effects of public action and investment on land value, modern tools, data analytics, and statistical techniques will help identify and measure value increments, Youngman said.

Armed with good practices, a theoretical rationale, and a growing list of cities around the world that have put value capture to use, those addressing the climate crisis hope the connection is becoming clearer between the massive public investments necessary to salvage the planet's future and the economic bounty they provide—and, ultimately, the ways that bounty can be reinvested for the public good (Bisaro and Hinkel 2018, Dunning and Lord 2020, Van der Krabben, Samsura, and Wang 2019).

Golden, the outgoing Boston planner, said he has sensed a "cultural shift" among landowners

and developers, who recognize that public investments in resilience infrastructure plainly protect private real estate assets, making them more likely to help foot the bill.

"What you really want is for developers to contribute to regional investments, but that's more difficult to negotiate. The benefits are more indirect."

Requiring developers to help finance the berms, seawalls, and natural systems restoration that will guard against an estimated 40-inch sea-level rise along the city's 47-mile coastline is seen as a matter of self-interest, Golden said—not only for individual development sites, but also for the continued prosperity of Boston as a regional economic engine. The private sector has exerted virtually no pushback on initiatives like the resiliency fund. "We have a lot of work to do," Golden said. "They get it."

Anthony Flint is a senior fellow at the Lincoln Institute, host of the *Land Matters* podcast, and a contributing editor to *Land Lines*.

In Boston, developers contribute to the costs of protecting the city's vulnerable waterfront. Credit: Marcio Silva via iStock/Getty Images Plus.

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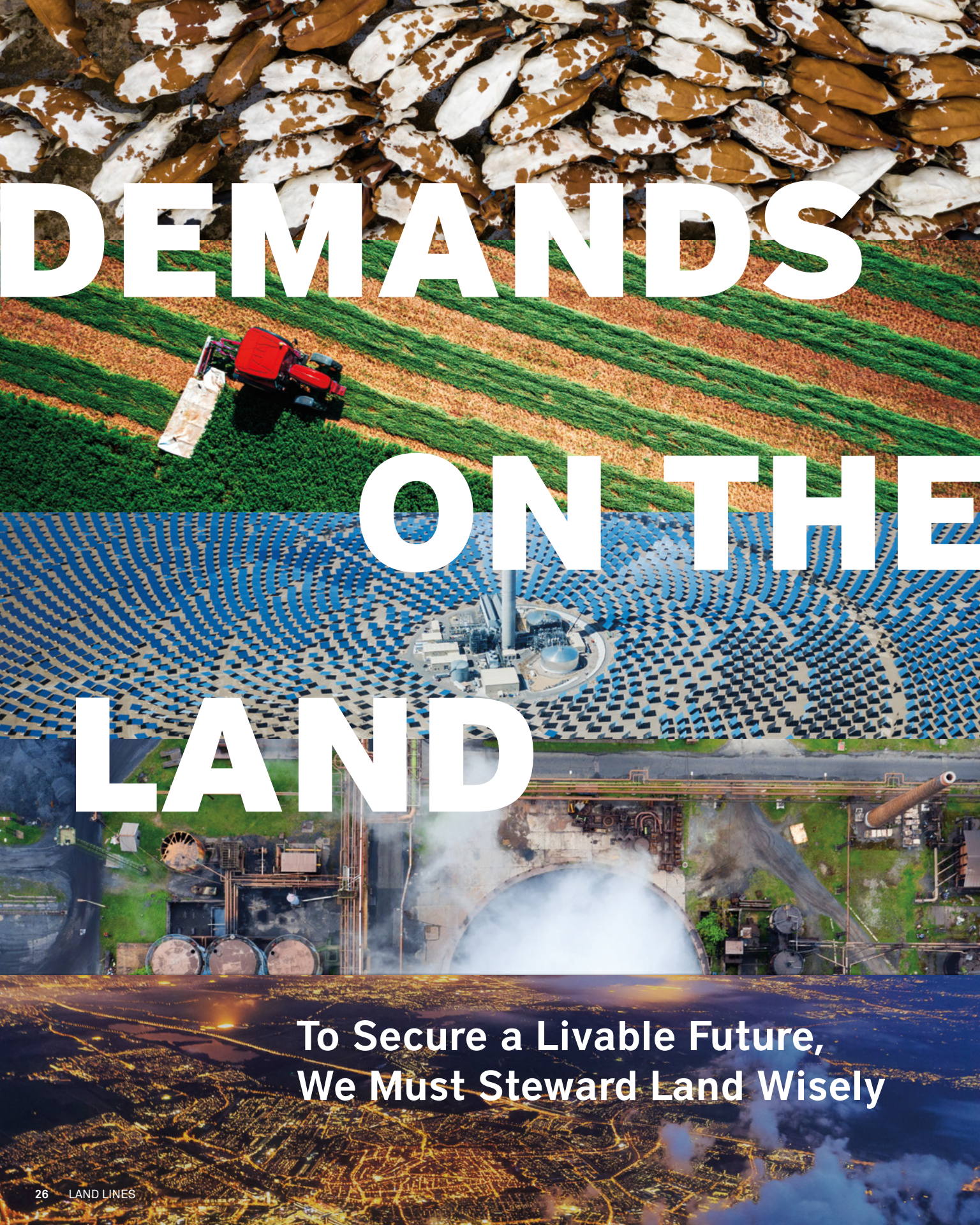


DEMANDS ON THE LAND

To Secure a Livable Future, We Must Steward Land Wisely

By Sivan Kartha

SINCE THE WORLD FIRST NEGOTIATED A CLIMATE TREATY in 1992, three precious decades have ticked by while we've allowed a climate challenge to evolve into a climate crisis. The latest assessment from the Intergovernmental Panel on Climate Change, released this spring, eschewed the moderate language of the staid scientific body, making it clear that society faces an urgent crisis and must take action. That report represents "a litany of broken climate promises," said UN Secretary General António Guterres. "It is a file of shame, cataloguing the empty pledges that put us firmly on track toward an unlivable world."

At last year's UN Climate Summit in Glasgow, the nations of the world doubled the emissions reductions they had previously promised for this decade, but we actually need a *fivefold* enhancement of those goals. As things stand now, we can emit only about 300 billion tons of carbon dioxide ($GtCO_2$) before global temperatures are expected to exceed the 1.5 degrees Celsius identified in the Paris Agreement as the upper limit of acceptable warming. If countries fail to cut emissions far beyond what they've promised so far, the world will exceed that 300 billion tons within this decade. That will lead us toward chaos far greater than the unparalleled storms, droughts, wildfires, and displacements the globe is already experiencing.

It's well within our capabilities to dramatically cut emissions. We know which renewable energy technologies and energy-efficient practices we need to deploy widely, we know that protecting ecosystems and other species supports our own ability to thrive, and we're equally aware of the exceedingly wasteful and fossil fuel–intensive agricultural practices and land-intensive diets that we need to alter.

As it turns out, land figures prominently in many of our most promising climate solutions, and is thus central to many of the tensions and trade-offs we must now deftly navigate. Having pushed the clock to the limit, we must find a way to avoid moving forward haphazardly, running roughshod over fundamental ecological and human needs in a mad dash for "climate-friendly" solutions. Stewarding land wisely while we face an increasingly hostile climate will prove critical to securing a livable future.

EVEN WHILE LAND IS INCREASINGLY STRESSED BY A CHANGING CLIMATE, it will face rising and conflicting demands from human society in our pursuit of both climate solutions and sanctuary from a more hostile climate. Let's lay out the main aspects of this contested landscape.

Land will be required to sustain species and ecosystems that are increasingly threatened by climate change to the point of extinction or collapse. Earth is currently undergoing its sixth mass extinction since the Cambrian explosion half a billion years ago. Writing of the evolutionary tree of life, Elizabeth Kolbert, a scholar of such extinctions, explains: "During a mass extinction, vast swathes of the tree are cut short, as if attacked by crazed, axe-wielding madmen" (Kolbert 2014). Even as a metaphor, this may be an understatement, as we now also have bulldozers,

Even while land is increasingly stressed by a changing climate, it will face rising and conflicting demands from human society in our pursuit of both climate solutions and sanctuary.

Credits (top to bottom): Martin Harvey via Photodisc/Getty Images; valio84sl via iStock/Getty Images Plus; Mlenny via E+/Getty Images; Mint Images via Mint Images RF/Getty Images; dennisvdw via iStock/Getty Images Plus.

big dams, and other even less judicious means of directly appropriating land from natural ecosystems. As human-caused climate change accelerates, it will overtake our appropriation of land as the top driver of the ongoing extinction (IPCC WGII 2022). A report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services found that more than a million species are threatened with extinction, many in the next few decades (IPBES 2019).

Sustaining the natural ecosystems on which human survival depends—from the mountainous snowpack from which rivers run year-round to the rich soils in which our food grows to the coral reefs that sustain coastal fisheries—ultimately will rest on our ability to reduce and reverse our appropriation and fragmentation of natural habitat, all while we stop fueling climate change. As a critical first step, nearly 100 countries comprising the High Ambition Coalition for Nature and People have called for a global 30x30 deal to protect 30 percent of the world's land and oceans by 2030. This ambitious effort aims to halt biodiversity loss and preserve ecosystems, with the added benefits of supporting economic security and a stable climate. Today, only about 15 percent of our land and 7 percent of our oceans is protected.

Sustaining the natural ecosystems on which human survival depends. . . ultimately will rest on our ability to reduce and reverse our appropriation and fragmentation of natural habitat.

Evacuees from Hurricane Maria in Dominica in 2017, top, and from flooding in Bangladesh in 2019, bottom. Credits: U.S. Navy Photo/Alamy Stock Photo (top); UN Women Asia and the Pacific via Flickr CC BY-ND-NC 2.0 (bottom).

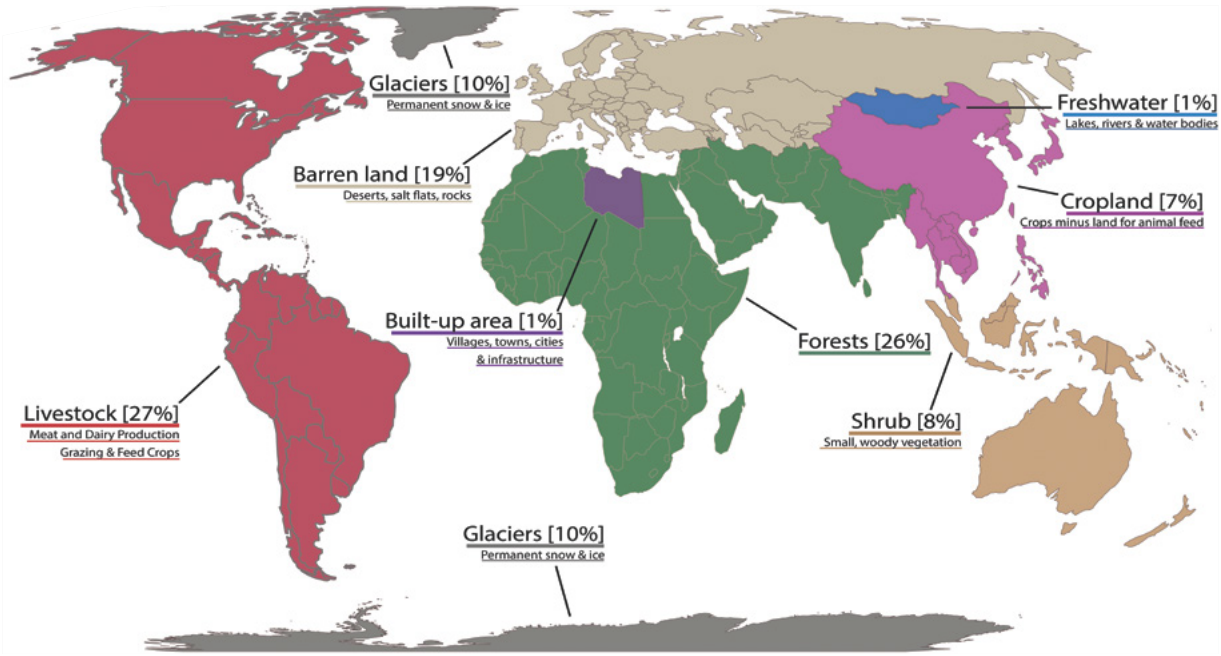
Land will be required to resettle people displaced by flooding, extreme weather, and climatic shifts that render currently inhabited areas no longer hospitable. We know the climate and weather extremes that are already driving displacement will escalate. The World Bank estimates that more than 200 million people will be forced from their homes by climate change in Asia, Africa, and Latin America in the next few decades, and millions more will be affected in other regions. This climate-induced dislocation and involuntary migration will amplify existing stressors such as conflict, food and water insecurity, poverty, and loss of livelihoods from economic or environmental pressures (IPCC WGII 2022).

In other words, marginalized and disempowered households and communities will invariably suffer the worst consequences, which will with rising frequency rise to the level of humanitarian

The strawberry poison dart frog, a species found in Central America. Credit: efenzi via iStock/Getty Images Plus.

DATA VISUALIZATION: HOW THE WORLD'S LAND IS USED

This map illustrates the aggregate surface area covered by various types of land use and terrain. Combined agricultural uses, at 34 percent, represent the largest human pressure on the landscape.



Source: Hannah Ritchie and Max Roser via OurWorldinData.org CC-BY-SA. Based on data from United Nations and World Bank.

and human rights crises. Any effort to manage these situations humanely will have implications for human settlements and the habitable land that they require. Resettlement will require far less land than other demands—one estimate suggests 0.14 percent of the planet (somewhat less than the area of the United Kingdom) could absorb 250 million climate migrants (Leckie 2013). Yet the mass climate migration already underway represents a significant shift in how and where people occupy and use land, and should be a priority for efforts to secure and preserve human rights for migrants and refugees.

Land will be required to feed our expanding global population, even as some regions face declines in water, increases in pests, and diminishing soil fertility. Climate change has slowed the growth in food productivity that was seen over the last decade, and climate-related extreme events have exposed millions of people to acute food insecurity and undermined water security.

A worsening climate will heighten these threats—which are, once again, cruelly directed at those who are marginalized and disempowered. Agriculture constitutes the primary human pressure on the global landscape; estimates suggest that it has already led to the clearing or conversion of 70 percent of global grassland, 50 percent of savanna, 45 percent of the temperate deciduous forest, and 27 percent of tropical forests. Agriculture also affects water bodies through drainage and chemical runoff, and emits greenhouse gases and pollutants into the atmosphere.

Agricultural approaches founded on principles of biodiversity and ecosystem regeneration are being increasingly proven and scaled, and have the potential to help combat climate change, even with a growing global population. Likewise, major changes to our global food

system that prioritize human rights, and that reduce meat consumption and food waste, can dramatically expand and deepen food security. A staggering share of global plant crops is eaten by livestock rather than people. More than one-third of all calories and more than one-half of all protein from agricultural crops goes to feed animals, with only a small share ultimately becoming nourishment for people. The consumption of meat is specifically charged with causing the continuing spike in deforestation of the Amazon rainforest, a biome that comprises 40 percent of the world's rainforest and serves as home to 25 percent of its remaining terrestrial species.

Land will be called on as a site for the energy sources—primarily solar power, wind power, and biopower—needed to replace the fossil fuels that now meet five-sixths of global energy demand. Solar and wind power, while they have undeniable impacts on the landscape, can be situated in areas suited for multiple uses; for example, wind turbines and solar panels can be sited on farmland or in urban spaces like rooftops and parking lots. Unlike solar and wind power, bioenergy—which is produced using agricultural feedstocks, in the form of either electricity (biopower) or fuels (biofuels)—must be sited on agriculturally productive land. At any significant scale, bioenergy competes with food production.

Consider the following: total cropland globally amounts to less than half an acre per person, yet it already puts considerable pressure on water, soil, and other ecological resources. Even if we posit a quite efficient process for producing and using biofuel (in contrast to the U.S. approach of burning corn-based ethanol in conventional combustion vehicles), more than 1.2 acres would be needed to keep a single passenger vehicle fueled. An efficient biopower

Major changes to our global food system that prioritize human rights, and that reduce meat consumption and food waste, can dramatically expand and deepen food security. A staggering share of global plant crops is eaten by livestock rather than people.

Farm workers in California. Credit: NNehring via E+/Getty Images.

plant would fare hardly any better, claiming roughly 0.8 acre per capita to grow the fuel needed to generate the electricity used by the average United States resident. By contrast, solar photovoltaics require less than 5 percent of one acre per person or, for the whole U.S. population, a bit less than 15 million acres. This is not a trivial footprint, but it's worth noting that in 2017 alone, federal land leases offered for oil and gas production in the United States amounted to more than 12 million acres.

To put it plainly, bioenergy would function for the typical high-energy consumer just as meat functions for the typical high-meat consumer—it would allow them to consume vastly more land than they would if they simply used that land's output directly. By extension, it would also enable the world's over-consumers to compete even more ruthlessly with the world's poor for the resources that underpin survival, like food, livelihoods, and homes.

Land will be called upon to "negate" our carbon excesses by removing accumulated carbon dioxide from the atmosphere. The world's lands serve as an enormous carbon sink, with plants and soil absorbing about a quarter of our excess carbon dioxide from the atmosphere. (Another quarter of our excess carbon emissions is absorbed by the oceans; the remaining one-half accumulates in the atmosphere and is responsible for warming the planet.) Deterioration of an ecosystem—such as by climate-induced pests, drought, fire, and deliberate human modification—diminishes its capacity to absorb carbon, and may even convert it into a source of carbon dioxide emissions. Unchecked climate change could disrupt climatic conditions enough to send a region like the Amazon rainforest across such a tipping point—converting it from a carbon sink to a carbon source—and in fact, just such a weakening of resilience is already being observed there (Boulton, Lenton, and Boers 2022).

Despite the threats that climate change poses to natural carbon absorption, it is increasingly held out as an alternative to

Sheep and solar panels share space on a farm in Germany. Credit: Karl-Friedrich Hohl via E+/Getty Images.

reducing our own emissions, or at least as a crafty expedient whereby we can buy some time, relax the mitigation burden a bit, and more gradually ramp up our emissions reduction efforts over a longer timeframe. Indeed, the hopes for these "negative emissions" strategies have grown beyond reasonable expectations. Some analysts of future mitigation options assume the removal of carbon dioxide from the atmosphere and storage of it on the land (in the form of plant or soil matter) or underground (as compressed carbon dioxide transported in pipelines) will grow to a scale comparable in land requirements to current global agriculture.

If we cooperated globally and worked strenuously to keep emissions within the 1.5-degree Celsius budget, viewing negative emissions as a possible solution for situations that were virtually impossible to address any other way (such as methane emissions from wetland rice cultivation) would be feasible and sensible. But instead, most countries have charted a slow pace of reduction efforts for the near term and inadequate reduction targets for the medium term; they have labeled these steps consistent with the Paris goals, presupposing a vast reserve of land will wondrously materialize for negative emissions duty when we need it. This is a reckless strategy. Pursuing it further means banking on land being available and hoping that negative emissions activities won't conflict with social needs such as food security.

Because the world has willfully downplayed the near-term effort needed to keep climate

change within manageable bounds, such a strategy could leave us—and future generations—stranded with an insufficiently transformed energy economy. Saddled with a fossil fuel–dependent energy infrastructure, society would face a much more abrupt and disruptive transition than the one it had sought to avoid. Having exceeded its available carbon budget, it would face a carbon debt that cannot be repaid, and ultimately see much greater warming than it had prepared for.

Indigenous groups have protected both biodiversity and forest carbon more successfully than others, even during decades of rapacious extraction of global forest resources. Their rights must be legally recognized and actively enforced.

WISE LAND USE AND STEWARDSHIP WILL PROVE CRITICAL to navigating our future. The specific technologies, practices, and policies are enormously varied and context specific, so it would be foolish to attempt a fair treatment here. But a few broad observations are warranted.

First, several cases touched on above illustrate how society is increasingly relying on land resources to help deal with climate change, even while land is itself under rising stresses from climate change. The expected tensions and trade-offs are already testing society's capacity for wise land stewardship in a more hostile climate, with mixed results.

As biodiversity loss accelerates, there is increasing recognition that a large share of remaining biodiversity-rich areas—including more than one-third of intact forests and 80 percent of the world's terrestrial biodiversity—is in the hands of indigenous groups. These stewards have protected both biodiversity and forest carbon more successfully than others, even during decades of rapacious extraction of global forest resources (Fa et al. 2020; World Bank 2019). This understanding must now be translated into policies that legally recognize and actively enforce community-based land tenure rights consistent with the UN Declaration on the Rights of Indigenous People, which most indigenous communities do not yet enjoy. Where that is done, indigenous communities will be better able to protect common resources through locally appropriate collective action. They will also be better able to resist outside actors who are intent on either extracting and degrading forest resources or on imposing "fortress conservation" models that disregard indigenous rights and are less effective in their ostensible conservation aims.

Much the same lesson applies to a range of emerging "green grab" strategies. As pressure on land is intensified by growing demand for bioenergy and food production, negative emissions capacity, and habitable areas, those who have capital, flexibility, political savvy, and powerful networks are crafting the relevant policies and ultimately benefiting from them, including through speculation. Consequently, the cost of public efforts to meet collective needs escalates, preventing people with the least political or economic power from meeting basic needs like food, livelihood, and home.

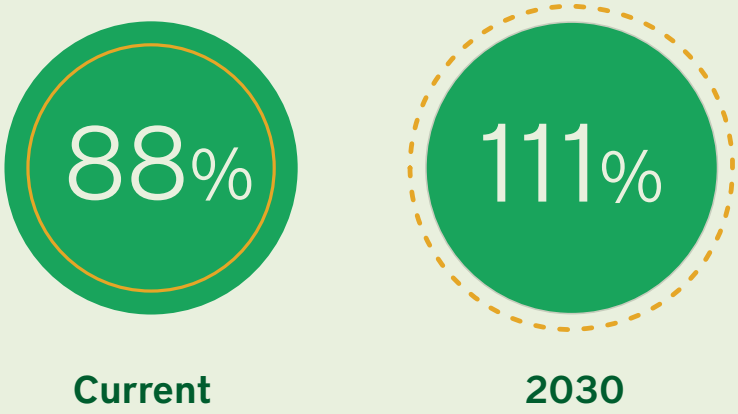
New ways of abstracting these components of land and ecosystems and integrating them into distantly removed market processes are legitimizing new forms of appropriation. Some of them are akin to financial derivatives, and indeed can be disconcertingly reminiscent of the mortgage-backed financial derivatives, the collapse of which brought on a global recession and threatened much worse. One particularly glaring example is the carbon offset program (the Clean Development Mechanism) that developed countries have used to meet their legally binding targets under the Kyoto Protocol. This mechanism is now understood to have been based overwhelmingly on fictitious greenhouse gas reductions.

We should thus be wary about market mechanisms that simply carry forward question-

Amazon rainforest, Brazil. Credit: Gustavo Frazao via iStock/ Getty Images Plus.

A Finite Resource

Land plays a central role in many currently proposed climate solutions, from increasing the absorption of greenhouse gases to growing crops for bioenergy. With global population projected to grow from 7.6 billion to 8.6 billion by 2030, the coming decade will bring difficult decisions about how best to use and protect the planet's **130 million square kilometers (km^2) of ice-free land**.



Working lands (forestry and agriculture)	92.3 million km^2 (71%)	98.3 million km^2 (75%)
Conserved and natural lands	20.8 million km^2 (16%)	39 million km^2 (30%)
Developed/built areas	1.3 million km^2 (1%)	2.1 million km^2 (2%)
Additional land required for bioenergy	--	5 million km^2 (4%)
	114.4 million km^2 (88%)	**144.4 million km^2 (111%)**

Sources: UN Department of Economic and Social Affairs, World Resources Institute, Energy Innovation.

Ranchers attend a regenerative agriculture workshop in Cimarron, New Mexico. Credit: Mario Tama via Getty Images News.

able assumptions of equivalence (among distinct bits of natural capital) or of fungibility (between natural resources and technical alternatives), and about policy regimes that privilege the idea of net economic welfare to rationalize probable casualties of distribution or outright injuries to human rights and justice.

AS SPECIFIC CHARACTERISTICS OF LAND and ecosystems—such as their promise as a carbon sink or suitability for energy production—become more highly valued and more tightly integrated into the global economy, a fundamental question becomes only more pressing: who controls land and who benefits from it?

Lincoln Institute President George McCarthy put it succinctly at the organization's Journalists Forum on climate change this spring: "Land contention redounds to power. And in disputes, power wins." If the very power structures at the root of climate change are left intact, then the resulting market mechanisms and policy interventions will fail to save the climate while worsening the global scourge of poverty and marginalization. In doing so, they can contribute to what is becoming the third injustice of climate change: the most vulnerable are not only the least responsible for and most affected by climate change, but also the frontline victims of ill-conceived climate policies.

Our global society is confronting risks of an existential magnitude. These risks—all of our own making—are equal parts ecological and social. Ecologically, we persist in placing insupportable burdens on our planet. Socially, we remain riven by obscene disparities in wealth and power that have rendered us dysfunctional in the face of a civilizational threat.

Solutions do exist. The importance of shifting to a less meat-intensive global diet for reasons of environmental sustainability—as well as personal health—is now clear. We have learned to be wary of narrowly focused mechanisms like carbon markets for protecting forests, given how complex these ecosystems are and how they provide multiple services to diverse human societies, not all of which are monetizable or even fully understood and appreciated.

Experience has shown us that indigenous communities, especially once they have legally enforced tenure rights, do a highly effective job managing forests and protecting biodiversity.

Solutions do exist. . . . We have the tools to save ourselves, but it remains up to us to actually do so.

On already significantly altered or degraded land, innovations in regenerative agriculture and ecosystem restoration are providing a means to maintain or enhance land-based carbon. And technological advances in the energy sector have made it possible for us to rehabilitate our fossil fuel–addicted global economy.

Perhaps most important, the world has finally reached a level of aggregate global welfare that—if it were shared more equitably—would make possible a dignified life for all, free from the privations of underdevelopment.

We have the tools to save ourselves, but it remains up to us to actually do so.

Sivan Kartha is a senior scientist at the Stockholm Environment Institute and codirector of its Equitable Transitions Program. He served on the Intergovernmental Panel on Climate Change during the preparation of its Fifth and Sixth Assessment Reports, and serves as an advisor to the Lincoln Institute climate program.

Wind turbines among wheat and canola fields in Washington. Credit: Terry Eggers via The Image Bank/Getty Images.

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Burlington, Vermont, Aims for Net Zero

Courtesy of Miro Weinberger.

A native Vermonter who was first elected in 2012, Miro Weinberger is serving his fourth term as the mayor of Burlington, Vermont. He attended Yale and Harvard's Kennedy School of Government, and worked for Habitat for Humanity before founding his own affordable housing development company. He's also a part-time athlete, playing catcher in an amateur over-35 baseball league.

Vermont has long been a progressive kind of place with a population dedicated to environmental measures, whether solar and wind power, electric vehicles, or sustainable farming practices. Burlington, its change-agent capital—the place that gave rise to Bernie Sanders, who served as mayor from 1981 to 1989—became the first city in the country to source 100 percent of its energy from renewables in 2014, a goal set in 2004. Now Weinberger and other leaders are building on that foundation, committing to shifting the city's energy, transportation, and building sectors away from fossil fuels entirely.

Burlington, Vermont, rises from the shore of Lake Champlain. Credit: Denis Tangney Jr. via iStock/Getty Images.

This interview, which has been edited for length, is also available as a *Land Matters* podcast: **www.lincolninst.edu/publications/podcasts-videos**.

ANTHONY FLINT: *Tell us about this ambitious goal of becoming a net-zero energy city by 2030. What is that going to look like, and what are the steps to make that happen?*

MIRO WEINBERGER: As a result of decades of commitment to more efficient buildings and weatherization, Burlington uses less electricity as a community in 2022 than we did in 1989, despite the proliferation of new electrical devices and whatnot . . . that sounds exceptional, and it is. If the rest of the country had followed that trajectory, we'd have something like 200 less coal-burning plants today than we do.

When we became a 100 percent renewable electricity city in 2014, there was enormous interest in how Burlington had gotten here. After talking to film crews from South Korea and France and answering question after question about how we did this, I came to think we had achieved it for two big reasons. One, there was political will. Second, we had a city-owned electric department that had a lot of technical expertise and that was able to make this transformation to renewables affordable.

The way we are defining net zero is to essentially not use fossil fuels in—or have a net-zero fossil-fuel use in—three sectors. For the electricity sector, we're already there. That gets [us] about 25 percent toward the total goal. The [others are the] ground transportation sector and the thermal sector—how we heat and cool our buildings.

The big strategies are electrifying everything, electrifying all the cars and trucks that are based here in Burlington. Moving the heating and

cooling of our buildings to various electric technologies, the most common one probably being cold-climate heat pumps.

Then, rounding out the strategies, we are looking to implement a district energy system that would capture waste heat [from the city's biomass facility] and use it to heat some of our major institutional buildings. Then we also are making changes to our transportation network to make active transportation account for more of our vehicle trips and bring down fossil-fuel use that way as well. Those are the major roadmap strategies.

AF: *Is there one component of this that you have found particularly tough in terms of trying to go citywide?*

MW: In general, I've been really pleased with our progress. We actually found in our first update in 2021, we were on target to meet this incredibly ambitious goal of essentially phasing out fossil fuels by 2030.

Part of that, admittedly, was that, as we all know, 2020 was a pretty exceptional year and we did see transportation-related emissions drop as a result of the pandemic. We just got a new measurement and we did see some rebounding, so that we are not quite on track through two years the way we were [after] one. The rebound that happened here in Burlington was about a quarter of the nationwide rebound in emissions. Basically, we had a 1.5 percent increase in emissions after the pandemic, whereas the rest of the country grew by 6 percent. We've seen a rapid increase in the adoption of heat pumps and electric vehicles over the last couple of years since we came forward with what we call green stimulus incentives very early in the pandemic.

That said, I often have this sensation that we are fighting this battle with one hand tied behind our back, because it is not a level playing field for new electrification and renewable technologies. The costs of burning fossil fuels are not properly reflected in the economics right now. We need a price on carbon in some form. The fact that we don't have that holds us back. When we get that—and I do think it's just inevitable that eventually we will get this policy right, like a growing number of jurisdictions around the world—I think we're going to have a wind at the back of all these initiatives. It will help with everything we're trying to do.

"I often have this sensation that we are fighting this battle with one hand tied behind our back, because it is not a level playing field for new electrification and renewable technologies. The costs of burning fossil fuels are not properly reflected in the economics right now. We need a price on carbon in some form."

AF: *Now, I want to make sure I understand. Do you want everyone in the city of Burlington to operate an electric vehicle by 2030? Is it that kind of scaling up and adoption?*

MW: Basically, yes. That is what it would really take to fully achieve the goal, that or some offset investments to help us get there, but we are very serious about doing everything we can to bring about as quickly as possible this transformation.

A year ago, we passed a zoning ordinance that [says] new construction in Burlington cannot burn fossil fuels as the primary heating source. We didn't prohibit fossil fuels—we thought that was too onerous, and the technology's just not there to go that far. Regulating the primary heating source can bring down the impact of a new building by as much as 85 percent. In recent weeks, the state signed off on a change to our charter that gives us the ability to go beyond that and put new regulations in place for all buildings in Burlington.

By next town meeting day, next March, we plan to have in front of the voters a new ordinance that would start to put requirements in place for the transformation of mechanical

In Burlington, investments on the road to net zero have included introducing electric buses and installing solar panels on the roof of the Burlington International Airport. Credits (left to right): Morgan True/VTDigger.org, Encore Renewable Energy.

systems for major new and existing buildings when they get to the end of their useful life. When water heaters break, for example, we are both going to have this strategy through our utility, offering very generous incentives, and have actual regulatory standards in place that require transformation.

AF: *I want to ask about the utilities. You mentioned Burlington Electric and then, of course, you have Green Mountain Power. How important is that piece, given that utility companies elsewhere seem to be wary of renewables and may even end up hindering that transition?*

MW: I've got to say, a decade in office grappling with these issues has made me a big believer in publicly owned power. All of the work that I described over the last 30-plus years, the city-owned electric department has been a big part of that. Municipalities, towns, mayors that don't have their own electric utility, I think it's harder. I do think there are things that any local community can do to collaborate with and, when necessary, bring public pressure to bear on utilities, which tend to have to answer to some public regulatory authority. I think that there are ways to push other utilities to do what Burlington Electric is doing. I think it's an exciting story in Vermont that the other utility that has really been quite innovative, Green Mountain Power, is an investor-owned utility.

If we get anywhere near this net-zero goal, it's going to mean we're selling a whole lot more electricity than we are now. We estimate at least 60 percent more electricity than today. Every time someone buys an electric vehicle and charges it up in Burlington now, and they do it at night, we're able to sell them off-peak power in a way that just brings more dollars into the utility. It's very good, the economics. That's why we're able to offer these very generous incentives—every time we bring another electric vehicle or heat pump online, that's a new revenue stream to the city. These incentives in many ways largely pay for themselves with that new revenue. To me, it seems like good business sense as well to move in this direction.

AF: *Vermont has become a very popular destination for mostly affluent climate refugees [who are] buying up land and building houses. What are the pros and cons of this?*

"Every time we bring another electric vehicle or heat pump online, that's a new revenue stream to the city. These incentives in many ways largely pay for themselves with that new revenue. To me, it seems like good business sense as well to move in this direction."

MW: You're right, we are seeing climate refugees here. We also had pandemic refugees. We've seen big new pressures on our housing markets, and that's the downside. We've long had an acute housing crisis, [but] it's worse than it's ever been now. The silver lining of that may be it may finally force Vermont to get serious about putting in place land use rules at the local and state level that make it possible to build more housing.

We desperately need more housing. We've got to get better about that, and I think there'll be environmental benefits if we do. To me, more people living in a green city like Burlington is a good trade-off for the environment.

AF: *Are there other strategies that you have in mind for keeping or making green Burlington affordable? Burlington has a successful community land trust, you encourage accessory dwelling units, you have inclusionary zoning . . . what's next?*

MW: We have a lot of work to do on our zoning ordinance and our statewide land use reform. Many projects in Vermont now—good projects, good green, energy-efficient projects in settled areas—have to go through both local and statewide land use permitting processes, an almost entirely redundant process that slows things down, adds a lot of costs, and creates all sorts of opportunity for obstruction. We have a lot of work to do and we're focused on it. There are three major upzoning efforts that we're pursuing right now and there's a big conversation about Act 250 [Vermont's land use and development law] reform happening in the state as well.

AF: *Finally, what advice do you have for other city leaders to take similar climate action, especially in places that aren't primed for it quite as well as Burlington is?*

MW: Whenever I talk to other mayors about this, I try to make the point that this is an area where political leadership [and community will] can have a huge impact. When I came into office, we had almost no deployed solar here in Burlington. We made it a priority. We changed some rules about permitting. We made it easier for consumers to have solar installed on their homes.

The utility played a role, and over a very small number of years, we became one of the cities in the country that had the most solar per capita. We're number five in the country. The only city in the top 20 on the East Coast at one point, and it's not an accident. This is making a decision to lead in this area and to make change. You can have a big impact.

At a time when clearly the climate emergency is an existential threat, at a time when clearly the federal government is paralyzed in its ability to drive change, and when many state governments are similarly gridlocked, mayors and cities can really demonstrate on the ground progress. I think when we do that, we show everybody else what's possible.

Anthony Flint is a senior fellow at the Lincoln Institute, host of the *Land Matters* podcast, and a contributing editor to *Land Lines*.

"At a time when clearly the climate emergency is an existential threat, [when] the federal government is paralyzed in its ability to drive change, and when many state governments are similarly gridlocked, mayors and cities can really demonstrate on the ground progress. I think when we do that, we show everybody else what's possible."

The Great Lakes region of the United States is facing a potential wave of climate migration, as people displaced by climate disasters elsewhere in the country seek out its relatively stable climate, access to fresh water, and available land. With support from the Consortium for Scenario Planning—a program of the Lincoln Institute—a team of researchers from Kent State University and the University of Buffalo is developing an exploratory scenario planning guidebook that will help communities identify and enact strategies for building a future that is economically robust, ecologically sustainable, and socially just.

To learn more about the Consortium for Scenario Planning, visit **www.scenarioplanning.io.**

Washington Street Bridge, Toledo, Ohio. Credit: Patricia Elaine Thomas via iStock/Getty Images Plus.

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