

REALTORS® & Smart Growth

# on common ground

SPRING 2022

## SUSTAINABILITY & CLIMATE RISK

Water Reuse  
Proactive Strategies  
Paying for Resiliency



# Climatically Challenged

Hope is not a strategy, they say, which means we are left with our wits to figure out how we will carry on in a world of increasing extreme weather disruptions. How will we respond to increasing levels of climate change induced risk? How can we possibly answer the seemingly sudden call for development strategies that are both durable and sustainable?

At the NATIONAL ASSOCIATION OF REALTORS®, 2022 President Leslie Rouda Smith has made sustainability one of her top priorities for the organization, which is ramping up activity based on its 10-year Sustainability Plan. For more on NAR's sustainability efforts, visit <https://www.nar.realtor/sustainability>.

Of course, the impacts of extreme weather are extraordinarily varied. Ranging from drought in some areas to an overabundance of water in other areas. Too, some impacts are sudden, such as the total destruction of a town by tornado or wildfire, while other impacts are of the slow-motion, train-wreck variety, such as the increasing warmth.

To be sure, this challenge can feel overwhelming but inside the pages of this edition of **On Common Ground**, there are signs of hope, signs that we are well on our way to figuring out how to live in, and respond to, a world whose weather is, at times, literally throwing more at us.

This collection of articles touches on sustainable development solutions, how to deliver the benefits equitably, and options for paying the extraordinary costs associated with creating the protection we need.



Courtesy of Kevin Ruck

Responding to specific types of extreme weather impact are investigated in articles examining what to do if your community has too little water and what to do if it has too much. At the extreme, or extreme weather, we explore how a community can recover from total destruction with two examples, one recent and one a decade and a half in the rearview mirror. It is troubling to contemplate, but we now have enough experience with such situations that strategies and best practices are starting to emerge; indeed, a cottage industry has formed.

Lastly, we explore a deep dive into the buying and selling of real estate, both commercial and residential. What do buyers look for in a property? How does one kick the tires on a structure whose most weather-challenging days may be ahead of it?

Within a short period of time, we have learned a lot about how to cope, if not thrive, in a climate-challenged world. No doubt this is a topic which we will be able to revisit with some frequency with reports of technique and technology which are enabling us to transform our landscape to be both functional and durable for us and future generations.

## Editor

Hugh Morris  
Manager, Community Development  
& Growth  
[hmorris@NAR.realtor](mailto:hmorris@NAR.realtor)

## Contributing Editor

Christine Windle  
Director, Community Outreach

**On Common Ground** is published twice a year by the Advocacy Group of the NATIONAL ASSOCIATION OF REALTORS® (NAR), and is distributed free of charge. The publication presents a wide range of views on smart growth issues, with the goal of encouraging a dialogue among REALTORS®, elected officials and other interested citizens. The opinions expressed in **On Common Ground** are those of the authors and do not necessarily reflect the opinions or policy of the NATIONAL ASSOCIATION OF REALTORS®, its members or affiliate organizations.

## Distribution

To order additional copies of **On Common Ground**, please e-mail us at [OCG@NAR.realtor](mailto:OCG@NAR.realtor) or contact Catherine Mesick at [cmesick@NAR.realtor](mailto:cmesick@NAR.realtor).

**On Common Ground** is available online at [www.nar.realtor/publications/on-common-ground](http://www.nar.realtor/publications/on-common-ground)

**On Common Ground** is also available in digital format optimized for tablets and smartphones at [www.oncommonground-digital.org](http://www.oncommonground-digital.org)

NATIONAL ASSOCIATION OF REALTORS®  
500 New Jersey Avenue, NW  
Washington, DC 20001

©2022 NATIONAL ASSOCIATION OF REALTORS®

# On Common Ground

## Spring 2022

### Sustainable Development Solutions

Start with Assessing the Risk to Your Own Property/Community

4

by Steve Wright

### Paying for Protection from Extreme Weather

12

by David Goldberg

### Equity is Essential

Strategies to Ensure Historically Neglected/ Under-Resourced Communities Do Not Bear the Brunt of Climate Change

20

by Steve Wright

### Wise Water Management

The Southwest's Counter-Attack to Climate Change

26

by Brian E. Clark

### Stormwater Management

Communities Need to Update Sewer Systems and Implement Green Infrastructure

34

by Joan Mooney

### When Entire Areas Disappear, How to Recover with Resilience

40

by G. M. Filisko

### Coastal Communities Prepare for Rising Seas

46

by Brian E. Clark

### Sustainable and Durable

Structures that Can Tough It Out

52

by Kurt Buss

### Real Estate in a Riskier Climate

58

by Brad Broberg

### Take Action: **THAT'S WHO WE**

Making smart growth happen

64



Courtesy of Visit Mesa

On Common Ground thanks the following contributors and organizations for photographs, illustrations and artist renderings reprinted in this issue: Alexendra Baccari, CBT; Stacy Barnes, City of Greenburg, Kan.; Spencer Blake, City of Phoenix; Kristin Brown, City of Seattle; Michael Gertzman, City of Phoenix; Tina Grimes, Rogue Valley Association of REALTORS®; Landon T. Hester, Center for Planning Excellence; Bronson Mack, Las Vegas Valley Water District; Peter Pfeiffer, Barley|Pfeiffer Architecture; Zack Rosenberg, SBP USA; Jennifer Gray Thompson, After the Fire USA; and Deisy Verdinez, U.S. Green Building Council.

Back Cover: Photos courtesy of Kiowa County Media Center and FEMA.





Courtesy of City of Hoboken, N.J.

# SUSTAINABLE DEVELOPMENT SOLUTIONS

START WITH ASSESSING THE RISK TO YOUR OWN PROPERTY/COMMUNITY



Courtesy of First Street

By Steve Wright

## Climate impact spans far beyond coastal areas.

Sustainability, resiliency, climate change, sea level rise, adaptation, infrastructure, hardening the system, storm events, frequent flooding, global warming, heat islands, drought, wildfires: 21st century life can be overwhelming.

The alphabet soup of scientific phrases can be off-putting and the doom and disaster predictions can encourage one to put down the antennas and let someone else worry about the issues.

Unfortunately, the impact of climate change — whether measured by danger to humans or negative impact on the economy in the tens of billions — cannot be ignored.

The issue is not limited to the coastal southeast, desert southwest or wildfire-prone west coast. Hurricanes landing farther north, snow bomb cyclones crushing the entire northeast, shoreline erosion and flooding along the Great Lakes, deadly power outages in Texas and other climate change-driven events make this a national problem.

The impact of climate change cannot be ignored.

Scientists, insurers, planners, economists, researchers, developers, think tanks, government agencies and professional associations — sometimes at odds over policy — are largely on the same page on climate change. The NATIONAL ASSOCIATION OF REALTORS® shined a light on the impact on residential and commercial property during its Sustainability Summit in December 2021.

Adam Smith, of NOAA’s National Centers for Environmental Information, spoke at the summit. He encouraged individual homebuyers, sellers, builders and community leaders to understand the risk to their individual properties and the communities they live in.

“To counter the growing risk of flooding there is a proliferation of public- and private-sector research tools that can help pinpoint current and projected future flood risk. These tools are also at increasingly finer scales and many are free to help inform decisions and investments moving forward,” he said.

“2021 was another year in a series of years where we had a high frequency, high cost, and large diversity of extreme events that affect people’s lives and livelihoods. It is concerning because it hints that the high activity of recent years is becoming the new normal. However,

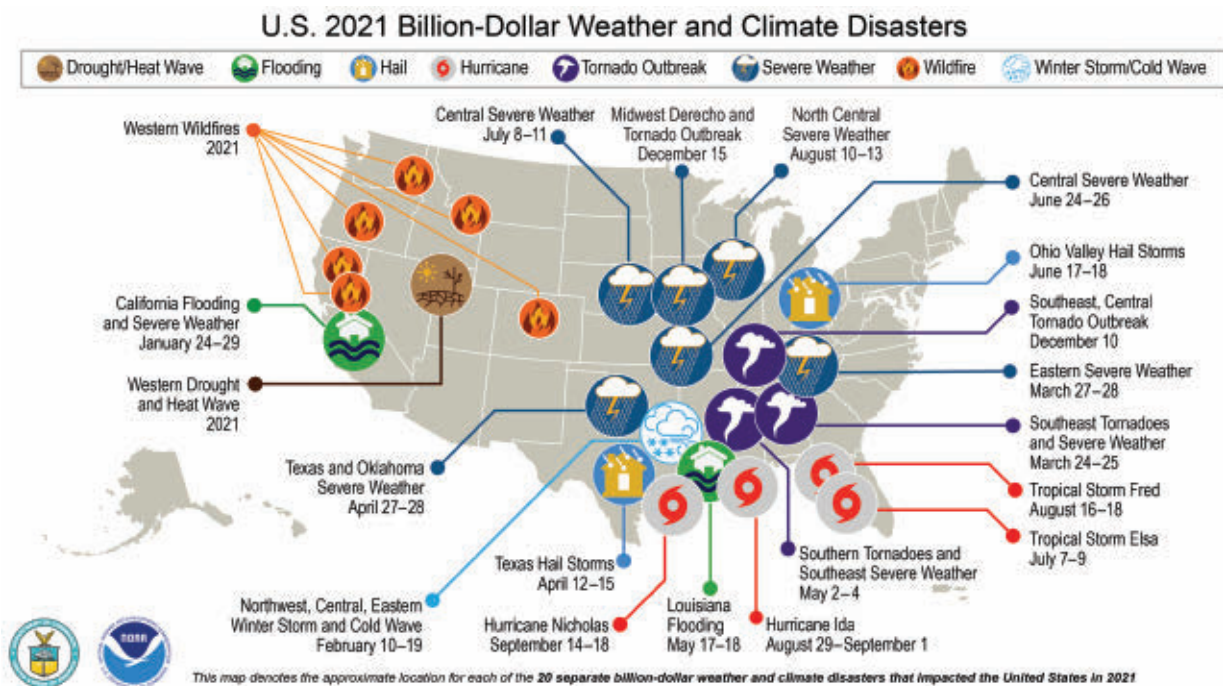
Adaptation can cost billions, but doing nothing comes at a much more staggering cost.

we can reduce our exposure and vulnerabilities to some aspects of these extreme events with forethought and planning,” Smith said.

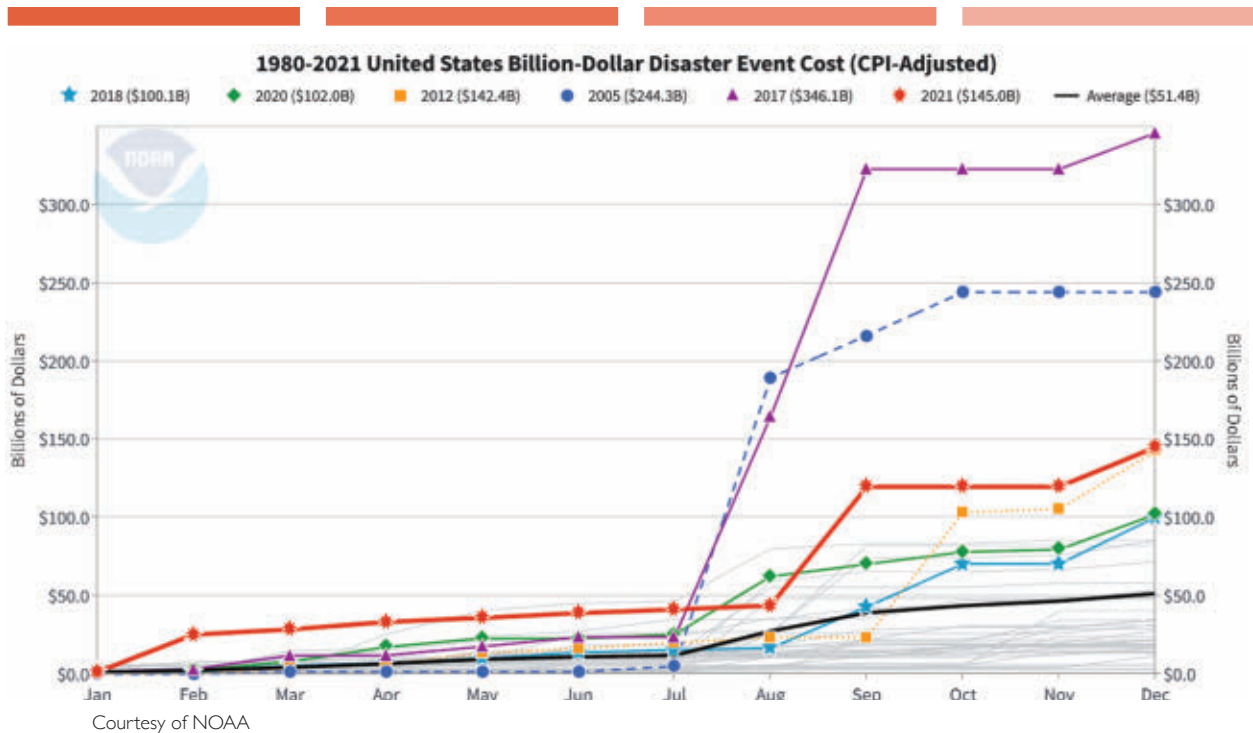
Smith acknowledges that adaptation investments in the billions can be intimidating both for taxpayers and the elected/appointed officials who spend their revenue. But doing nothing comes at a much more staggering cost.

“Studying where to raise and harden coastal infrastructure is an investment that will likely pay future dividends to the communities who benefit from such investments,” he said. “In addition to Miami’s efforts, other cities including New York and Boston are working to elevate and harden coastal infrastructure to storms and sea level rise.”

Smith said it’s plausible that climate change may affect growth patterns in areas that are repeatedly impacted by costly events such as flooding or wildfires.



Courtesy of NOAA



“It’s important to know that the number and cost of weather and climate disasters are increasing in the United States due to a combination of increased exposure [more assets at risk], vulnerability [where we build, how we build], and that climate change is increasing the frequency of some types of extremes that lead to billion-dollar disasters,” he said. “A lot of development has taken place in vulnerable areas along the coasts, the wildland urban interface or in river floodplains. Vulnerability is especially high where building codes are insufficient for reducing damage from extreme events. Better understanding of the risks for weather and climate-influenced hazards is becoming increasingly important.”

Smith said one silver lining from the extremes of 2021 was that large-scale, years-long flood mitigation investment was tested and did well. The \$15-billion levee and pumping system that the U.S. Army Corps of Engineers built around New Orleans was tested by Hurricane Ida, and the city fared better than areas outside it with older levees and no mitigation infrastructure.

“California recently decided to invest heavily in hardening its power grid to mitigate wildfire impacts. This is an investment that will almost certainly pay off in the years ahead given the increased intensity of wildfire seasons,” he said. “The Texas power grid issues from the mid-February

2021 cold wave was also an example where additional resilience of the power system would have saved billions of dollars in damage.

Whether it is learning the information needed to urge public officials to invest in resiliency, or simply finding out what the risks are to your individual property — and which combination of insurance and construction can mitigate a huge loss — individuals need data.

Redfin, the national real estate brokerage with a huge online presence that allows homeowners to get an estimate of exactly what their home is worth, while accessing tons of other free data, has added climate risk information to its home listings.

The feature, powered by ClimateCheck, displays the risk of flood, heat, fire, drought and storms by individual address, zip code and city. A Redfin report found nearly 50 percent who plan to move in the next year are relocating because of extreme temperatures or natural disasters and 80 percent of those surveyed are hesitant to buy a home in places with increased natural disasters.

**Better understanding of extreme-weather hazards is important.**



Photos courtesy of SDOT

## Climate impact is applicable across the country and there is risk to residential and commercial real estate.

Realtors Property Resource® (RPR®) a nationwide, property database available only to members of the NATIONAL ASSOCIATION OF REALTORS®, delivers parcel-level data to REALTORS® to share with their clients and customers, assisting them in the process of buying, selling or leasing of both residential and commercial real estate. RPR recently announced a partnership to provide REALTORS® with access to the ClimateCheck platform, which started mid-April 2022. Jeff Young, CEO and general manager of RPR, says RPR is adding this layer of information for REALTORS® to identify climate risks and be able to suggest simple ways to adapt properties so they are more resilient to extreme weather hazards.

The First Street Foundation has compiled invaluable data to create FloodFactor.com — a powerful free tool for folks to see historic, present and future risks to the home, business, farm, etc.

“Imagine being able to access data that used to cost a small fortune for big companies. Now people can access state of the art flood model information for free at FloodFactor,” said Jeremy Porter, chief research officer of the nonprofit. “We built a model partnering with more than 80 universities and experts looking at storm surge, tidal flooding, precipitation and riverine flooding.”

Porter said FEMA flood hazard maps help flood plain managers and planners, but they don’t take individual property risk — from multiple impacts of climate change — into account.

“For most, a home is the largest purchase in their life, so we developed crucial information at a property level and made it publicly accessible,” said Porter, noting that First Street has partnered with REALTOR.com to share information.

“We are saying ‘don’t worry about 2100, this is happening now,’” he said. “There are historic signals now: tidal flooding and 100-year storms are happening more frequently, there’s more water in the streets and property values aren’t appreciating in some flood-prone areas.”

Porter is aware that climate science, predictions of doom and the high cost of addressing it can tempt many to bury their head in the sand. So, First Street and its partnerships aim to make science more accessible and digestible.

“Our primary mission is making this data available to people who don’t have access to these resources,” he said. “Climate impact is applicable across the country and there is risk to residential and commercial real estate and the communities they are in.”

Porter said FloodFactor can help individuals to demand that their communities do not build in places that are not safe. He noted many cities and counties have not dedicated resources to analyze flooding data so they can plan for resiliency.

“Even if your home is relatively safe, if your power station is at risk, if your government buildings and facilities are at risk, your community may not be sustainable,” he said. “This can impact your tax base, supply chain, access to essential goods and the ability to recruit employees and employers.”

Tom Larsen, senior director of Content Strategy at CoreLogic Inc., participated in the NAR climate summit. CoreLogic provides proprietary information to clients. He noted there are more than 120 million homes in the United States and all need to be more aware of the risk of climate change and what sustainability practices can protect them.

Compact, mixed-use, transit-oriented development helps a community to be resilient against flooding and storms.



Top: Courtesy of the U.S. Green Building Council  
Bottom: Courtesy of SDOT

“There are two levels of risk. Risk today and what that analysis projects — the incremental risk in the near future,” he said. “Risk varies block by block and varies whether you are on low ground, near a canal, river, or lake. Miami is at ground zero with flooding and California has increased risk from wildfires, but the risk is increasing everywhere. In Ohio, you have spring floods, more severe storms, more ice forming dams in rivers — that can put many more at risk.”

Larsen noted skyrocketing insurance rates in Florida (due to storms and flooding) and in California (due to wildfires). He said data can help property owners to perform a sound cost-benefit analysis.

“Should I elevate my home? Should I move away? Should I vote for city bonds to elevate levies, to harden infrastructure? This helps shift climate change discussion from the emotional to the ‘what’s the cost of no action vs. the cost of action?’” he said. “We can work for better building codes, micro levies, growth patterns. Analytics can help put climate science into the balance sheet — there’s a big loss coming from climate change, so how do we reduce that loss?”

The Congress for New Urbanism advocates for walkable, compact, mixed-used, transit-oriented communities. An article in its Public Square online magazine summarized the environmental benefits of walkable places, adapted from the “Cities Alive” report by Arup, a multinational engineering and design firm. The sustainable/resilient benefits include: reducing greenhouse gas emissions and air pollution, improving water management and urban microclimates, encouraging transportation that isn’t automobile-dependent and minimizing land use — because it is easier to focus adaptation infrastructure on compact development versus sprawl.

The United States Green Building Council (USGBC) promotes sustainability through its Leadership in Energy and Environmental Design (LEED) green rating for everything from buildings to entire cities. The nonprofit’s LEED for Cities program encourages sustainable and resilient communities.

Hilari Varnadore, vice president for Cities, heads the USGBC’s efforts to certify entire cities, or counties, as LEED rated. More than 160 U.S. cities have qualified and one dozen international cities have gone through the process.

“We require local governments to collect performance indicators: median household income, educational attainment, many other factors. They feed that and other data to see how they are doing. Then they analyze the socio-economic data and map it out,” she said. “On a map it’s so obvious to see disparity and disinvestment.”

Varnadore said Orange County, Fla., which includes Orlando, has done an excellent job of color coding its areas of need. She said the coding helps prioritize everything from economic intervention to infrastructure spending to focusing on climate adaptation in vulnerable areas.

“The countywide or citywide report identifies strengths and weaknesses. It helps steer land-use policy. Compact, mixed-use, transit-oriented development helps a



community to be resilient against flooding and storms,” she said. “The LEED city accreditation process encourages reclaiming brownfields and measuring the energy performance of buildings — which can make a city more sustainable while addressing inequity.”

David Abell, senior manager, LEED for Cities at USGBC, said climate response can be as simple as adding more street trees and adding shaded bus shelters to make transit use more comfortable in extreme heat. He noted that Miami-Dade County, which has LEED Cities Gold certification, has a full-time heat officer to address issues in an area where the number of extreme heat days increases each year.

“The southwest is an area looking at heat,” he said. “One thing I’ve seen is a lot more urban tree master plans. In Phoenix [a LEED certified city,] they are planning a tree/shade inventory. Cities are investing in sidewalks, shelters, connectivity — things people need to get to transit.”

Abell said Louisville, Ky., has worked with the National Institutes of Health to study how greenspace improves public health. The Green Heart Louisville initiative, also supported by The Nature Conservancy, looks at trees as medicine.

Varnadore said the LEED for Cities program allows diverse cities and counties to share best practices for mitigating heat, flooding, storms and related climate issues while also tackling issues of socioeconomic and other inequalities.

“Houston and Billings, Mont., are very different places with different climates and population scales, but they are in the same group with each other,” she said, noting that winning sustainable land-use, growth and building policies are exportable.

“In Hoboken, N.J., they came in on our pilot program and did major resilience work to mitigate flooding and storms. They redid their waterfront. On the surface, it looks like parks and a beautiful urban space. Beneath that is an amazing level of infrastructure to maintain their housing, commercial and viability against climate change.”

Abell said to become LEED certified, cities must assess their green and gray infrastructure and their relationship to equity.

“We help them mine data to ensure decisions are centered around equity. We want to ensure that communities

To become LEED certified, cities must assess their green and gray infrastructure and their relationship to equity.



Top: Courtesy of the U.S. Green Building Council  
Bottom: Courtesy of Curtis + Rogers

historically left behind are addressed in all aspects of quality of life — including infrastructure investment,” he said.

Varnadore said the USBGC also wants to make sure cities are working with diverse groups — so neighborhood solutions are tailored to the needs of the residents, not a top-down approach that often fails. The steps to LEED certification also make sure cities are working collaboratively with regional nonprofits and foundations capable of leveraging dollars with grant funding.

In Miami, Landscape Architect Aida Curtis, principal of Curtis+Rogers Design Studio, has been immersed in resilient design, decades before the city became synonymous

with ground zero for climate disaster — both the slow variety from sea level rise and the immediate knockout punch from the killer winds and storm surge of increasingly frequent hurricanes. She stresses that mitigation can be beautiful and practical.

After Hurricane Irma, a federally funded study proposed a 10- to 30-foot-high floodwall that would run along the Miami's picturesque bayfront spanning from downtown Miami, south across the Miami River (with floodgates) and to the Manhattan-like Brickell Area. Curtis' firm was hired to illustrate alternatives to what most saw as a hideous wall.

"We came up with a series of hybrid solutions, nature based — that would add living shorelines, natural breakwaters, near-shore artificial reefs, and raised seawalls. It would add 39 acres of open park land for the citizens of Miami," she said, who also generated visuals of how bad the seawall would look — to further the argument for more equitable nature-based solutions.

Inland, Curtis's landscape architecture and planning encourages development and other rules that truly create a sustainable network through all of Miami's diverse communities.

"Instead of removing trees to construct — move the trees and/or build around them. Add more nature to your buildings — people in Italy are building vertical forests," she observed. "Use more nature-based solutions for flooding: permeable parking lots, invest in the public spaces around your projects and invest in renewable energy for your building. Create wider sidewalks — permeable to store water, with the ability to support large trees to create shade."

In Louisiana, where sea level rise is erasing land each year, relocation of entire cities is an option. In early 2021, the state Community Development Department broke ground on a 22.5-acre plot aimed at resettling people from a flood-plagued neighborhood that earned the nickname "Flood City."

The Advocate newspaper in Baton Rouge reported that the small community of Pecan Acres has flooded 17 times in the past 30 years. The state earmarked about \$19.4 million for the resettlement effort, funded through a mix of federal and state grants used for disaster and relocation initiatives.



Curtis + Rogers Design Studio, in above rendering, illustrates alternatives for Miami's flood protection, which includes living shorelines, natural breakwaters, near-shore artificial reefs, and raised seawalls.

## Retreat could be the only ultimate solution in below or barely above sea level cities.

"After years of planning, some 40 homeowners will have the opportunity to move to the new community that they've named Audubon Estates," the Advocate reported, noting many Pecan Acres residents are low- to moderate-income and moved to the area after previously living on nearby sharecropping land.

The new town is about two miles from the oft-deluged Pecan Acres. Once all residents move from Pecan Acres, the area will be restored to a wetland that could help mitigate regional flooding.

The Advocate reported that Pecan Acres was built in the late '60s and '70s on a parish dumpsite that previously was low-lying swampland, making it vulnerable to floods. Many in the neighborhood couldn't afford flood insurance, which is needed to obtain federal grants for flood repairs.

Efforts to curb flooding in the Baton Rouge-area town by installing pumps and other measures failed. The inability of pumps and infrastructure to resolve flooding could be a canary in the coal mine warning that retreat could be the only ultimate solution in below or barely above sea level cities in Florida and Louisiana.

While some communities' answer to resiliency will include retreat, Rutgers University-Newark Professor Jason Barr's answer for New York is a resounding — EXPAND! The economist created quite a stir when his January 2022 New York Times Op-Ed urged incoming Mayor Eric Adams to expand Lower Manhattan substantially.

If we're spending billions to do some climate mitigation, why not create more of the most valuable real estate in the world?



As seen in this rendering, Curtis + Rogers Design Studio proposes adding 39 acres of open park land, for the citizens of Miami, to mitigate flooding.

By reclaiming land — 1,760 acres to be exact — from New York Harbor, Barr suggests the city's housing crisis could be answered with 250,000 new residences — a good chunk affordable. Barr, who points out that New York has a history of expanding by expanding the shoreline, even has a name for his new city tacked onto the city — New Mannahatta.

“New York started in Lower Manhattan and it expanded the shoreline many times there, from the time the British took over. Other cities are doing large infill projects. Hong Kong, suffering from housing affordability and being land constrained, is doing 2.5 times my suggestion — 1,700 hectares,” said Barr, whose vision for New Mannahatta includes absorbing Governor's Island.

New York city has started a major climate resiliency project along Manhattan to help reduce future flood risk. “If we're going to spend billions of dollars on this, why not create more of the most valuable real estate in the world?” Barr asked.

Barr said the value of the new land could leverage a new subway line, parks, infrastructure and most important of all — mixed-use housing with a strong percentage of it affordable. Barr has heard much “it can't be done” skepticism and incorrect claims that the vision would end up as a giveaway to billionaires.

“Of course, I want some buildings for billionaires — that would raise the money to help subsidize the affordable housing,” he said. “But an authority would own the land

and have full control of the long-term leases. That would allow large tracks devoted to middle- or low-income housing.”

When the remnants of Ida dumped heavy rain on greater New York, dozens of people lost their lives and subway lines — the lifeblood of commerce in the city — were heavily damaged by flooding. Barr said events like that will happen more often and working-class people will be cut off from jobs if dramatic action isn't taken. He understands the cynicism toward his project, but said the time for design for action is now.

“Doing nothing is much more expensive than doing a big project,” he said. “In all climate change adaptation, we are going to be weighing the cost of inaction versus the cost of action,” Barr said. ●

Steve Wright (@stevewright64) is a writer, educator, disability rights activist, and marketer of planning services. He has contributed dozens of stories to On Common Ground — focusing on best practices plus diversity, equity, inclusion and accessibility. Based in Miami, he along with his wife, Heidi Johnson-Wright are teaming to teach a groundbreaking course on Universal Design at the University of Miami School of Architecture. The full-credit course is taught to graduate and upper-level undergraduate students at the highly ranked school of architecture and urban planning. The Wrights hope to adapt the housing-specific elements of the course into in-person and online continuing education opportunities for REALTORS®. Steve Wright blogs daily at Urban Travel and Accessibility, <http://urbantravelandaccessibility.blogspot.com/>.



Courtesy of First Street

# PAYING

# for Protection from Extreme Weather

By David Goldberg

**T**he February warning from the global watchdog on climate change was stark: No longer theoretical, the planet-altering effects of climate change are here. Worse, we are nowhere close to investing enough to “adapt” to sea level rise, increasingly brutal storms, year-round wildfire threats and much more, wrote the Intergovernmental Panel on Climate Change in its 2022 report.

Few people in the United States feel that conclusion more than Camille Manning-Broome, who heads a Louisiana nonprofit helping the state’s communities navigate the current and expected fall-out from climate change. “We’re all paying for the disasters already,” said Manning-Broome, president of the Center for Planning Excellence in Baton Rouge. “What we’re not paying near enough for is prevention.”

Our financial systems, our policy decisions, and our governance are not in a place where we are making smart investments in climate adaptation.

Louisiana faces a quadruple whammy of climate impacts: rising sea and sinking coastal land, extreme heat events, along with increasingly frequent and intense hurricanes and thunderstorms, all leading to more frequent river flooding. “Forty percent of the contiguous United States drains through Louisiana,” she noted, so even when not hit by a tropical storm, heavier rains upstream can eventually inundate much of the state. In 2016, every parish in Louisiana was declared a disaster area, most from river flooding.

In recent years, Manning-Broome said, federal disaster relief has accounted for as much as 40 percent of the state’s budget. While the aid is welcome, she said, surprisingly few of those dollars were going to flood management systems, raising roads above flood stage, burying power lines and hardening the power grid, relocating people from harm’s way or myriad other disaster-prevention strategies. “Financially, at this point I would hope to see more responsibility and good stewardship of resources from not only the feds but also the insurance companies and banks, to have a more preventive focus,” Manning-Broome said. “Our financial systems, our policy decisions, our governance are not in a place where we are making smart investments in climate adaptation.”

“Even now, the biggest home sales and high growth are in high-risk coastal areas and wildfire-threatened areas, and the banks are still investing in development in those areas,” she added. While the Federal Emergency Management Agency and the Department of Housing and Urban Development are awakening to the contradictions, old habits persist, she said. “When there is a disaster, on the flip side, we are putting money back into rebuilding in those areas through FEMA and HUD policies. In Louisiana, the majority of HUD-backed mortgages are for high-risk homes.”



Louisiana is the canary in the coal mine, a portent of what is coming rather than an outlier, said Joyce Coffee, president of Climate Resilience Consulting. “There is no escaping climate change. Every state in the nation is facing current risks and will grapple with increasing effects.” Communities in those states should be investing now to prepare for climate risks, including storms and flooding, coastal inundation, extreme heat, wildfires, tree and crop loss, an influx of climate refugees, even an increase in vector borne diseases.

“Cities are responsible for 70 percent of global emissions and most vulnerable to the impacts,” said Bella Tonkonogy, U.S. director for the Climate Policy Initiative (CPI), whose mission is “to help governments, businesses, and financial institutions drive economic growth while addressing climate change.”

CPI regularly performs a global study of climate finance needs for water and energy systems, buildings, industry, transportation, and other mitigation and adaptation measures, and then tallies where the money is actually going. CPI estimates that, worldwide, the public and private sectors need to increase their investment by at least 590 percent, to \$4.35 trillion a year by 2030. And while investment in mitigation — moving from coal to renewables, from oil to electricity for transportation, etc. — is critical, the shocks we are already experiencing trumpet the need to shift the balance toward adaption in a hurry, Tonkonogy said. “Our study found that just 7 percent of climate finance is going to adaptation.”

### A federal infusion brings opportunity and peril

If U.S. communities play their cards right, the recently authorized, massive infusions of federal pandemic relief and infrastructure investment represent the biggest down payment yet in aid to localities steeling themselves for climate impacts. While November’s bipartisan, \$1.2 trillion Infrastructure Investment and Jobs Act specifically allocates \$50 billion to projects designed to make communities more climate resilient, the truth is that states will have wide latitude as to how they screen projects for funding, Coffee said.

“The bottom line is that today local governments should be planning as if there is so much money, they don’t know what to do with it,” she said. “If a coastal community knows that coming sea level rise will require a new or stronger sea wall, or if flood-prone cities know they need a much more robust stormwater management system, or they need better transit networks to reduce emissions and keep people moving, now is the time to move on those plans. The peril, however, is that the money will be spent for projects conceived before the threats were understood, and that those old-school projects could exacerbate future disasters. If that money goes to ‘shovel-ready’ projects from a previous era, we will miss a huge, once-in-a-lifetime opportunity. It would be nothing less than tragic.”

As the two agencies most intimately involved in disaster relief and recovery, FEMA and HUD have in recent years begun to develop programs aimed at “precovery” —



Courtesy of the Center for Neighborhood Technology

Just 7 percent of climate finance is going to adaptation.

measures to prevent the displacement, destruction and disruption associated with extreme weather, fires, and the like. FEMA has created a competitive grant program known as BRIC — Building Resilient Infrastructure and Communities — that funds adaptation measures absent a disaster declaration. HUD, too, provides funding on a competitive basis through its Community Development Block Grants to states, with an emphasis on aid to low-income and communities of color. To qualify, projects must emerge from an action plan that describes how proposals would address “disaster-related impacts to infrastructure, housing, economic revitalization and mitigation in the [most impacted and distressed] areas.”

### The catch: Federal grants require a plan and a local match

The catch with these and other grants is that local governments need to have spent the money and time to assess their risks and come up with a detailed plan to head them off, and they need a local match of as much as 50 percent of total costs of a given project. That’s money that many local governments can find hard to come by.

Massachusetts has sought to help its localities overcome these barriers with its Municipal Vulnerability Preparedness (MVP) program. The MVP first provides money for locals to conduct assessments of their threats and then run an inclusive process with citizens to develop action plans. With those done, participating communities can apply for MVP Action Grants to implement projects. Taking a cue from their neighbor, Rhode Island created a similar program, dubbed Resilient Rhody.

Florida, too, has a Resilient Coastlines Program that provides threat assessment and planning dollars to local communities on a competitive basis, said James Murley, chief resilience officer for Miami-Dade County. More recently, the state has acted to establish a more consistent stream of tax revenue for adaptation projects. “Florida is one of a half-dozen states without an income tax,” Murley said. “In lieu of that, we have a high real estate transfer tax executed by the state on the sale of any property. It has been authorized for land purchase, affordable housing and most recently to address sea level rise and flooding.” Interestingly, he added, “This is out of a very Republican leadership team. They have found religion on adaptation, even if they aren’t eager to talk about reducing emissions.”

### Traditional Flood Risk Reduction Strategy



Traditional flood risk reduction strategies such as those focusing on storm surge reduction and drainage are unable to manage the flood risk of today and the future.

### Resilient System



A resilient system integrates the best practices in (re) development and accommodates water to reduce economic damage from flooding.

Graphics above courtesy of Center for Planning Excellence

Florida municipalities looking for a funding source for their local matches or to complete projects on their own dime also can create stormwater utilities under state legislation. Separate from water and sewer agencies, stormwater utilities charge fees for managing the results of ever-more-frequent deluges and can use those dollars to pay off voter-approved bonds for infrastructure investments. “Cities like Miami Beach are using these funds to raise roads and upgrade their pumping systems,” Murley said.

Gaining voter approval for bonds, though, can be a trick, he added. “The challenge with educating the public to be prepared to pony up is that absent a crisis, it’s hard to get people to worry about something that could happen. Most people are trying to make a living and get through COVID,” Murley said. “But these days even a heavy rain can trigger massive flooding, and they are coming more often, so people are starting to see the evidence. Still, you have to have a whole campaign and persuasive messengers.”

That approach worked for the city of Miami in 2017 when voters authorized the \$400-million Miami Forever Bond. As one of the U.S. cities most threatened by sea level rise, Miami in the previous decade had seen a 400-percent jump in frequency of floods. Bond proceeds are going

toward building “a stronger, more resilient future for Miami, alleviating existing and future risks to residents, economy, tourism and the city’s legacy,” as the city’s website says. With an eye toward equity and aiding the most vulnerable communities, funds are allocated to five categories: flood prevention, roadways, parks, public safety, and affordable housing.

Like Miami, Norfolk, Va., is especially vulnerable to sea level rise and has won voter approval of a dedicated funding source. Lying on sinking land between the Atlantic Ocean and the Elizabeth River, the city of 250,000 also is home to the world’s largest navy base. Both city and the base experience increasing “sunny day flooding,” thanks to rising tides and sinking land. To provide matching funds for a slew of proposed adaptation projects, the city asked for and got voter approval for a dedicated property-tax increase of \$.01 per \$100 assessed value that was dubbed “the resilience penny.” The \$1.8 million raised per year can be used to pay off up to \$20 million, repaid over 20 years.

With those dollars as a match, Norfolk in 2020 won a HUD grant toward its \$122.2-million Ohio Creek Watershed Project. The project is intended to create an



Even a heavy rain can trigger massive flooding, and they are coming more often.

Miami-Dade County Sea Level Rise Strategy. Courtesy of Miami-Dade County.





The Ohio Creek Watershed Project is intended to create an integrated flood control system while connecting two predominantly African-American neighborhoods with a park, walking trails, a new fishing pier and sports field. Photo courtesy of the City of Norfolk, Va.

integrated flood control system while connecting two predominantly African-American neighborhoods with a park, walking trails, a new fishing pier and sports field. The green spaces can hold water and filter pollutants. To be completed in 2023, the project also includes a raised road, a flood wall, an earthen berm, and a tidal gate.

### Creating land to save land: A proposal for new Manhattan real estate

Manhattan is home to some of the richest companies and individuals in the world, but even New York City is struggling to find the resources to protect an island that faces six feet of sea level rise by the end of the century. Wake-up calls have come in succession: Superstorm Sandy in 2012 claimed 44 lives and caused \$19 billion in damage and economic displacement. Summer 2021 brought a record heat wave followed by tropical storm Henri and then Hurricane Ida, whose intense rains triggered the first city-wide flash flood emergency. In late 2021, the office of outgoing Mayor Bill de Blasio released a master plan to protect lower Manhattan's Financial District and Seaport that envisions extending the shoreline to make room for flood walls to protect against rising tides and severe storms, to create new green space, elevated walking and cycling trails and more. Still to be answered: Where to get up to \$7 billion to execute the plan.

Enter Rutgers economics professor Jason Barr with a notion worthy of a brash global city: Build and lease more Manhattan real estate. "My idea is to take everything in the mayor's plan and push it out into the harbor and build up new land in between, above expected sea rise," Barr said. "Manhattan real estate is the most expensive on the planet. Revenue from leasing the land would more than pay for creating it and the new climate-protection infrastructure, and you could build thousands of units

of affordable housing." Barr's proposal would expand the island of Manhattan 2.5 miles into New York harbor, creating a new neighborhood of 1,760 acres.

"Everything has to be on the table going forward and we need to get the public to understand that the work has to start today. We can see how kicking the can down the road for the last 40 years has left us playing catch up with reality. The public is too often told to measure how infrastructure work today is going to benefit them today. But the work today, which certainly has economic benefits and costs today, is always the work we are leaving to future generations. This requires leadership willing to look out past the next quarter or the next election," said Sandy Krueger, CEO, Staten Island Board of REALTORS®.

Creating new land from in-water fill is a practice in other countries. The Dutch did it when they settled New York (New Amsterdam then) and are still doing it in the Netherlands. Numerous Asian countries are doing it as well, Barr said. To gauge the potential cost of his idea, he looked to Hong Kong, whose Lantau project to create a new neighborhood of more than 4,000 acres is expected to cost about \$81 billion. That translates to about \$34 billion for his plan, he said. "It sounds like a lot, but, literally and figuratively, it's dirt cheap." He estimates there is more than enough fill dredged from ports around the globe to complete the project. "The market value of the land would be worth \$240 billion at today's prices."

### A perfect storm: Climate disasters that kill the tax base needed to meet them

Most places, of course, don't have the option of creating pricey real estate from fill dirt. In fact, many of the most vulnerable communities are home to low-income residents, people of color and Native tribes who see already modest tax bases declining in the face of climate disasters.

## We need to develop communities differently to advance resilience.



Courtesy of Center for Planning Excellence

Adaptation planning, rain barrels and gardens, permeable pavers, and raised building structures are strategies to make communities more resilient.



Courtesy of Center for Planning Excellence



Courtesy of the Center for Neighborhood Technology

“People with means reach the tipping point earlier and move out of high-risk areas,” said Manning-Broome. “In Louisiana, we are seeing the slow death in our less affluent communities over time. Every time we see a hurricane, from Katrina to Ida, we see a decline in population and property values.

St. Charles had two hurricanes back-to-back and never recovered 16 percent of their population. How are they going to pay to protect themselves without a lot of outside help?”

The costs of preventing or adapting to the displacement of people by climate disasters go beyond infrastructure, she added. “Last year’s Hurricane Ida hit a mostly Native area and people were displaced across Louisiana. For people like them, we need a plan not only for housing, but also wrap-around services in relocation areas.”

“For us as a county with 34 cities,” said Miami-Dade’s Murley, “we have more of them with serious financial needs than not.”

Affluent communities like Coral Gables have established a trust fund for dealing with sea level rise. “Many of our communities are a step away from financial ruin. They ask the county for a lot of help just keeping the sewer systems working.” But the threats to low-income people extend beyond flooding, he noted. “We now have an extreme heat officer and task force — and this goes right to our vulnerable populations because many don’t have tree canopy or efficient AC. In Miami, traditionally we rarely got temperatures over 100. Now we get that and higher and it doesn’t cool off at night during heat events, and that especially hurts lower-income communities. That’s a whole new area of climate change impact. People predicted it was coming, but now it’s here. It’s like peeling an onion, it’s one layer of impacts after another.”

Harris County, Texas, which manages flood control in and around Houston, is taking bold — and somewhat controversial — steps toward ending the cycle of disaster and decline for less-wealthy communities. After Hurricane Harvey in 2017 pounded the area with the most rain in U.S. history and flooded out 166,000 homes, county officials in 2018 won approval of a \$2.5-billion bond measure to fund hundreds of flood-control projects. But rather than follow past practices of prioritizing recovery and flood prevention in higher-priced areas, county officials adopted a policy of first addressing issues in the quick-to-flood areas where mostly Black and Latinx people live.

“Between the flooding and the winter storm that showed the vulnerability of their power grid, Houston is showing all of us the urgency of adaptation,” said Stewart Sarkozy-Banoczy, director of strategic partnerships and development for the Resilient Cities Network.

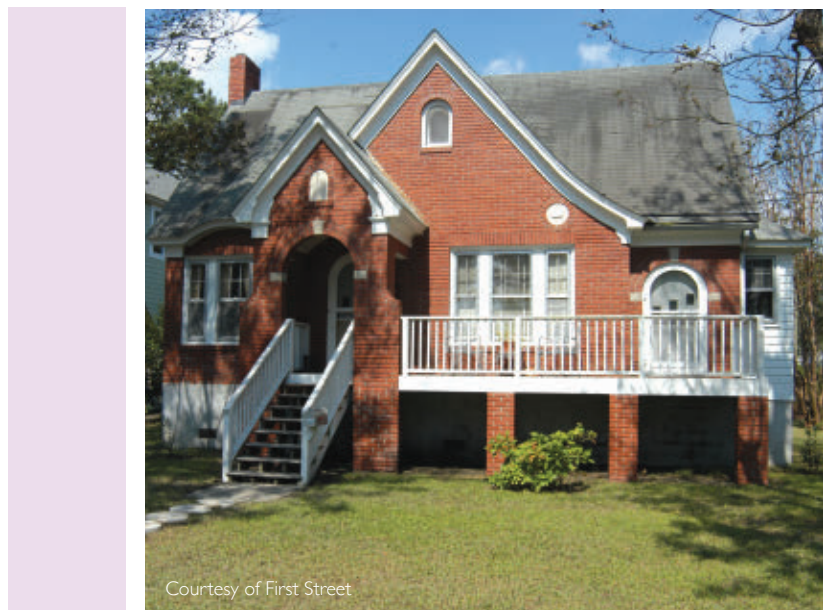
Houston also is showing other places how to use zoning and development codes to require raised buildings or keep development out of lowlands and other vulnerable areas, he added. “Cities can get smarter about using zoning and codes to show where to build and how to build for resilience,” Sarkozy-Banoczy said. “But they also need to partner with the lenders who finance development. We are creating tools where lenders can look at development with the same [adaptation] lens. A project in a potentially flood-threatened area might score better if it includes, say 5-foot basements, permeable pavement, HVAC on upper floors, and generator hookups. They are incrementally small moves, house by house or building by building, but on a larger scale you are moving to be more resilient and able to recover value,” both for the lender and for the tax base.

### A last resort: Buyouts and relocation

When all else fails, some communities might choose — or be forced into — “managed retreat” from threatened areas. New York, for example, has rezoned to limit future development in areas threatened by sea level rise and, after Sandy, bought out more than 1,000 properties from flood zones. San Francisco, meanwhile, has openly discussed the eventual abandonment of infrastructure and removal of private structures in some coastal areas.

Faced with areas that are repeatedly applying for disaster aid, the federal government has now begun to consider buy-outs as more of an option. In 2016, the Native community of Isle de Jean Charles in Louisiana received federal funds to buy out homes and relocate inland. Also in 2016, Manning-Broome’s CPEX worked with the state’s congressional delegation and the city of Gonzalez to win a funding package to clear 41 homes from the Silver Leaf neighborhood so the area can revert to 50 acres of wetlands.

“This is a really challenging discussion, because someone has to be the leader,” Manning-Broome said. “But as a public decision-maker you are faced with a limited toolkit. Our mayors and elected officials are fighting for infrastructure for their communities because they need



them to remain viable to have a tax base and fund protection measures. But when we look at the flood maps and think about how to make best use of resources, you actually need a plan to phase out infrastructure investment in some areas. And no politician is going to do that. So, you are left with local leaders fighting for the existence of their communities because there is no other alternative.”

Ultimately, it will be up to the federal and state governments to make some of these calls — and provide the funding for relocating communities. “We can’t continue asking individuals to be resilient on their own. We need leadership at all levels committed to developing systems and structures that support the adaptation and mitigation needed to advance resilience for all of our people.”

“This requires facing uncomfortable and unpopular realities about what our future looks like,” she added. “We have to be willing to do things differently — from the way we use our land and develop our communities, to the way in which we engage people in our economy. No one has figured it out, but we have a head start in Louisiana because of the risk and the number of disasters that we have been grappling with over the last 15 years.” ●

David A. Goldberg is a nationally recognized journalist and founding communications director of two national nonprofits, Smart Growth America and Transportation for America. In 2002, Mr. Goldberg was awarded a Loeb Fellowship at Harvard University, where he studied urban policy.



Courtesy of California Strategic Growth Council

# EQUITY IS ESSENTIAL

STRATEGIES TO ENSURE HISTORICALLY NEGLECTED/UNDER-RESOURCED COMMUNITIES DO NOT BEAR THE BRUNT OF CLIMATE CHANGE



Courtesy of California Strategic Growth Council

By Steve Wright

Throughout the twentieth century, American cities have frequently disrupted or endangered communities of color — homes and businesses demolished for highways and urban renewal projects; health and property values threatened by polluting factories and other industrial uses.

Cities traditionally have been very slow to improve marginalized neighborhoods. In the first half of the twentieth century, amenities such as paved streets, streetlights, water and sewer service, and trash collection were often withheld.

In the coming decades, cities will spend tens, perhaps hundreds of billions on climate adaptation. The obvious and poignant question is: will we avoid the missteps of the past, perhaps even righting old wrongs via giant infrastructure? — or will it be more of the same uneven playing field?

Fortunately, several city, county and statewide agencies, as well as academics, are looking at resilient design through the lens of equity, inclusion and environmental justice.

### Louisiana plans for greater climate impacts

Camille Manning-Broome — president & CEO of the Center for Planning Excellence (CPEX), a nonprofit organization that coordinates urban, rural and regional planning efforts in Louisiana — has been working on the front line of climate change the past 15 years.

“Rapid sea level rise, higher temperatures, loss of land, more frequent and more intense hurricanes — these climate impacts and climate disasters are unavoidable in Louisiana,” she said. “Climate vulnerability is compounded by economic vulnerability — across lines of race, income, health and physical ability.”

Manning-Broome said Louisiana must adapt because in addition to a high poverty rate, the state has a heavy economic reliance on oil and gas production — at a time when the focus is shifting to lower carbon fuel sources, to combat rapid climate change.

“You are literally trying to save your place, your home, your identity, your ability to survive and thrive in this world,” she said, noting Louisiana is the only southern state to have a climate action plan. Its goal is net zero by 2050. “Sixty percent of emissions come from oil and gas production and 20 percent from the transportation sector. We have to target those two main areas and shift to renewable energy.”

Manning-Broome said communities cannot grow by sprawl — they have to grow with a lighter footprint and be accessible to all via transit. She is well-aware that amenity-rich communities on higher ground are becoming too expensive for many people. She said green infrastructure, such as increased tree canopy and natural ways of retaining water, must be done with equity. Heat islands can disproportionately impact people who cannot afford high air conditioning bills. Many poor communities have been built in flood plains and that has to stop.

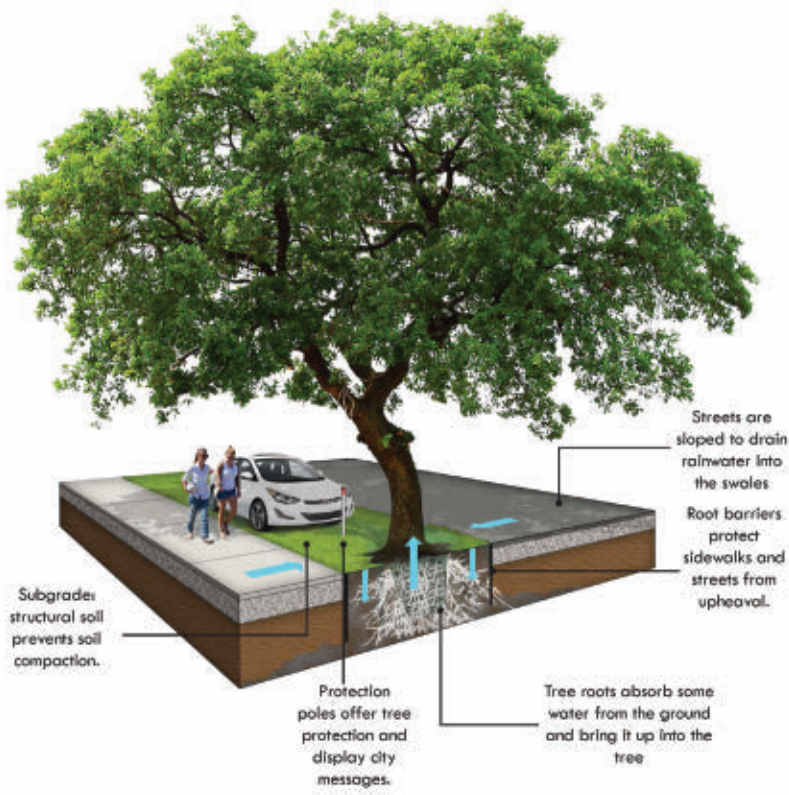
“When we build for resilience, when we harden infrastructure, it will drive our economy and town functions. That means we must address poverty, racial division and build with a sensitivity to cultural factors,” she said.

In its 2021 report “High Ground, High Prices,” CNN reported on Black families in New Orleans pushed out

Several city, county and statewide agencies, as well as academics, are looking at resilient design through the lens of equity.



Seattle's Equity and Environment Initiative work.



A Curtis + Rogers design proposes to maximize the inclusion of trees to build resilience to the impacts of climate change.

not by Hurricane Katrina, but by gentrification that followed in its wake.

“Irish Channel, once a largely working-class area on high ground near the Mississippi River, went from 75 percent Black in 2000 to 71 percent White by 2019, according to Census data — one of the most dramatic racial shifts in the city over the last two decades. Experts and local activists say the changes affecting the neighborhood are an example of climate gentrification — a process in which wealthier people fleeing from climate-risky areas spur higher housing prices and more aggressive gentrification in safer areas.” CNN reported.

“Across the globe, the highest-risk land and communities usually are inhabited by the lowest-empowered people,” Manning-Broome said. “A lot of climate gentrification is happening.”

Though they don’t quite touch, other than via the Gulf of Mexico, Louisiana and Florida are siblings bound by the brutal one-two punch of sea level rise plus hurricanes that are more frequent, more intense and more devastating.

Across the globe, a lot of climate gentrification is happening.

## Miami equitably plans for climate change

“Our firm is dedicated to working on public climate adaptation projects that are open to all. What we are finding is that little funding has been invested in these areas, and as such, the spaces have been seriously deteriorated and are facing climatic-related challenges — cracked and uneven sidewalks generally resulting from lack of tree maintenance; neighborhoods where open spaces have been paved for ease of maintenance, rendering them unbearable on hot Miami days; and edges of waterfront parks being inundated due to tidal flooding,” said Miami-based landscape architect Aida Curtis, principal of Curtis+Rogers Design Studio. “On the forefront of our adaptation of these spaces is the issue of access, ensuring equal access for all to the newly adapted space, ensuring that the connections to the public areas are adequate, shaded and fully accessible so everyone has access to this public realm.”

A native of Honduras, Curtis and her firm have been working in Miami’s Little Havana area for the past three years developing an interconnected street tree master plan, which would make the streets more resilient to flooding and protected from the impact of urban heat created by too much pavement and too little shade.

“In Miami’s East Little Havana neighborhood, 20 percent of the population lives in poverty and 92 percent of the population is Hispanic. The area is plagued by 7 percent unemployment and lower education levels. This area has less trees, less shade and canopy coverage, with less resilient street conditions,” Curtis said, noting her work incorporates socioeconomic data when designing for resiliency. “The Little Havana neighborhood suffers from health problems including diagnosed diabetes, obesity, high blood pressure and high cholesterol, poor mental health, asthma prevalence and poor physical health — many of which can be directly connected to climate change. The area residents experience more barriers to health and equity and climate change impacts.”

The Curtis+Rogers plan proposes to maximize the inclusion of trees in the area to build resilience to the impacts of climate change through tree shading, and enhance the quality of the air, water and land through a mature tree canopy’s ability to sequester carbon, release oxygen, and filter storm water.



Positive health, equity and climate change results will come from adding to and further connecting existing green spaces.

“Our plan also proposes to create pedestrian and cycling corridors fostering alternative modes of transportation. The plan proposes to create a series of ‘blue-green’ streets with permeable surfaces to develop enhanced storm water retention capabilities while allowing mature trees to grow,” Curtis explained. “Positive health, equity and climate change results will come from adding to and further connecting existing green spaces, improving urban biodiversity, reducing the city’s urban heat island effect, soaking up air pollutants, and sequestering a significant amount of carbon dioxide.”

### Seattle’s Environmental Justice Fund

An Equity and Environment Initiative guides all of the city of Seattle’s Office of Sustainability and Environment’s efforts and advances key community-identified programmatic efforts. Community support includes grants to support initiatives led by and for the people most affected by environmental and climate inequities through the Environmental Justice Fund. The fund recently awarded \$750,000 in grants for 14 projects. The fund focuses on delivering measurable community health and well-being outcomes in Seattle’s Duwamish Valley, where the impacts of climate change and sea level rise are disproportionately felt.



“In Seattle, we are confronting the intersecting crises of climate change, COVID-19, and systemic racism by leading alongside the community and working directly with the community. The Environmental Justice Fund is a critical tool to directly support community-based organizations led by communities of color that are bringing innovative, aggressive, and bold local solutions to achieving environmental and racial equity.” Seattle Mayor Bruce Harrell said.

Seattle’s Duwamish Valley is home to the greatest number of contaminated waste sites and the poorest built environment characteristics in the city. Residents of the South Park and Georgetown areas within the valley have a life expectancy of 73.3 years — eight years less than the average in Seattle and King County.

The city’s Duwamish Valley Program is a multi-departmental effort driven by environmental justice guiding principles, racial equity outcomes, community input, and community-led plans.

Since 2020, the city’s holistic approach to climate change adaptation planning addresses community priorities and promotes health equity by centering the voices and needs of people of color and lower-income individuals.



“The Duwamish Valley community has been leading and working on these issues for decades, so it is really exciting to partner in ways that match the creativity and bold solutions being put forward by them,” said Alberto J. Rodríguez, the city’s strategic advisor for Duwamish Valley. “This approach will allow us to collaborate in transformational ways. What’s even more exciting is that we are rooting sea level rise adaptation in community resilience; power and wealth building today are as critical as engineered infrastructure to respond to climate change impacts tomorrow.”

With funding from Robert Wood Johnson Foundation, the city will work with community and other partners to develop a resilience district. It will feature a geographic strategy, inspired by global models, focused on adapting to flood risk and other climate change impacts.

Since 2017, Seattle has helped nearly 700 households convert from dirty, inefficient heating oil to clean, energy-efficient electric heat pumps. The city’s 2022 budget earmarks \$1.7 million to support low- and middle-income households to transition from oil heat. The program provides no-cost heat pumps to income-qualified households and offers a \$1,500 instant rebate for all others. Seattle’s goal is to eliminate heating oil use by 2028.



The city of Seattle’s Duwamish Valley project.



### California focuses on equity as key to resilience

Louise Bedsworth, program director of Land Use at the Center for Law, Energy & the Environment at Berkeley Law, clearly stated “Equity is the key to resilience — three ways make it a priority” in her fall 2021 opinion piece in “The Hill.” The three key tactics include:

- Identify and prioritize protecting the most vulnerable to changing climate.
- Employ integrated approaches that connect investments across built infrastructure, natural, social and economic systems.
- Provide resources to increase access to funds and amplify the voices of communities and individuals in all phases of project development through technical assistance and capacity building.

Prior to Berkeley, Bedsworth was on the front lines of California’s climate crisis, serving in state government for a decade including a stint as executive director of the California Strategic Growth Council. In an interview, she said government and community leaders must focus on building sustainable and resilient communities based on equity. That approach would be fairer and more holistic than in places where the sole priority is protecting the most valuable real estate.

“We are seeing the impact of climate on our most vulnerable in the United States and globally. Whether it is the disability community, the unhoused community, etc. — we have to understand and identify who those most vulnerable people are,” she said, noting that more government agencies must use data, mapping and other tools to correlate community vulnerability with race and any other factors that can be tracked so they can be better addressed.

With climate change impacts, California wildfires have grown more frequent and widespread. To protect the system, electric companies have shut down parts of the power grid in the line of advancing flames. These intentional blackouts can be devastating to people with disabilities that require power for charging wheelchair batteries, refrigerating medicine, operating ventilators and managing body temperature with air conditioning.

Leaders must focus on building sustainable and resilient communities based on equity.



Solutions include more public transportation, more bikes, and more energy efficiency programs that target low-income families.



Courtesy of SDOT

“We can’t just be thinking about putting up a sea wall, we have to think about the social issues of communities,” she said. “Cities will be getting a lot of federal infrastructure money. We must decide how we spend it on equity and this has to be led by community voices — it cannot be a top-down exercise.”

Bedsworth said California’s Transformative Climate Communities (TCC) program takes a holistic approach to neighborhood-scale investment in communities disproportionately burdened by pollution and with high concentrations of poverty. She praised the TCC for basing results not just on physical infrastructure investments, but also on the social and economic benefits of these projects.

The California Strategic Growth Council has awarded millions in grants and provided technical assistance to communities that have experienced pollution, disinvestment and other issues.

“We’ve seen place-based solutions tailored to the needs of the community,” she said. “Housing is a common need. It also has created community gardens, mobility solutions, bikeways, walkways. It brings together community partners and stakeholders to match investments to what is needed in the community. It can guide anti-displacement policy — so when you bring in investment, residents and businesses are not pushed out.”

### Equitable climate mitigation planning

Ivan Moreno, strategic communications manager at the Natural Resources Defense Council (NRDC), an international nonprofit environmental advocacy group, said preparing for climate mitigation in a way that is equitable is a huge issue in the United States and around the globe. He lamented that a lot of politicians have learned to weave equity and inclusion into their rhetoric and promises, but “when the rubber hits the road, equity and inclusion don’t actually make it into the plans when they are executed.”

The NRDC, backed with Bloomberg Philanthropies’

American Cities Climate Challenge funding, has workers in several cities supporting climate planning.

“Solutions include more public transportation, more bikes, more energy efficiency programs that target low-income families,” Moreno said, noting that fossil-fueled, single-vehicle transportation is a big contributor to carbon pollution.

“Zoning laws have been used to create more segregation,” Moreno said, noting that many polluting factories are in communities of color and that highways almost always cut through low-income and marginalized communities — robbing wealth and creating noise and emissions from heavy traffic. “Now many mayors’ solution to reinvestment is to recruit more factories or giant distribution warehouses to underinvested communities. It’s very easy to locate a dirty industry or giant warehouse in a community.”

Moreno noted that many marginalized communities oppose these mega developments, even if it comes with the promise of some jobs. He noted that a giant warehouse with acres of truck parking destroys the fabric of the neighborhood. Once a giant compound is introduced, it’s impossible to repair the small-scale fabric of the neighborhood.

Moreno said sustainability and resiliency goals are better met with incremental improvements that support neglected communities. These would include community kitchens, indoor farming and small-business incubators — woven in with green infrastructure. ●

Steve Wright (@stevewright64) is a writer, educator, disability rights activist, and marketer of planning services. He has contributed dozens of stories to On Common Ground, focusing on best practices plus diversity, equity, inclusion and accessibility. Based in Miami, he teaches a groundbreaking course on Universal Design at the University of Miami School of Architecture. Wright blogs daily at Urban Travel and Accessibility.



Courtesy of the City of Phoenix

# WISE WATER MANAGEMENT

The Southwest's  
Counter-Attack  
to Climate  
Change



By *Brian E. Clark*

**K**athryn Sorensen is a proud native of Arizona. She's also the former head of water services for the city of Phoenix and is now research director for the Kyl Center for Water Policy at Arizona State University's Morrison Institute.

She is quick to note that the cradle of civilization was in arid Mesopotamia between the Tigris and Euphrates rivers — in what is now modern Iraq — not in a northern temperate zone. “Desert cities are the oldest cities and I’m confident they will stand the test of time,” said Sorensen, who rejects the idea that people should not dwell in arid regions.

“People live where water flows and this part of Arizona has a wonderful quality of life. People will continue to

## The current drought in Arizona is the worst in more than 110 years of record keeping.

move here; we just have to manage the water that we have responsibly and sustainably and build on our culture of conservation. All in all, I believe we are in good shape.”

But Sorensen isn't naive about the threats of climate change and says she takes very seriously the need to conserve water and make changes in the built and natural environments so that her city and others in the Southwest can survive and thrive.

For good reason: The current drought in Arizona is the worst in more than 110 years of record keeping. Multiple dry winters with limited precipitation, combined with hot and dry summers, have intensified drought conditions across the state.

The Colorado River system, which provides 45 percent of the water for the Arizona Municipal Water Users Association (which includes Phoenix, Tempe, Scottsdale and other cities in the Valley of the Sun) has also experienced extensive drought conditions over the past 18 years. Due to over-allocation exacerbated by the prolonged drought, Lake Mead outside of Las Vegas has dropped to historically low reservoir levels and a water shortage has been declared for 2022, requiring use restrictions in some areas.

While she bemoans the tendency of some to pick on Arizona metropolitan areas as being unsustainable, she said she believes that cities like Phoenix and Tucson have a vibrant future. “We understand the value of water in the desert and support investment in the infrastructure that will bring certainty,” she said.

Moreover, she added, other cities elsewhere in the Southwest — now in the midst of a severe, 20-plus-year drought — can learn from what Arizona is doing. The same is true in Las Vegas, Los Angeles and San Diego, officials in those cities say.



Less than 50 percent of Phoenix water supplies comes from the Colorado River. Phoenix has access to additional supplies that are not impacted by this shortage in the Salt & Verde rivers, groundwater, and reclaimed water to replace shortfalls in Colorado River supplies. Photo courtesy of the City of Phoenix.

Yet there are critics, such as Jonathan Overpeck, an interdisciplinary climate scientist and the Dean of the School for Environment and Sustainability at the University of Michigan. A former Arizona resident, he warns that climate change and aridification (continued drying and heating — essentially ongoing drought) in the Southwest pose a huge threat to the region.

Sorensen acknowledges the outlook for the Colorado River — which serves the domestic, agricultural and industrial needs of 40 million people in the Southwest — is “tough.” Due to ongoing drought, its flows have dropped by more than 20 percent in recent years.

“However, it is important to put into context the fact that central Arizona is blessed with large and productive groundwater aquifers,” she said. “It has long been planned that we would protect those aquifers and only dig into and use them when we need to in times of surface water shortage.

“For the most part, central Arizona has been very successful in protecting its aquifers. We have been managing and recharging them with surface water and been careful about their use so that resource will be available for future generations.”

Phoenix is located where the Salt and Verde rivers come together and was chosen long ago by native people as a place to live. “It is in an alluvial plain, where water has been deposited for eons in a productive aquifer,” she added. “So, we believe there are generations of water there, if managed carefully.”

Sorensen said water use in Phoenix has declined by 30 percent per capita in recent decades, as the city experienced rapid growth while also becoming denser.

In addition, the city recycles reclaimed water from its sewage system. While it is not yet used for drinking water, huge amounts cool the Palo Verde [nuclear power] Generating Station, which is 45 miles west of Phoenix. Treated wastewater also goes on riparian habitats, irrigates sports fields, golf courses, non-edible crops and commercial landscapes. It is also used to recharge aquifers by storing water underground. Sorensen expects the use of reclaimed water to grow in coming years.

Cynthia Campbell, the current water resources manager for Phoenix, said her city has relied on educational efforts rather than mandatory restrictions to reduce water use.

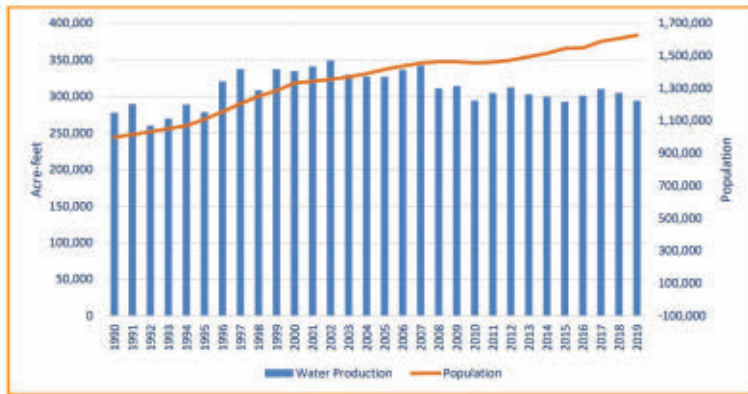
“We are proud of the fact that we have done more with education and outreach than most places have done with rebates,” she said. “We’ve grown by 400,000 people in the past 20 years, but cut our water use per person.

“That has a lot to do with new buildings using the most up-to-date fixtures, so that is very helpful. We also encourage people to think about their landscaping as well as find and fix leaks inside and outside their homes.”

We have done more with education and outreach than most places have done with rebates.



## Phoenix Water Production vs. Population Growth, (1990-2019)



Phoenix water use has declined by 30 percent per capita in recent decades. Graph courtesy of the City of Phoenix.

The city's water rates and zoning are geared toward encouraging xeriscaping, which uses native plants and other desert vegetation. Forty years ago, 80 percent of the homes in the city had grass lawns. Now, that figure is down to 10 percent.

"Most developers are on board with xeriscaping and limiting water use," she said. "But we still need to get some homeowners' associations to be less restrictive about requiring grass in front yards.

"...Xeriscaping and other kinds of desert design and planting can be very beautiful. That absolutely fits into our culture of conservation. We are going to double down on our educational outreach efforts.

"Besides, people here are pretty independent and don't want to be told what they can or can't do on their property. We try to keep it to a point where we educate and convince people that this is the right thing to do. Then we watch the results.

"We know, though, that the future will be hotter and drier so that tradeoffs will have to be made. Reducing use of water on outside landscaping is a big one, but we think people get it."

Because temperatures of nearly 120 are no longer rare in Phoenix during the summer, the city recently created a Heat Response and Mitigation Office — the first of its kind in the nation. It is headed by David Hondula, a climate scientist formerly with Arizona State University.

According to a study commissioned by the Nature Conservancy last year, Phoenix could save lives and millions, even billions of dollars, by adapting to rising heat. The



Students, families and volunteers at Emerson School in Phoenix celebrated the school's 100th anniversary by planting 100 trees and plants, which helps cool the desert city. Photo courtesy of the City of Phoenix.

people most vulnerable to the heat are often in poor and minority communities where many households lack the means to cope with heat waves that are becoming more frequent, widespread and severe. Phoenix's Maricopa County recorded 323 heat-related deaths in 2020.

The study also looked at the costs that can be caused by steadily rising temperatures to human health, labor productivity, electricity and roadways. Extreme heat already costs people in metro Phoenix \$7.3 million every year in emergency room visits and hospitalizations due to heat-related illnesses. Maintaining roadways in the metro area costs transportation agencies over \$100 million annually as streets and highways buckle, rut and crack from high temperatures.

"As Phoenix continues to urbanize and its population expands, the benefits of adapting to extreme heat may only increase, as will the consequences of inaction," the report said. "To implement the ambitious solution scenarios and realize the associated benefits, both the public and private sector will need to play an active role."

Planting enough trees to provide canopy for a quarter of the desert city and covering all of the area's buildings with "cool roofs" made of materials that don't absorb heat could help the city save billions of dollars over the next three decades, the report concluded.



Xeriscaping, which uses native plants and desert vegetation, reduces water usage on landscaping. Photo courtesy of SNWA.



Southern Nevada's "Water Sense" program included graphics on seasonal watering restrictions, which limit when businesses and residents can irrigate landscaping. Graphic courtesy of the SNWA.

Installing cool roofs on just a third of the structures in the Phoenix metro area could help save as much as \$280 million annually in avoidable losses from decreased labor productivity, increased energy needs and heat-related illnesses and deaths.

The city has a two-pronged plan to deal with increased heat. They include access to cool spaces for residents now and longer-term strategies aimed at cooling the city, by tree planting, building engineered shade structures and altering the built environment in other ways to mitigate unrelenting high summer and fall temperatures.

"We need to think about policies in the zoning and building code domains, about how and where we are constructing buildings, what kinds are appropriate in which locations and the landscape requirements around them," Hondula said.

He said the development community will play a key part in ongoing discussions to make sure the city is successful in the future. "We need to take steps today to make sure the city 20, 30 or 50 years in the future is largely going to be shaped by decisions we make over the next five to 10 years."

Hondula is confident Phoenix can make the changes needed to deal with climate change and ensure its future economic vitality. The climate modeling studies he has seen are encouraging, if the city pulls the right levers as it continues to grow. "We can continue to urbanize, but wind up with a future that is cooler than the one we have today, even with continued global warming."

In Las Vegas, Doug Bennett is the Conservation Manager for the Southern Nevada Water Authority (SNWA). He said he is especially proud of the utility's "Water Smart" program, which was launched in 2004.

"It was a voluntary program to construct dwellings that had much smaller water footprints than would be built using the code that was in place at that time," he said.

Over time, more than 20,000 homes were built, which served as "the trailblazer for the U.S. Environmental Protection 'WaterSense' home program.

"We did it with the help of the homebuilders. One of the lead builders on that was KB Homes, which has a strong sustainability bent. They aren't afraid of trying some things that are outside the norm of the industry and building projects that have innovative ideas embedded in them. KB was one of our critical partners, but we had others like Pulte."

The program was so successful that it was used as a model for area building codes. "Now all homes in Nevada have to be built with WaterSense-labeled plumbing fixtures and Energy Star appliances are pretty much the norm," he added.

Moreover, landscape design restrictions, many of which date to 2003, take care of much of the outdoor water use component. "Back then, we implemented new codes that said you couldn't plant grass in the front yard of a new home and you couldn't plant more than 50 percent of the area in the backyard as lawn grass," he said.



Southern Nevada landscaping crews remove grass in preparation for installing drip-irrigated water-efficient landscaping. Photo courtesy of the SNWA.

That effort has resulted in the removal of an impressive 200 million square feet of turf grass and saved 163 billion gallons of water. Summer water restriction rules include Sunday bans and no watering from 11 a.m. to 7 p.m., the hottest period of the day and when irrigating is least effective. In 2021, more than 1,900 water waste fines were issued by agencies for non-compliance, which brought in \$560,000.

“To be frank, most of the residential water use at a residential home in that era was on lawns,” he said. “People were using more water on turf than for anything else in the household. It dwarfed indoor use like showers or washing machines. Research showed lawns required about 10 feet of water each year, and we live in a region where four inches of annual rainfall is typical.”

Cutting lawn sizes, plus a move in the housing industry to greater densities and building to the “WaterSmart” program made post-2004 houses 50 per cent more efficient.

Current rules include prohibition of all grass in front and backyards of new residential homes and commercial developments, a ban on high-water use, evaporative cooling in new commercial development and prohibition of new golf courses in the Las Vegas Valley Water District Service Area.

Las Vegas works with cities around the globe on ways to cut water use. That includes Singapore, which is the only city that currently recycles more water than Las Vegas, Bennett noted.

“We are always interested to hear what is going on in other water-stressed regions,” he said. “One of the exciting things about the public water industry is that everyone is eager to share their ideas. There is no competitive advantage to keeping secrets about things that work well.”

Water use in the SNWA is now 110 gallons per person per day and the goal is to trim that to 86 gallons per person per day by 2035. “By making additional changes, we hope to wind up with a water footprint that we think will keep us sustainable,” he said. “We will continue to be very aggressive in our water conservation measures with the expectation that the shrinking Colorado River is not going to provide more water in the future.”

Steffen Lehmann is a professor of Architecture & Urbanism at the University of Nevada Las Vegas and founding director of the university’s Urban Futures Lab. He is less optimistic about the region’s future and notes that Las Vegas is the fastest-warming city in the United States.

Lehmann’s lab is researching nature-based solutions that can be up-scaled and transferred to other cities. “There are many exciting new concepts and solutions emerging, from “cool materials” that keep buildings cooler, to new ways to activate natural cross-ventilation (reducing the need for air-conditioning), to behavior change that increases waste avoidance, to new planning concepts that integrate the intersection domains of food-water-energy,” he said. “Some of the new solutions are actually ‘old’ solutions that used to be common sense a long time ago and some deliver a payback of the investment in less than five years.”

He proposes “regreening” the city, making it an urban forest with native plants and trees to deal with the threat of urban heat islands, such as Las Vegas’ famed Strip.

“The way we build, with concrete roofs and black tiles, is the worst as it absorbs solar radiation and traps the heat, making the city a baking oven during heat waves,” he said.

Building to the “WaterSmart” program made post-2004 houses 50 per cent more efficient.

He stresses that the region needs to reduce its dependency on driving because 35 percent of heat-trapping greenhouse gas emissions in Southern Nevada come from transportation. Building in a more mixed-use and higher-density manner would help reduce energy use and make neighborhoods more walkable and compact, following what he calls a polycentric urban structure model.

He would also limit metro Las Vegas' urban growth boundary and seek ways to reduce the high use of air-conditioning. "Let us be honest, for half the year we could get away without air-conditioning," he said, noting that Las Vegas has more solar radiation potential than any other city in the country. "As long as all energy generated is not coming from renewable clean sources like solar, we need to reduce our use of air-conditioning."

Brad Coffey is the Water Resources Manager for Southern California's Metropolitan Water District (MWD), a regional wholesaler and the largest supplier of treated water in the country. A cooperative made up of 14 cities, 11 municipal water districts and one county water authority, it provides water to 19 million people in a 5,200-square-mile service area.

About 25 percent of the water used in Southern California typically comes from the Colorado River. Another 30

percent originates in the Northern Sierra. The remaining 45 percent comes from a mix of what are considered local supplies, which includes the city of Los Angeles' eastern Sierra water deliveries as well as recycling, desalination and groundwater supplies.

Coffey said a drought in the 1980s "changed the calculus of what we do to recognize that the next person who lives in Southern California and the next dollar of economic activity can't come from more and more imported supplies.

"We developed an integrated resources plan that aimed to transform the region from being about 60 percent dependent on imported supply to about 40 percent dependent on imported water supply and 60 percent local supply and conservation, recycled water and the like."

Fast forward 30 years and he said the MWD is now working on a regional recycled water program that would transform the largest discharge of treated waste water in southern California into an engine for groundwater replenishment. It would have a cycle of water that becomes far less dependent on a snowpack-dependent source.

He praised the Orange County Water District (OCWD) for spearheading consumer acceptance of recycled water with its "Water Factory 21" project, which took treated wastewater from the Orange County Sanitation District, recycled it, blended it with imported water and injected it into 23 wells to combat seawater intrusion. It has since evolved into the district's Groundwater Replenishment System, the world's largest effort for indirect potable (drinkable) reuse.

Thanks to scientifically proven advances in water technology, the system takes highly treated wastewater that would



The OCWD Groundwater Replenishment system is the world's largest effort for potable water reuse, and its Green Acres Project also provides recycled water for landscape irrigation and industrial uses. Photo courtesy of Orange County Water District.





Water conservation and treatments continue to advance, while climate change remains a factor.



The Southern California MWD Regional Recycled Water program, currently under EPA review, could become one of the largest water treatment plants in the world. Photos courtesy of Southern California Metropolitan Water District.

have previously been discharged into the Pacific Ocean and purifies it using a three-step advanced treatment process. In addition, the OCWD's Green Acres Project (GAP) is a water reuse effort that provides recycled water for landscape irrigation at parks, schools, golf courses and industrial uses, such as carpet dying; toilet flushing; and power generation cooling.

Coffey said the amount of recycled water in the MWD in recent years has ranged from 10 to 12 percent, more than a 10-fold increase from the 1980s, when the average use of potable water per person in Southern California was about 200 gallons per day. That figure has dropped to around 120 gallons per person per day, a decline of 40 percent. But he said a 20 percent recycled figure is within striking distance.

Currently, the district's Advanced Purification Center is a 0.5 million gallon per day demonstration facility that will generate information needed for the potential future construction of a full-scale recycled water plant. It uses a unique application of membrane bioreactors designed to significantly increase efficiency in water recycling.

Scientists and engineers are testing the process, utilizing full-scale treatment modules, to ensure the resulting purified water meets the highest water quality standards. Once approved by regulators, this innovative process could be used throughout California and even applied around the globe.

Fully constructed, it would provide about 150 million gallons of water a day, enough for about 500,000 homes. Purified water from the advanced treatment facility would be delivered through up to 60 miles of new pipelines to the region's groundwater basins, industrial facilities and two of MWD's treatment plants.

While water conservation and treatments continue to advance — the elephant in the room remains climate change.



“The Southwest may well have a grim, dry and hotter future in front of it,” said the University of Michigan's Overpeck. “And no one really knows how big those all-important aquifers, such as the Colorado River Basin, are.

“Last year, the all-time temperature record was broken when 130 degrees was reached in the Mojave Desert's Death Valley and I'm worried we will have long periods of temperatures in the 120 range in coming years,” he said. In addition, power shortages triggered by extreme heat would be problematic, to say nothing of dust storms, more wildfires and more smoke and other pollution, all of which will hit poor communities hardest.”

“Fortunately, there are a lot of smart people working on these problems,” he concluded. “The question is do politicians there have the political will to tackle them. Regardless, there is a lot to be concerned about.” ●

Brian E. Clark is a Wisconsin-based journalist and a former staff writer on the business desk of The San Diego Union-Tribune. He is a contributor to the Los Angeles Times, Chicago Sun-Times, Milwaukee Journal Sentinel, Dallas Morning News and other publications.

# STORMWATER MANAGEMENT



Excavation continues at Chicago's McCook Reservoir, slated for completion by 2029. The second stage of the reservoir will hold an additional 6.5 billion gallons of storage, for a total of 10 billion gallons. Photo courtesy of Metropolitan Water Reclamation District of Greater Chicago.

**Communities need to update sewer systems and implement green infrastructure to withstand severe weather impacts.**

*By Joan Mooney*

**M**ore than 700 municipal water agencies around the country are updating their sewer systems, at a cost of billions. It's an urgent task because in the 100-plus-year-old systems — built with state-of-the-art design at the time — raw sewage is spewed directly into local rivers during heavy rainstorms. The affected sewer systems are concentrated in the Northeast and in older systems in San Francisco and Chicago, among other cities.

Those combined sewer overflows (CSOs) have created polluted waterways that have been the subject of at least one lawsuit and local and federal consent decrees. Water agencies are updating their systems with massive tunnels and sewage treatment plants, trying to prepare for the even greater needs — and heavier rainstorms — that climate change will bring.

Luther Place Memorial Church was one of the selected DC River Smart Communities program participants. Anacostia Watershed Society staff and community volunteers planted a rain garden, seen here capturing and filtering stormwater. Photo courtesy of Anacostia Watershed Society.



One of the large tunnels for the Washington, D.C. Clean Rivers Project. Photo courtesy of DC Water.



## Washington, D.C.: Lawsuit leads to overhaul

Washington, D.C., is home to two rivers, the Potomac and the Anacostia. The city attracts millions of tourists every year, many of whom enjoy beautiful waterfront sites around the city. But the rivers have a complicated history.

In 2000, the Anacostia Watershed Society sued DC Water over the sewage in the river. The eventual result was a 2005 consent decree, a court order with the U.S Environmental Protection Agency, that requires the city to meet certain pollution standards in the river.

The elements of the consent decree have been renegotiated over the years. After a modification in 2015, the plan includes both gray and green infrastructure (GI). Gray infrastructure is what is traditionally thought of as infrastructure — tunnels, reservoirs, pumping stations and treatment plants.

“Green infrastructure uses vegetation, soils, and natural processes that mimic nature, to soak up and store rainwater where it falls to control wet weather pollution and create healthier urban environments,” according to the EPA.

## Four new tunnels, new treatment plant

The bulk of the city’s consent decree requirements will be met by the construction of four large tunnels and a sewage treatment plant, all part of the city’s Clean Rivers Project. The Clean Rivers Project is a massive undertaking, the largest infrastructure project since the city’s subway system was built starting in the 1960s. The first phase was completed in 2018, as the newly built Anacostia River Tunnel was connected to the Blue Plains Tunnel.

The two tunnels have deep shafts and large concrete structures that divert raw sewage from the Anacostia River. The tunnels deliver the combined sewer overflows to the Blue Plains Advanced Wastewater Treatment Plant, which cleans the water before discharging it to the Potomac River.

The third tunnel, the Northeast Boundary, will be completed in 2023. Once it is connected to the other two tunnels, combined sewer overflows to the Anacostia will

Green infrastructure uses vegetation, soils, and natural processes that mimic nature, to soak up and store rainwater water.

be reduced by 98 percent, said DC Water. It should also reduce the chance of flooding in area neighborhoods from 50 percent to 7 percent.

The final phase will be completed by 2029 with construction of the Potomac River Tunnel. The consent decree sets a deadline of March 2030.

The Clean Rivers Project has been a success so far.

“The Anacostia River Tunnel dramatically reduced sewage discharge into the river,” said Phillip Musegass, vice president of programs and litigation at the Potomac Riverkeepers.

Emily Conrad is director of communications for the Anacostia Watershed Society (AWS), which filed the lawsuit against the city in 2000. Clean Rivers has exceeded expectations, she said. September 2021 saw several days of rain in a row, and the tunnels captured 100 percent of the overflow — more than five billion gallons.

The system is designed to capture 80 percent of overflow, and there have been rainstorms where it captures less than 100 percent. Construction of the Northeast Boundary Tunnel should bring the capture rate up to 98 percent, Conrad said.

### How prepared is it for climate change?

The real question is how the system will do as climate change brings heavier and more frequent storms to the area.

“We have a very high degree of control compared to a lot of systems in the country,” said John Cassidy, Clean Rivers lead pollution control officer engineer at DC Water. “We’re set up for a changing climate.”

Director of Clean Rivers Moussa Wone explained.

“It’s designed to be at least 20 percent bigger than required, based on the model,” Wone said. “The pumping station and treatment system are at the end of the tunnel, so we can double the size. It’s a very practical way to expand the system without exorbitant cost.”

Musegass of Potomac Riverkeepers doesn’t think the system is adequately prepared for the future. When DC Water created the plan, it followed EPA guidelines. The plan used rainfall data from 1988 to 1990, a period with higher-than-normal rainfall.

“Now, that’s over three decades old,” said Musegass. “More recent history in this region raises concerns that data is not what we’re going to see in the future.”

DC Water is set up for a changing climate.



DC Water

The cost of Clean Rivers is primarily paid for by ratepayers, using a formula based on impervious area and generation of wastewater. Impervious area is pavement where water runs off instead of seeping into the ground underneath.

DC Water has sought federal funding but has received only \$270 million of the total cost to date of \$1.9 billion. When all projects are completed, the total cost is expected to be just under \$3 billion, said Wone.

### DC's Stormwater Retention Credit program

DC was the first city in the country to create a Stormwater Retention Credit (SRC) trading program. The idea is to shift the cost of retrofitting areas with green infrastructure to private developers, said Matt Johnson, branch chief for green infrastructure incentives and assessment in the DC Department of Energy and Environment.

“Rather than build green infrastructure in the central business districts, we do it offsite when it’s cost-prohibitive to do it onsite,” Johnson said.

Under regulations the city created after the EPA consent decree, any new development project that disturbs more than 5,000 square feet of land must meet specified stormwater retention standards. One way developers can do that is by buying stormwater retention credits.

The first SRC trade was in 2014. A nonprofit group, Building Hope, leased the site of a closed elementary school and started an extensive renovation of the building. The school’s modest size and structural limits made it hard for it to install green infrastructure onsite.

To meet the city’s stormwater retention standards, the school bought credits from the Westchester, a co-op apartment complex in another part of town. The Westchester had installed rain gardens that generated the stormwater credits. Selling those credits to the school enabled the Westchester to recoup a large portion of its investment installing the rain gardens. The transaction also allowed the school to meet its stormwater retention obligations.

The stormwater credit program also has a purchase price guarantee, called the Price Lock Program. It allows stormwater credit generators to sell the credits to the city’s Department of Energy and Environment at fixed prices, without losing the option to sell to another buyer. If the participant sells to another buyer, DOEE pays a portion of the purchase price on behalf of the buyer.

The green infrastructure park was constructed as part of a DC Green Infrastructure Design Challenge. The park has rain gardens, nature boulders for creative play, painted paths and steppingstones, pedestrian bridges and new trees. Photo courtesy of DC Water.



“[Large-scale] development is the main driver of green infrastructure,” said Johnson of DOEE. “The Price Lock Program is DOEE’s way of putting our thumb on the scale.”

Part of the goal of the Price Lock Program is to make it easier to generate stormwater credits on land owned by nonprofits, such as churches, cemeteries and schools. Such projects get funding priority.

Currently, 13 percent of development is taking on some voluntary off-site stormwater retention. Because the stormwater retention credits have to be generated in areas of the city where untreated sewage goes into the river, DOEE hopes to generate more green infrastructure there to help clean the waterways, Johnson said. The long-term success of the program depends on large-scale developers opting to buy stormwater credits, he added.

### Bioretention, permeable pavement

For other green infrastructure, the city has four RiverSmart programs: Communities, Homes, Rooftops and Schools. The Communities and Schools programs are administered by the Anacostia Watershed Society. For both programs, nonprofit groups can apply for a grant to install green infrastructure, and the AWS hires contractors. Examples of GI projects are permeable pavement, rain gardens and bioswale.

Permeable pavement allows rainwater to seep through the pavement and gradually disperse underground instead of just running off, as it would with a conventional concrete sidewalk. Rain gardens are planted with native vegetation that allow rain runoff to be absorbed into the soil. Bioswale are vegetated or mulched channels that convey stormwater runoff while removing dirt and silt.

Green roofs are planted with vegetation and, in some cases, a drainage and irrigation system.

The Alliance for the Chesapeake Bay works with the city to run RiverSmart Homes. Under the Rooftops program, property owners can get a rebate of \$15 per square foot if they voluntarily install green roofs. To be eligible, the property must be in a Municipal Separate Storm Sewer System (MS4) area, one where sewage is discharged directly into the river.

### Chicago: nation's largest reservoirs

The Chicago sewer system, while sharing DC's outdated design and combined sewer overflows, has some important differences. Chicago was not sued, but it entered into a consent decree with the federal and state EPA.

"The motivation was to get us on an enforceable schedule to complete our project," said Kevin Fitzpatrick, assistant director of engineering at the Metropolitan Water Reclamation District of Greater Chicago (MWRD). "The federal government began cracking down on CSOs." Chicago's deadline is December 31, 2029.

Chicago's Tunnel and Reservoir Plan (TARP) is designed to reduce flooding and improve water quality by capturing stormwater and sewage before it goes to area waterways. The four tunnels total 109 miles and service Chicago and 51 suburbs. MWRD adopted the plan in 1972.

"During a storm, pumping stations are trying to clean as much water as they can from tunnels," said Fitzpatrick.

During very big rainstorms, the tunnels and reservoir may completely fill up and spew combined sewer overflows (CSOs) into the waterways. The two TARP systems that are completely built capture at least 99 percent of CSOs, Fitzpatrick said.

How prepared is Chicago's system for increased rains in the future from climate change?

"Unfortunately, the design is based on data from decades ago," Fitzpatrick said. "The size is pretty much maximized." At 10 billion gallons, TARP's reservoir has more storage capacity than anywhere in the country. The original reservoir, built in partnership with the Army Corps of Engineers, held 7 billion gallons.

"MWRD expanded it on our dime to 10 billion," said Fitzpatrick. "There are no additional plans to expand it."

MWRD paid for the first part of the project with EPA grants, then with state revolving funds and low-interest loans. To build the reservoirs, MWRD partnered with



Above: Thanks to a partnership between MWRD, schools, nonprofits and municipal agencies, this schoolyard at Grissom Elementary School has a pervious community space that also cuts down on neighborhood flooding. Below: Students enjoy a new permeable playground at Whistler Elementary School on Chicago's Far South Side through a collaborative effort with the water authority known as Space to Grow. The schoolyard also combats flooding and improves area water quality. Photo courtesy of Metropolitan Water Reclamation District of Greater Chicago.



the Army Corps of Engineers, which shared the cost. MWRD raises most of its share of the cost through real estate taxes. It can also sell bonds.

MWRD has also worked with the Chicago Department of Water Management to install different types of green infrastructure. They partner with Transportation Departments, park districts and Chicago public schools to provide permeable pavements, bioswales and green alleys planted with native vegetation.

The city also has a program to provide all Cook County residents with rain barrels at a discounted price of \$22, or half price for residents over 65. Since 2008, the city has distributed 148,000 rain barrels. Rain barrels are a type of green infrastructure that capture rainwater from roofs and save it for when a resident may need it. By keeping this water out of the sewer system, rain barrels help prevent

## EDUCATING YOUR LOCAL COMMUNITY ABOUT FLOODING

Education about risk assessments and storm preparedness also help to make communities more resilient when faced with extreme weather events. For the Baldwin REALTORS® Association in Alabama, putting on a Flood Week to educate members was an obvious choice.

“We’re in the middle of the Gulf of Mexico, it’s a hot spot for flooding and hurricanes,” said Allison Woodham, education director for the association. Baldwin County gets an average 66 inches of rainfall a year. “Flooding is a huge topic in our area.”

Jennifer Foutch, government affairs director, applied for and received a Rural Outreach Grant from the REALTOR® Party. The association put on Flood Week in August 2021.

Some of the week’s activities were at the association’s offices and others with speakers attending virtually and REALTORS® viewing them on a screen in the event space. Flood Week was attended not only by REALTORS® but also by local planning officials and some members of the public.

The week began with a virtual town hall with speakers from the National Flood Insurance Program and the Federal Emergency Management Agency (FEMA). Speakers discussed Risk Rating 2.0, the new federal program designed to be more equitable and easier to understand.

Another session covered how to read FEMA flood maps. That brought representatives of local and city planning departments, Woodham said.

One day offered a working lunch where attendees could discuss the increased design and building standards of the Fortify a Home certification. It’s a program of the Insurance Institute for Business and Home Safety, a nonprofit

arm of the insurance industry based in South Carolina. There are three types of fortified certification: Fortified Roof; Fortified Silver, with additional protection such as windows that can withstand higher winds; and Fortified Gold, in which a home is built from the ground up to be more secure against extreme weather.

One of the more popular programs was “Let’s Talk Flood,” with a well-known local meteorologist. He told REALTORS® what they need to look for if their buyers are interested in buying a flooded home, and how to get a home in a flood area ready for sale. REALTORS® could earn three hours of CE credit for attending the workshop.

Another popular session was “Lessons Learned from Hurricane Sally,” which had swept through the area a year earlier. The panel included the meteorologist, an expert from State Farm Insurance, and the emergency management director for Baldwin County.

To make the event fun, association staff posted flood facts on its social media page and offered giveaways such as a portable fan and hurricane preparedness kit. The end of the week featured a drawing for a generator.

The main lesson: Document everything.

“If you talk to someone, what’s their name?” said Woodham. “Keep receipts for all your expenses. Take a picture of whatever you do.”

A lesson from the entire week: Flooding “affects all areas of our membership,” said Woodham. “People may think if you’re not on the beach, it doesn’t affect you. But it affects all areas.

“There’s no one here who doesn’t feel it.”

The city has a program to provide all Cook County residents with rain barrels at a discounted price. Photo courtesy of Metropolitan Water Reclamation District of Greater Chicago.



sewer overflows and flooding. As a local example, much of the rain that falls on the Chicago Center for Green Technology’s roof flows into four 3,000-gallon cisterns and is later used to water the landscape. According to the EPA, rain barrels can save a homeowner 1,300 gallons of water per year and is another tool to assist communities with stormwater and rainwater control. ●

Joan Mooney is a freelance writer in Washington, D.C., who wrote the NATIONAL ASSOCIATION OF REALTORS® Water Infrastructure Toolkit.



When Entire Areas  
**DISAPPEAR,**  
How to Recover with  
**Resilience**

Destruction from  
tornadoes and wildfires  
is often total, making it  
both easier and harder  
to come back stronger.



It was 15 years ago, in May 2007, that an EF5 tornado barreled through the 1,300-person city of Greensburg, Kan. In just 15 minutes, give or take, 12 people were killed and 95 percent of the town was obliterated, according to Stacy Barnes, who grew up in the town and is now its administrator.

“We really had no choice but to start from the ground up,” she states. “But because we had a blank slate, we also had an opportunity. How could we rebuild for future generations? What does that look like? That conversation happened early with community leaders.”

Today, it looks like a wind farm generating all the town’s electricity, water savings from low-flow toilets and drought-resistant landscaping, and LED-powered street lights.

The devastation that tornadoes and wildfires leave in their wake is often complete. Entire neighborhoods and cities that existed a day, even an hour earlier, seemingly evaporate, leaving their residents stunned and without a manual for starting over from nothing.

That’s where experts like Zack Rosenberg come in to help community residents and leaders understand what leaders in Greensburg realized early on — that through tragedy, there can be an opportunity to rebuild for resilience. Rosenberg and Liz McCartney, who are married, co-founded SBP, an organization headquartered in New Orleans launched in 2005 after Hurricane Katrina blew through the city.

“We respond to disasters to build or rebuild houses, and we’ve done that in response to hurricanes, massive home-devastating rains, tornadoes, and wildfires,” he says. “We exist to fortify people against their breaking point after disaster.”

“One way to do that is to be reactive,” explains Rosenberg. “That means rebuilding people’s houses, but you

can never get to scale that way. You can never rebuild to the full community you had before. The right action is to drive resilience and to drive planning.”

Rosenberg isn’t the only disaster recovery expert who believes the answer to rebuilding after total loss isn’t going on autopilot and attempting to recreate what once existed. Today’s momentum has shifted to reimagining first, then rebuilding.

### Emergent leaders in demand

The first step in ensuring that what comes after a disaster is resilient, is turning to the right people for leadership. In 2021, Steven R. Norris, MAI, CRE®, principal at Norris Realty Advisors in Pasadena, Calif., who led a team called the CRE® Consulting Corps, served that role after the 2018 Camp Fire essentially razed Paradise, Calif.

Local REALTORS® feared the recovery had bogged down, and Norris’ interdisciplinary team stepped in to provide focus and guidance. Aubrey Pruis, association executive of the Paradise Association of REALTORS® commented on the process. “The team of counselors listened to our problems and concerns,” Pruis said. “We feel this project is going to change lives and give a lot of people hope. It already has.”

It was the first time Norris led a team of real estate, appraisal, development, planning and zoning experts to advise a community after a natural disaster. “But it sure won’t be the last,” he laments.

“Paradise was two years into its recovery, and rebuilding was taking a lot longer than it should have, a situation mostly having to do with the county’s wealth,” explains Norris. “Rural counties have a harder time recovering from natural disasters. Paradise’s pace of recovery was slightly above glacial, and they were getting frustrated.”

Norris believes devastated towns should quickly turn to an expert to lead their recovery. “These communities need a dealmaker who can make things happen without



OPPOSITE: Greenville, Calif., is rebuilding after the Dixie Fire decimated the community. Courtesy of After the Fire.

LEFT: Greensburg, Kan., was flattened by a tornado in 2007. Photo courtesy of FEMA.

After a disaster, today’s momentum has shifted to reimagining first, then rebuilding.

government burdening the process,” he says. According to Norris, that role was filled brilliantly by Jennifer Gray Thompson, CEO of the nonprofit After the Fire USA, who became an advocate for resilient rebuilding by complete accident.

In October 2017, Thompson was working for the county of Sonoma, Calif., where 11 wildfires broke out and torched 6,000 housing units the first night alone, causing 43 deaths. “Nobody had ever seen that kind of wildfire behavior before,” recalls Thompson. “Nobody knew a fire could travel a football field every three seconds. Where I live in the Sonoma Valley, it was surrounded by fire for 10 days. We had first responders, but not enough social services to support our valley of 40,000 people. So, I took on an outsized leadership role.

“An emergent leader is necessary in all disasters — we see that today,” says Thompson. “It was a terrible experience from a trauma point of view, but it was also the most amazing experience of my life. I decided that my life had to be helping this place rebuild. But the hardest thing about disaster has been that nobody showed up to tell us what to do next. I had nobody to call.”

Today, Thompson is that person. “I reached out to Paradise 10 days after the Camp Fire started,” she states. “Through my own experience, I learned the value —

which I suspected would also be true in Paradise — of having someone show up who says, ‘This is terrible, but there’s hope, and you can make it through this. Here are some things that can help.’”

### A ‘make it work’ mindset

Norris says building for resiliency requires communities to completely rethink how they operate, including easing requirements on density, parking, and other issues tied to the zoning process.

“It should be, ‘Let’s figure this out together,’” he asserts. “You need to have independent planning consultants who can offer ideas catalytic to development, and there needs to be a ‘let’s get it done attitude’ in city hall. It’s not about a grand building project. It’s about what can be done to get people hammering nails right way.”

“People need to be entrepreneurial, and this is where the dealmaker comes in,” he adds. “It’s going to take work, and you’ll need things like zoning changes. It’s a world-view issue I see all the time. There are entrepreneurial people who want to get things done and bureaucratic people who follow the rules. Someone needs to sit them all down and get them to come to the middle.”

Rosenburg couldn’t agree more. “The only way to be resilient is to intentionally rebuild for the next disaster,” he says. “There has to be adherence to, and focus on, building standards and codes. That said, cities and states have to streamline the process with simplicity. Whether it’s using technology, looking at their whole processes again, or understanding what’s essential and what’s nice to have — the humanity of the people who need to move home has to be elevated above ‘we’ve always done it this way’ thinking.”

“I think there’s no better example than New York City’s response to Hurricane Sandy,” he adds. “I’d say reconstruction costs doubled because of the arcane permitting process in New York and the lack of appetite to look at things differently.”

Images courtesy of After the Fire.

An emergent leader is necessary in all disasters.





Photos courtesy of (clockwise): James Hardie; Vulcan Vent; and SBP USA.

## As rebuilding happens, communities should focus on building materials that both prevent and withstand future disasters.

Speed is also critical to resilient rebuilding. A sluggish recovery means people will plant roots elsewhere, causing the community to struggle to regrow.

“Three things determine whether people are going to be pushed beyond their breaking point,” explains Rosenberg. “The time between the disaster and recovery, the unpredictability of the process, and the lack of access to resources. Leaders have to answer pretty quickly the equation they’re solving. What’s ‘N’ in that equation? How many houses were lost? What’s the total cost? What’s the plan moving forward? People can deal with the time it takes to recover if they have a predictable path forward.”

Barnes agrees but also advises against haste. “You don’t want to rush and to make quick emotional decisions you later regret,” she says. “Two things were pivotal in our community — getting our temporary school up in time for kids to start school in August and Federal Emergency Management Agency putting in a temporary trailer park that provided housing in the community. Those things in the first couple of months were critical to getting people back to the community.”

Rosenburg says enabling states and FEMA to use flyover imagery and BigData to determine compensation would be faster — and more consistent and predictable — than today’s practice of sending adjusters door to door.

That brings up two other factors Rosenberg says can’t be ignored in rebuilding for resiliency — affordability and equity. “One thing we saw was that, after disasters, people were essentialized by how they paid for their house,” he states. “You’re either a renter or a homeowner, and renters didn’t even come second. Even for people who

own homes, lower-income people and folks of color are often less able to withstand the delay until federal money arrives. We’re working deeply on systemwide approaches.”

### Materials make a difference

Of course, as rebuilding happens, communities should focus on building materials that both prevent and withstand future disasters.

Experts say strengthening construction isn’t cost prohibitive. “It’s not much more expensive,” says Elizabeth Hausler, founder and CEO of Denver-based Build Change, whose mission is to ensure that communities and cities build resilience. The damage from the nearby 2021-2022 Marshall Fire in Boulder, Colo., which killed two people and destroyed more than 1,000 structures, has heightened the resiliency issue for her.

“Affordability is a challenge to start with, but the improvements in building materials that could be done should be affordable for most,” she explains. “We’re not talking about huge amounts of money.”

In Greensburg, many residents rebuilt for the next tornado. “A lot of people took extra steps to build safe rooms where they didn’t have them before,” says Barnes. “Hopefully, they never have to test those.”

When it comes to rebuilding for fire resistance, Thompson preaches things like Vulcan vents, which block embers from entering homes; Hardie board siding; and metal roofs. She adds that residents who had at least of five feet of clearance between their home and flammable materials have fared better in wildfires.



# REALTORS® TAKE THE LEAD IN WILDFIRE PREVENTION

Across the nation, REALTORS® are integral in building resilient neighborhoods.

And their work with consumers during the homebuying process can be a huge part of education before and after natural disasters.

Oregon's Rogue Valley Association of REALTORS® (RVAR) has stepped up on wildfire prevention. In September 2020, the organization's CEO, Tina Grimes, was completing the work the RVAR was doing with the city of Ashland, Ore., to create wildfire prevention materials when a wildfire swept through two cities just north of Ashland.

More than 2,800 structures in the Talent and Phoenix communities were destroyed in what was named the Almeda Fire. Jefferson Public Radio called it "the most destructive wildfire in Oregon's recorded history."

After some stunned utterances to herself, Grimes determined that, given the level of devastation, it was best to hold off on the program's launch. In Spring 2021, the RVAR and city of Ashland, Ore., published a website [[ashland.or.us/SectionIndex.asp?SectionID=539](http://ashland.or.us/SectionIndex.asp?SectionID=539)] and brochure educating residents about ways to protect their homes and businesses from wildfires.

"It explains the right kinds of landscaping, fencing materials, and roofing," she states. "It's specific to the city of Ashland, and this year we'll rebrand it and expand it to other fire districts in the area. We also created a form REALTORS® can use with buyer or seller clients to make them aware that the entire city is a fire zone, what that means to them, and the steps they can take to make their home more defensive against wildfires. Many of our members have thanked us for creating the form because it helps them have a necessary conversation with their clients."

RVAR also funded two-day training on fire-wise properties presented by the National Fire Prevention Association for local home inspectors.

The entire program cost \$33,000 and was funded by an NAR consumer advocacy grant [[realtorparty.realtor/about-us/rvar-consumer-0921](http://realtorparty.realtor/about-us/rvar-consumer-0921)]. "We're committed to amping up the training with REALTORS® on the form they can use and reaching back out to inspectors to advertise fire-wise information as a service they can provide," says Grimes.

Leaders at other REALTOR® associations have reached out to see if RVAR will share its materials with them. "We're a very rural, forested area," she notes. "What happened in our area in 2020 was unique, but every summer, we have wildfires, and we have people on evacuation alerts. So, this will be a two- to three-year push. And wildfires are a big problem in all western states, from the Rockies to the coast."





Greensburg focused on rebuilding with resiliency and community priorities. Today, the town has a wind farm that generates its electricity and drought-resistant landscaping. Photos courtesy of the City of Greensburg, Kan.

Whether it's to withstand fire or wind, Hausler stresses three Cs: configuration, connections, and construction material quality. "Configuration refers to things like a building with a big, long overhang, where wind will get caught under the underhang and blow off the roof," she explains. "It's also about things like connecting or disconnecting carports."

"Also, everything has to be securely connected together, which is especially important for wind and not so much for fire," adds Hausler. "You might have a sturdy set of masonry walls, but the roof isn't adequately anchored and tied down to the walls."

Then there's the quality of building materials. In Hausler's ideal world, rebuilding would shift away from timber and wood-based buildings to masonry and concrete, which don't burn and stay put in the strongest high-wind events.

"The argument today is that timber is much more sustainable because concrete and production of cement produces carbon dioxide," she explains. "However, in a fire, the timber building will burn down and generate a huge amount of CO2 emissions, while concrete won't. So, there's a tension between sustainability and disaster resilience."

Hausler acknowledges, however, that ship may have sailed in the United States, with its huge appetite for wood-frame construction. That said, other materials can be substituted for resiliency, such as roof shingles made from recycled tires or ceramic clay tile.

"For my house in Colorado, which is wood frame, I'm looking at replacing my wood shingles with a more fire-resistant roof," she notes. "It's probably going to be more expensive, but I think it will matter most in reducing the chance my home will catch fire."

"Some developers will use the cheapest materials they're allowed to use," she says. "So, homeowners need to demand higher-quality building materials, and insurance companies need to give incentives like lower premiums for those products to be used."

Hausler points consumers to "The Buyer's Guide to Resilient Homes" [[buyersguidetoresilienthomes.org/](http://buyersguidetoresilienthomes.org/)] from the Federal Alliance of Safe Homes.

Government entities could also provide incentives and streamline processes to help communities rebuild more resiliently. "I'd like to see governments waive impact fees and provide one-stop permitting," says Thompson. "I'd also like to see the federal government have one approach for all federal grants. We've seen huge strides made due to COVID-19. FEMA and the Small Business Administration are showing what they can do quickly."

Rosenburg is advocating for a bridge loan program that would lend to residents in disaster-devastated areas until federal dollars arrive. "Right now, people can be reimbursed if they spend their own money and they qualify for reimbursement," he explains. "That's horrible for people who can't spend their own money."

The entire focus for governments should be offering carrots rather than sticks. "If the message is, 'You should do these things to rebuild resiliently and it's going to cost more,' without providing any subsidy, it's going to be tough for communities," says Hausler. "We work in partnership with governments and other institutions that can provide incentives. There are programs out there that do this, but they need to be universalized."

Ultimately, while government incentives can help drive resilience, Barnes says it all comes back to the community itself. "It's good to have outside help, but knowing who your community is, what your needs are, and how to build for the future is critical," she says. "You're the ones who are going to live there." ●

G.M. Filisko is an attorney and freelance writer who writes frequently on real estate, business and legal issues. Ms. Filisko served as an editor of NAR's REALTOR® Magazine for 10 years.



# COASTAL COMMUNITIES PREPARE FOR AND DEAL WITH RISING SEAS

Photo courtesy of Alaska Department of Commerce, Community and Economic Development; Division of Community and Regional Affairs' Community Photo Library.

By Brian E. Clark



Photo courtesy of Romy Cadiente.

Rising sea levels have eaten away at the land where homes used to be in Newtok, Alaska.

In western Alaska on the edge of the Bering Sea, the Yup'ik village of Newtok has slowly disappeared over the past few decades, the victim of climate change and rising temperatures that have eroded the frozen tundra under its community.

“Rising sea levels, melting permafrost, sinking ground and bigger storms have eaten away at the land where homes used to be, so we have had to move to higher ground,” said Ramman Carl, the tribal administrator.

Since 2007, the Ninglick River — which flows into the Bering Sea beside the community — has eroded more than 500 feet toward the village, with less than 80 feet remaining between the closest dwelling and the water.

The new home to more than 300 Newtok residents is on nearby Nelson Island in the village of Metarvik, which is 100 feet above sea level. Fewer than 90 people remain in Newtok. But they, too, plan to move, Carl said.

“There are many other coastal towns in Alaska that will have to move to higher ground,” he said. “If they are on the ocean shore, they are in trouble. When winter storms hit now, icebergs go into some villages. It’s dangerous.”

Far to the south in Louisiana, the community of Isle de Jean Charles has all but disappeared into the Gulf of Mexico due to coastal erosion and sea level rise. The island, home mostly to descendants of Native Americans, once encompassed 22,000 acres.

Today, only 320 acres remain and the land where islanders once hunted, trapped, grazed animals and raised crops is now under water. Thanks to a \$48-million federal Community Development Block Grant, residents are now moving to New Isle, a planned community 40 miles to the north of Isle de Jean Charles.

There are similar stories from the North Shore of Oahu in Hawaii, where homes have collapsed as sandy dunes erode. Research conducted by the University of Hawaii’s School of Ocean and Earth Science and Technology predicts sea level rise of at least one foot by the year 2050 and four feet by the end of the century. This would endanger two-thirds of the roadways on Oahu and displace up to \$19 billion in critical infrastructure.

For the past 2,000 years, scientists say the level of the earth’s ocean was relatively stable. However, governments around the globe are now facing the near certainty of anthropogenic (human-caused) climate change, which is raising sea levels, creating stronger storms and more flooding, and could drive millions of people from their homes.

In New Jersey, Rutgers professor and climate scientist Robert Kopp is leading a multi-university team studying the coastal climate crisis that includes civil engineers, urban planners, economists, emergency management specialists, environmental anthropologists and social scientists.

With the aid of a \$20-million grant from the National Science Foundation, the group is partnering with communities to develop adaptation plans that protect coastal areas increasingly threatened by extreme weather. It’s also looking into how people respond to rising waters and the behavior of housing markets, mortgages and insurance companies, as well as the effects on municipal budgets.



Newtok, Alaska



Coastal Maine

Photos courtesy of: (top) Alaska Department of Commerce, Community and Economic Development; Division of Community and Regional Affairs' Community Photo Library; (above) Courtesy of the Island Institute; and (right & below) Courtesy of Hawaii Department of Land and Natural Resources.



Eroding north shore in Oahu, Hawaii

“We are dealing with complex and rapidly changing coastal environments and hazards,” said Kopp, who noted that warming waters are also expanding — a scientific phenomenon known as volumetric increase.

“Rutgers and most of the team working on this project sit within the dense urban mega-region that stretches from New York City, through New Jersey, to Philadelphia,” said Kopp, who is also director of the Rutgers Institute of Earth, Ocean and Atmospheric Sciences and professor in the Department of Earth and Planetary Sciences.

“We have to understand the dynamics of how humans and the coastline interact in such complex, urbanized regions so that we can thrive despite rising sea levels and intensifying heat and rainfall and take advantage of new opportunities like offshore wind. The lessons we learn here should have application to urban megalopolises around the world.”

While Kopp said government agencies as well as individuals need to plan for sea levels that will rise 18 inches by 2050 and as much as six feet by the end of the century with unchecked emissions growth, the impacts of global warming and sea rise are being felt now.

“You don’t have to look into the future to see the damage,” he said. “I’ll use New Jersey as an example because that’s where I am. If you look on the Jersey shore, our tidal flooding that used to happen every couple of years in the 1950s is now several days each year, a 10-fold increase. Similarly, Atlantic City and Norfolk, Va., are feeling the impact of flooding on a regular basis.”

He explained human-caused sea level changes since 1900 were responsible for about 10 percent of the damages caused by Hurricane Sandy in 2012, which wreaked nearly \$70 billion in havoc and killed 233 people in eight countries from the Caribbean to Canada.

What coastal communities can do to adapt depends on local circumstances. “I would argue there is no cookie-cutter solution,” Kopp observed. “You have to have community-level discussions and engage people to let them know what the future may look like. Depending on the setting, accommodation could mean hardening the infrastructure and elevating buildings and erecting sea walls.

“But it also includes setting aside land for the water, like parkland in areas of tidal flooding. For some communities, that means relocation. For them, you need a long-term plan. But I wouldn’t want to jump to relocation right away. I’d want to determine how we’d know when we are on a trajectory where we need to transition to that strategy.”

In Maine, Susie Arnold is a marine scientist with the Island Institute, a community development organization founded nearly 30 years ago. She agrees with Kopp that there is no single formula for coastal towns and cities that are dealing with sea rise.

The first step that Maine communities are doing is “understanding what their vulnerabilities are and figuring out what high-priority actions need to be taken,” she said, noting that Maine has 3,478 miles of tidal shoreline and thousands of islands. “It really is a

We are dealing with complex and rapidly changing coastal environments and hazards.



Photo courtesy of FEMA





The downtown area of Bath, Maine, is only several feet above sea level. It is working with the American Institute of Architects to help it deal with rising seas. Photos courtesy of Main Street Bath.

## What coastal communities can do to adapt depends on local circumstances.



community-by-community effort in that each one has a top priority or top area of vulnerability.

“We have southern Maine towns that have very low-lying sandy beaches that are being lost. The wave action is pounding on those communities that are developed right up to that sandy coastline. Conversely, you have the Down East Coast, which is much rockier and much more elevated in many cases, so you are seeing different stresses there.”

Due to the variations in coastal elevations, the danger of rising sea levels is uneven. “We have hundreds of peninsulas with low lying areas that are heavily affected. But other spots are higher. So, it really does depend where you are located,” Arnold observed.

She lives in the coastal city of Bath, which has a population of around 9,000 and is located on the mouth of the Kennebec River. It is popular with tourists, many attracted by its 19th Century architecture. The city’s downtown is only several feet above sea level.

She said Bath has been “keeping an eye on this issue for nearly a decade” and worked with a Design and Resilience Team (DART) from the American Institute of Architects (AIA) to help it deal with rising seas.

The DART report suggested not only traditional hardening techniques like sea walls and stone and earth revetments, as well as “green infrastructures” like beefing up sand dunes, planting trees and other vegetation that can absorb water.

Rising sea levels have already taken their toll on Bath. According to the First Street Foundation, a national group focused on flood risk, Bath has been hit by the highest property value losses in Maine caused by rising sea levels between 2005 and 2017.

In all, it said nearly \$70 million was lost in Maine among \$403 million across the region during that period. Roughly 17 percent of Bath properties were at risk in 2019 and that number could increase another 9 percent in 30 years, with more than 8,000 residential properties at risk statewide. Nationally, research available from First Street (<https://firststreet.org/press/rising-seas-erode-15-8-billion-in-home-value-from-maine-to-mississippi/>) said rising seas have eroded \$15.8 billion in home values from Maine to Mississippi.

Though Arnold’s home is on a bluff well above the water line, she said she has friends who have been affected because the road to their homes floods. She said scores of roads on the Maine coast will need to be raised. “That is common because of the nature of Maine. We have hundreds of dwellings on peninsulas with only one way in and out. When those roads flood, it is a bottleneck for emergency services.”

She also acknowledged that the sea will ultimately take back some areas, but meanwhile, more effort needs to be put into cutting greenhouse gas emissions to lessen future sea level increases.





## SMART COAST CALIFORNIA: DEALING WITH SEA LEVEL RISE

Climate change is real. On this point, Cambria REALTOR® and Smart Coast California ([smartcoastca.org](http://smartcoastca.org)) President Joe Prian agrees with the California Coastal Commission.

Where he and the Commission disagree is over the controversial term “managed retreat” and how to deal with rising sea levels. Managed retreat is a coastal management strategy that allows the shoreline to move inland, instead of attempting to hold the line with nature-based solutions and possible structural engineering.

“None of us is in denial of climate change and that it is happening,” said Prian, who is the broker/owner of RE/MAX Pines by the Sea. Property owners have the right to defend their properties and the government cannot require them to allow natural hazards to destroy their property for public benefit without just compensation.”

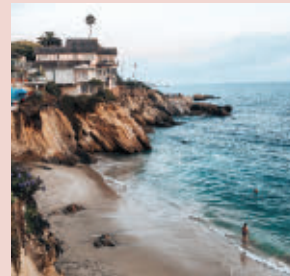
He also objects to attempts to reinterpret the Coastal Act, which became law by referendum in the late 1970s. “They’re trying to give a new interpretation of what an existing structure is instead of adhering to the Coastal Act and letting existing structures develop shoreline protections devices when threatened by wave action.”

Critics argue that the Commission has exceeded its mission, violated property rights and worsened the state’s housing shortage by limiting development of housing in the coastal zone. Advocates, however, contend it has protected open space, views, habitats and public access to the state’s beaches.

The Commission has also urged city leaders to do all they can to consider other options to sea walls — which critics say protects homes but ruins beaches — including managed retreat.

“We need to have a ‘tiered response’ to rising seas,” he said. “We need to look at all options to protect property and beaches. That’s why we live in California and all agencies, local and state, need to work together to make sure our communities thrive. We need to ensure we have factual data that shows what the experts are saying is correct and what gets implemented should happen only if certain thresholds manifest.”

According to Smart Coast, tiered response is a “planning principle that proposes to institute certain defined policies



**We need to have a “tiered response” to rising seas. We need to look at all options to protect property and beaches.**

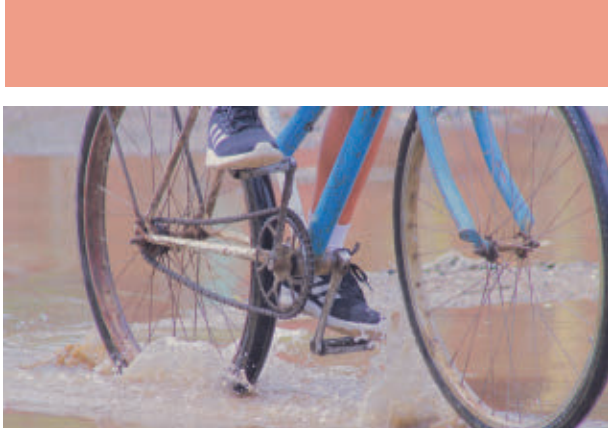
if, and only if, there are specific thresholds of sea level rise that are documented in reality, as opposed to the current projections. The logic behind this is that it is prudent to wait and see if the projected sea level rise should manifest within the time frames postulated.”

There are wide variations in how much the Pacific may rise. According to a National Research Council report, the increase could be between two and 12 inches by 2030; five and 24 inches in 2050; and 17 and 66 inches by 2100. A worst-case scenario forecasts a possible nine-foot rise.

“We want people to be able to protect their property, and if they are not allowed to do that, they should be compensated at fair market value and related costs,” Prian said.

In the meantime, Smart Coast California — which consists of more than two dozen California REALTOR® associations and a coalition of homeowner associations and individuals — is rallying pushback against managed retreat in cities that are updating their coastal plans. It advocates for replenishing beaches with new sand, enhancing kelp forests and building offshore reefs, groins (medium-sized artificial structures built perpendicular to the shoreline) and submerged breakwaters to protect the coast. A last resort is seawalls, replacing private ones and building new infrastructure to protect communities.

According to its website, “these options should be adopted as preferred alternatives to managed retreat in areas that cannot accommodate relocation of developments and those that prohibit property owners from defending their homes, businesses and related infrastructure.”



“We know that there is not enough money in the world to adapt to some of the worst-case scenarios,” she said. “Humankind has never dealt with something of this scale in the past. The solutions aren’t entirely clear and they haven’t been evaluated for success over the long term.”

“Adapting will be expensive, but we do know that it is much more cost effective to fix a piece of infrastructure before a disaster strikes. Fortunately, we have an influx of federal money coming in for planning to take care of some of the real obvious problems before a superstorm hits and causes a lot of damage.”

According to Madeleine Hill, 2022 president of the Maine Association of REALTORS® and designated broker at Roxanne York Real Estate on Bailey Island, Maine, “The Maine Association of REALTORS® supports decision-making efforts and solutions that employ sound science, smart growth and balance when analyzing climate change and sea level rise and its impact on private property rights. Because of Maine’s strong home rule ordinance powers afforded to our cities and towns, this emerging issue will require the cooperative efforts of local, county and state governments for study, interventions and solutions.”

In Louisiana, Camille Manning-Broome is president of the Baton Rouge-based Center for Planning Excellence. According to a recent National Oceanic and Atmospheric Administration report, the Gulf of Mexico could rise two feet by 2060.

She said her home state has lost more than 2,000 square miles of land due to sea rise, subsidence and the channeling of the Mississippi River, a process that began in the late 1920s and has greatly diminished the flow of new sediments that kept delta lands from shrinking.

In addition, the region has been battered by major storms, including Hurricanes Katrina and Rita, both of which hit in 2005. Following those disasters, she said the state developed a coastal protection and restoration

authority to start rebuilding land and protecting communities on the coast.

Manning-Broome explains, “We are a state with a lot of vulnerabilities and there is no single federal program that supports climate adaptation. A lot of climate adaptive funding is post disaster and those are very antiquated programs.”

“We need alignment with federal agencies to use our resources more creatively. Fortunately, the government has recently come up with some additional funding like the Building Resilient Infrastructure and Communities program from Federal Emergency Management Administration and that’s a good start.” <https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities>

Some areas will ultimately be returned to the wild. “We’ll need to design communities around adaptations, in some cases building nature-based solutions,” she said. “It means changing how we think about our infrastructure and the built environment. But there is never going to be enough resources, empathy or political will to buy out entire regions.”

She cited Japan, the Netherlands and Denmark as countries with cultures more amenable to decisions that produce land-use changes and said her agency has a best practices manual devoted to adaptation. “There are many good examples from around the world.”

“But in this country, some decisions may be more market-based,” she said. “Insurance companies and their actuaries are taking a harder view of risks related to sea level rise and climate change. When loan-makers at banks do the same, I think we’re going to be looking at some big shifts.” ●

Brian E. Clark is a Wisconsin-based journalist and a former staff writer on the business desk of *The San Diego Union-Tribune*. He is a contributor to the *Los Angeles Times*, *Chicago Sun-Times*, *Milwaukee Journal Sentinel*, *Dallas Morning News* and other publications.

# SUSTAINABLE -AND- DURABLE



Courtesy of GBCI, 200 West Madison Avenue, Chicago, IL

COMMERCIAL &  
RESIDENTIAL  
BUILDING

STRUCTURES  
THAT CAN  
TOUGH IT OUT

By Kurt Buss

---

## “Then I’ll huff, and I’ll puff, and I’ll blow your house in!” – The Big Bad Wolf to the Three Little Pigs

This children’s fable was to be instructive in the benefits of hard work and perseverance, with the two lazy pigs building their houses quickly using straw and sticks so they could spend their time at leisure, while the third pig took his time to build a brick house, where all three little pigs survived the severe wind event — which was the Big Bad Wolf. Severe wind and other weather events today are growing in frequency and intensity, exacerbated by climate change. The story of the Three Little Pigs also illustrates the need to build structures that can “tough it out” and protect their inhabitants from external hazards.

Today’s dangers are posed by increasingly slower, bigger and more powerful hurricanes and tropical storms, subsequent surges and flooding, rising seas, extended drought, record-breaking wildfires and deadly heatwaves turning hardscapes into open-air furnaces, and non-air-conditioned homes into ovens.

Barley|Pfeiffer Architecture is based in Austin, Texas, but builds and consults on residential and commercial developments throughout the country, focusing on innovative building science, designing structures that can stand up to the elements, and taking micro-climate and setting into account. Peter Pfeiffer, architect and principal of the firm, provided some thoughts on building sustainable, resilient structures to tough it out in times of growing climate change.

“This is something I got passionate about back during the Carter administration when I was in high school,” Pfeiffer began. “It’s important for me to get the word out to the real estate community [about correct sustainable design and building.] I’ve been a licensed REALTOR® since 1979 and I refer work to a lot of REALTORS® now. REALTORS® are serving a very important place in that they are the front line of interface between the homebuilding community and the buying community.”



Courtesy of GBC



(Above) Due to the remote setting of this residence, durability and resilience were two essential goals. The home is not only designed to be comfortable without air-conditioning, its self-sufficiency is assured through an extensive roof-mounted solar array that produces between 95 and 110 percent of the electricity needed to run the home. All water needs, outdoor and domestic, are provided through a 50,000-gallon rainwater collection system. Healthy living is also assured through superior Indoor Air Quality strategies designed into this home. Photo courtesy of Barley|Pfeiffer Architecture.



The Arroyo. Courtesy of USGBC.

## There are many design features that can reduce a building's vulnerability to climate risk.

“The strategies vary for sustainability, and specifically for resiliency, depending upon where you are. For instance, if we were designing a home in Colorado, or suggesting how it gets built, you would want a home that could keep itself warm during the extremely cold winters, and if it were out of power, how would it handle itself and would it still be able to be inhabitable and for how long of a time? Might that mean instead of it being all electric, maybe it does have a gas stove and a fireplace that burns wood? We learned that during the Texas freeze that, yes, it's wonderful to say the homes are all going to go all-electric, but jeepers creepers, when the grid goes down, you're screwed. So, sustainability is a function of what you do to make the place livable during adverse climatic situations.

“In Texas, and in a lot of the South, resiliency is different than other U.S. communities, such as dealing with earthquakes. It may be about dealing with floods if you're down on the Gulf Coast. But there is a larger consideration — can you live in that building, nursing home or house after a hurricane comes through and wipes out power for a few weeks? In most homes, you can't. They're not designed to self-ventilate well, and they're not designed to overly heat up

from the sun. You're just in terrible shape if you're living in Houston or Austin and a hurricane knocks out the power.

“So, in our area, resiliency is about making the house or building livable or occupiable without air conditioning. And you can do that. We can live without air conditioning for a few weeks. If you design it right, you can make it so the home gets no warmer than eighty-two degrees. And, no, it's not wonderfully comfortable, but it's livable.”

Extreme heat causes more deaths than any other climate change hazard in many parts of the world, particularly in hardscaped urban areas. The Urban Land Institute (ULI) published a research report called “Scorched: Extreme Heat and Real Estate,” which stresses the need for implementing “heat-resilient” building designs and land uses.

“There are many design features that can reduce a building's vulnerability to climate risk,” says Lindsay Brugger, AIA, vice president of Resilience (ULI). “Combining a tight building envelope with onsite renewable energy and battery storage may enable the building to continue functioning — or at least maintain habitable temperatures — should a power outage occur. Careful detailing is critical to avoid water or ember penetration. When considering material selection, designers will want to consider their climate risk — are waterproof, heat resistant, or flame-retardant materials needed? — as well as the health implications of the product to ensure the material doesn't become toxic if a wildfire, flood, or other hazard event occurs.”

While cladding a house or selecting façade materials for commercial structures may have traditionally been driven by street appeal and cosmetic appearance, selecting materials for severe weather resiliency is going to require a different approach. It can't just be pretty; it's got to be bulletproof. Fortunately, manufacturers are providing greater choices that can be both.

At the recent NAHB International Builders' Show, James Hardie showed off its new Architectural Collection of cementitious panels with stucco-style finishes offering many textures and colors. Much more practical than clapboard application, these panels can be fastened to create a seamless building skin made of fire and impact-resistant material.

Another cutting-edge technology regards the manufacturing of impact-resistant composite tiles, currently used primarily for roofing, and one more method of bullet-proofing the building envelope against hail and debris,



(Left) Courtesy of James Hardie. (Right) Courtesy of Jeremy Levine Design.



(Above) Courtesy of GBCI, Greenwise Headquarters Rooftop. (Right) Courtesy of Corten Roofing.

## Building for resiliency begins with design.

as well as embers. But shielding the roof is meaningless if it's lifted off in a high-wind event. Creating load path continuity from the roof-to-wall connections, and down through to the wall-to-foundation connections is necessary to help keep roofs from detaching during hurricanes, tornados or micro-climate events.

In terms of sustainability, the most sustainable and resilient items for structural exteriors would, arguably, be metal and concrete, with wood and vinyl being replaced by engineered products, using chemistry and polymers instead of heavy equipment and extractive technology.

Weathering steel, such as Corten, has shown its durability and strength with sea containers, and when they're used as housing or storage, if properly attached to a foundation, will stand when lesser structures don't. Metal's inherent ductility allows it to bend and not break, making it more resilient than wood or plastic, and it can be attached to structures with stronger connectors than nails and adhesives. Technologies are making lighter, tougher and more decorative stamped panels for roofing that snap-lock and can resemble patterns from wood to slate.

Concrete has demonstrated, since ancient Egypt, that it can withstand the elements and gets stronger with age, but the manufacturing of cement, such as Portland, has always been extremely energy-intensive and highly polluting in carbon dioxide emissions. Discoveries and materials are being developed to make a more environmentally friendly product that can be used in 3D printing, which is fast becoming a technology that could have a quantum shift in how we approach building for the future. We're just not there yet. Building for resiliency begins with design, such as multiple roof slopes to better withstand strong winds, channeling



excessive airflow through central shafts built into the structure, designing for cross-ventilation, convective (stack) ventilation and thermal siphoning, or just allowing the more vulnerable overhangs to break away before causing greater damage to the roof structure. This "planning for damage" approach, known as frangible architecture, can also apply to ground-level walls in hurricane areas where the houses are on stilts or piers and the lower area is used for parking and storage.

Commercial buildings and structures face the same resiliency issues as residential structures, but operate on a different scale and function. Myrrh Caplan is the sustainability director for Skanska, one of the largest commercial construction and development companies in the country, and serves on a number of committees dealing with heat and general resilience. She said resiliency is not just the topic of real estate, it's the topic of every city across the country, especially the ones on the coast.

Resiliency looks different for all areas of the country. Glass skyscrapers in coastal regions, as well as hospitals and nursing homes, can survive the storm but suffer greater casualties in ensuing power outages. For instance, Caplan explains, "One thing you have to think about in the Northeast are the winds, the 'Nor'easters' as they say. In thinking about that — the severity of storms, the increased number of hurricanes and the intensity of those — wind continues to be a big factor for building in the Northeast.

"One of the strategies we're deploying, and this isn't particularly new, is the concept of doing triple-glazing. Adding that additional layer of glass not only helps with strengthening the glazing surface, it helps keep your building hotter in the winter and cooler in the summer.



“For an existing building, if the owner can’t afford to replace all their glazing or upgrade to triple-pane or whatever the solution is, there are films out there that can be applied, regular thermal films as well as those that have PV incorporated into them, that could help with the issue of thermal gain.”

Following the Cool Roof Rating standards for reflective materials, vegetated roofs and other design components, as well as using glass with a lower solar heat gain coefficient, specifically on the east and west sides of the façade, is another way of reducing heat gain in the building. Exterior shading devices can also minimize solar heat gain during peak heat conditions.

Skanska also considers the shape of a building. The company developed and constructed the 121 Seaport building in the Seaport District of Boston, a LEED Platinum certified, mixed-use glass tower with 400,000 square feet of office space and 58,000 square feet of retail. As detailed in one of its press releases, the building is oval in shape and was

an intentional design element for resiliency. It helps with wind shear and the structure does not have to be fortified as much as a normal, square building because the wind is not going to be the major issue. Not having to add extra structural elements for strength dropped its carbon footprint, but it’s also just a beautiful building. If you look at most of the other buildings in that area, almost all of them are square or rectangular. So, now you have something that’s aesthetically pleasing in a sea of block buildings.

Caplan points out that the durability of the materials being used is also an important factor . . . “as well as the constructability practices in order to create a building that can last for 75 years to more than 100 years of life, when, typically, clients would look for 50 to 60 years. I find it inspiring.”

Skanska also works with its clients to consider community resiliency. When you think about heat resilience, and what the impact of the building has on the surrounding building or pedestrians walking by or people driving on the streets, you have to think of the heat and glare coming off the building. So as a responsible community member, there has to be consideration to the impact on others in terms of creating the heat-island effect from the reflection coming off the building.

Caplan believes that in terms of the carbon emissions conversation, the future is now. “We’re developing net-zero carbon buildings, we have them in design, we have some that are about to start construction. Those projects are just getting bigger and bigger because everyone is just getting better at identifying how we can achieve those things even in a larger facility.

“We have plenty of clients that are doing net-zero carbon, net-zero energy, net-positive energy buildings . . . and many designs [the design community is] working on today are either leaning in that direction or are about to achieve that. It’s pretty incredible to me that we’ve gotten here.”

In the Seaport District of Boston, the 121 Seaport building is a LEED Platinum certified, mixed-use glass tower.

Photo courtesy of CBT Architects, Bruce Martin Photography, © Bruce T. Martin





One simple rule for sustainability and resiliency: it's all about what makes sense for where someone is building.



Courtesy of James Hardie.

The U.S. Green Building Council recently updated its LEED Resilient Design Pilot Credits, originally offered in 2015. Two of the updates refer specifically to assessing the project in terms of location and identifying the specific risks, and prioritizing a tiered approach to design. Risks that must be considered as part of this credit now include sea level rise, extreme heat and more intense winter storms. The third update regards the Passive Survivability and Back-Up Power During Disruptions credit, which centers around the concept that buildings should be able to safely shelter occupants during a power outage, as well as be able to provide back-up power.

Armor-coating buildings to perform like a Roman legion shield wall is a best practice for severe wind and debris, but what about water and fire? How do you keep hurricane-force rain and wildfire-driven flames from penetrating the structure? 2020 was the most devastating wildfire season in the country's history.

Pfeiffer recounts a severe fire five years ago to the west of town [Austin.] "The one home that we designed in that neighborhood was the only home still inhabitable, and in ok shape, after all the other homes around it were destroyed. And it's for a few simple reasons: We used a fire-restrictive exterior material and fire-resistive exterior window frames, so when embers were being blown against the house, they didn't find much of combustible materials to burn. The other component that really helped it through the fire was the use of metal siding. Metal siding makes sense because it helps thwart the heat from coming through in the summertime, but it also protects the house in wildfires.

"The roof was metal. Metal roofs, particularly light-colored, are the smartest roofs you can do almost anywhere in North America — or anywhere in the world. If the

roof is installed with an air space underneath it, then it can withstand all sorts of things. It can withstand embers on it without transmitting the heat to the house below. It's also great in the summertime in resisting solar radiation."

"Another key element from a technology material point of view is what we call sealing the attic — don't ventilate it. And the best way to seal an attic is using these [expandable] spray polyurethane foam products, because you don't want embers to get sucked up in through the overhang or soffit vents and into the attic. The whole reason for ventilating attics is based on 1940s technology that doesn't matter anymore. It's a goofy part of the code that just needs to go away. But the building codes are very slow in responding to what really makes sense from a building science point of view.

"The specific recommendation I would make if someone cares about designing homes that are going to be resilient and sustainable for the future climate changes is, in any area of the country where air conditioning is used for a significant amount of time, design the home so it won't absorb an excessive amount of sunlight. And that certainly starts with orienting the house the right way, even if it's a production-builder neighborhood."

Modern technologies may provide more bulletproof skins, but Pfeiffer sees one simple rule for sustainability and resiliency when building for future severe weather hazards. "It's all about what makes sense for where someone is building." ●

Kurt Buss is a freelance writer who lives in Colorado, with over 25 years of experience managing recycling programs along Colorado's Front Range. He writes about resource conservation, being a baby boomer, and enjoying the Rocky Mountains. You can visit his website at [www.kurtbusscoloradofreelancewriter.com](http://www.kurtbusscoloradofreelancewriter.com)

# Real Estate IN A Riskier Climate

CHALLENGES,  
OPPORTUNITIES,  
AND TRENDS



**M**other Nature is very powerful, but also very sensitive. That's the bad news and worse news about climate change.

Although average temperatures are climbing by only a fraction of a degree each year, that's enough to produce increasingly painful consequences in the years ahead.

Floods, wildfires, droughts and heat waves will spread and strengthen. Rising sea levels will inundate many coastal communities. Storms — including hurricanes and tornados — will intensify. Places that were once safe and temperate will become less and less hospitable.

Putting the brakes on climate change is a daunting challenge made twice as hard by the political divide over the main cause of global warming — carbon emissions from human activity or natural cycles. With the situation likely to get worse before it gets better, coping with climate change will be a defining issue in the world of real estate for years to come.

No corner of the real estate industry will escape the fallout from climate change. Insurers, investors, lenders, developers, property owners and regulators all face the physical and financial risks generated by a toastier planet.

“There are trillions of dollars in real estate value at stake here ... and there will be winners and there will be losers,” said Matt Kahn, author and professor of environmental economics at the University of Southern California.

A report from the Mortgage Bankers Association, “The Impact of Climate Change on Housing and Housing Finance,” examines all the dominoes that are likely to fall in areas where climate change amps up its destructive power.

Insurance, for example, won't just cost more, it may become impossible to find. People will start to default on their mortgages as their homes lose value and they can't afford to repair or retrofit them. Lenders will begin to raise rates or refuse to make loans in certain areas. Property tax revenues will decline and communities will lose the funding they need to make their infrastructure more resilient.

Coping with climate change will be a defining issue in the world of real estate.

All of that raises the specter of the 2008 housing crash. By backing home loans through Fannie Mae and Freddie Mac and providing flood insurance through the National Flood Insurance Program (NFIP), the federal government — and by extension the nation as a whole — is heavily exposed to any pain that climate change inflicts on the housing market.

“Taxpayers sometimes end up on the hook when stakeholders in the housing system face extreme challenges,” notes the report. “It is easy to visualize scenarios where climate change triggers significant increases in taxpayer support for the existing pillars of the housing finance system.”

But for every action there is an equal and opposite reaction. As coastal homes become less desirable because of flooding, high ground becomes more valuable — but also less affordable to the people living in those communities. The result is climate gentrification.

The Center for Climate and Energy Solutions cites Miami as a prime example. Much of the city's high ground is home to low-income communities of color like Little Haiti. Now those areas are drawing developers and wealthy buyers, which could eventually price out the people who have historically lived there.

No corner of the real estate industry will escape the fallout from climate change.



Millennials see sustainability as a way to help fight climate change.

That's not the only way climate change hits lower-income brackets extra hard. They can struggle to afford improvements that make it easier to live with some of the effects of global warming such as rising energy costs.

Global warming drives up energy costs in a number of ways. Extreme drought threatens hydroelectric capacity. Extreme storms ravage electrical grids that must be repaired. Extreme heat increases demand for energy to power air conditioning.

The Federal Housing Administration offers financing assistance through the Energy Efficient Mortgage Program, which lets borrowers stretch their loan if they spend the additional amount on energy-saving improvements such as weatherization, high-performing HVAC systems and solar power.

Fannie Mae has a suite of Green Mortgage Loan products for multifamily properties that benefit borrowers who invest in energy and water efficiencies, including lower interest rates and additional loan proceeds for energy and water efficiency retrofits.

But going green is about more than trimming utility bills. Many people — especially millennials — see sustainability as a way to help fight climate change in the long run by emphasizing clean, efficient and renewable energy sources.

“Consumers in my age bracket want to make a positive impact,” said REALTOR® Ethan Shapiro, founder of Climate Change Realty. “They are aware of the issues and do not want to have a dead planet in 90 years.”

Launched in 2020, Climate Change Realty is a Boulder, Colo., brokerage and a nationwide referral service that donates 50 percent of its revenues to nonprofit organizations dedicated to fighting climate change — a business model that reflects Shapiro's personal interest in the fight and appeals to the priorities of the next generation of homebuyers.

Serving that generation will require REALTORS® to understand climate change's increasing influence on the residential real estate market, Shapiro said.



“The ability to know how to make a home energy efficient and market those features is going to be a big thing for REALTORS®,” he said. “Those [homes] are going to be more valuable because they’re going to be more resilient to changes.”

The question when addressing an issue as complex as climate change is where to start. Kahn believes it’s crucial to give the average person access to reliable climate-risk information when making real estate decisions. “Real estate will be better able to adapt to climate change if we can certify which places are high flood risk, low flood risk, high fire risk, low fire risk,” he said.

In the past, environmental threats did not change that much from year to year in most locations. Now those threats are becoming more common and more severe and spreading to places where people never experienced them before.

That’s why Kahn considers it essential to rate climate risk in the same way Moody’s and Standard and Poor’s rate credit risk. If people don’t know how and where global warming will change current conditions, how can they weigh future risks and costs when buying a home or making other real estate investments, he said.

“The most dangerous part of climate change is the unknown unknowns,” Kahn said. “It may never occur to someone that a tornado could someday hit them because of climate change.”

The ability to know how to make a home energy efficient and market those features is going to be a big thing for REALTORS®.



Courtesy of USDA, photo by Julie Holland





The real estate industry is responding to many consumers for whom climate change is a key factor.

The real estate industry is responding to many consumers for whom climate change is a key factor in the buying and selling process. This comes as 72 percent of Americans say global warming is happening and 65 percent say they are worried about the effects, according to a recent survey from the Yale Program on Climate Change.

“With most people accepting climate change as a fact of life, it makes sense to treat it like other facts that influence how real estate is bought and sold,” said Matthew Eby, founder and executive director of First Street Foundation.

First Street Foundation is a nonprofit research and technology group that is creating online tools that share data about individual climate risks. “We believe no property should be bought or sold without a climate-risk assessment,” Eby said.

First Street started by launching Flood Factor, which calculates specific flood risk over the next 30 years for 142 million properties. Flood Factor is available on the First Street website and through partners like Redfin and Realtor.com.

Coming soon is Fire Factor, which will provide similar information about wildfire risk. Tools to assess heat, drought and other global warming perils will follow.

The goal of assessing environmental risks is not to discourage people from moving to places threatened by climate change. Many people can afford and will continue to live in places that are uniquely attractive and will remain popular. The goal is to ensure people have the information they need to make informed decisions, including the growing risks and costs of living in those areas (e.g., insurance rates and heating/cooling costs) and the expense of taking preventive measures to protect your property.

“There are tradeoffs you have to make, but [you] need to make that decision with a full set of data versus unknowingly purchasing a home that has a risk no one has told you about,” Eby said. “And that happens all the time today.”

The goal is to ensure people have the information they need to make informed decisions.



Preliminary results from research by Kahn and the online real estate company Redfin found that many Redfin users changed their home searches after clicking on the Flood Factor link that appears with every listing. Another app called ClimateCheck provides users information about fire, heat, drought and storms.

“It just goes to show that homebuyers do care about flood risk and if they have more information on it, it will make them behave differently when it comes to searching for a house,” said Daryl Fairweather, chief economist at Redfin.

But awareness about climate change is not translating into action when it comes to where people are moving. “When you look at the aggregate of where people are moving, they’re moving to places that have higher climate risk than the places they’re leaving,” Fairweather said. “I think a lot of that is driven by affordability, income taxes or just wanting to move somewhere warm.”

The question of affordability is a paradox because climate change has the potential to drive the cost of housing — both owning and renting — up as well as down. In places where little can be done to adapt to climate change, shrinking demand may indeed lower prices.

But the opposite may be true in places where people can adapt and where the appeal of the location — near the beach or nestled in the foothills — makes the cost of lifting a home above flood level or guarding against fire with a metal roof worth the investment for those who can afford it.

“The demand for homes will always be there because people need places to live, but demand will be a lot stronger for the homes that are made to be resilient or are naturally resilient,” Fairweather said.

Resilience is an essential theme in commercial real estate as well. “Without a doubt,” said Kevin Dollhopf, a senior global corporate real estate executive who works with Fortune 500 companies. “Most corporate real estate executives are taking these things into active consideration right now. It’s a risk-based world.”

Although the physical threats are the same — floods, wildfires, storms, extreme temperatures — the existential challenges facing the commercial real estate sector are different than those facing individuals in the housing market.

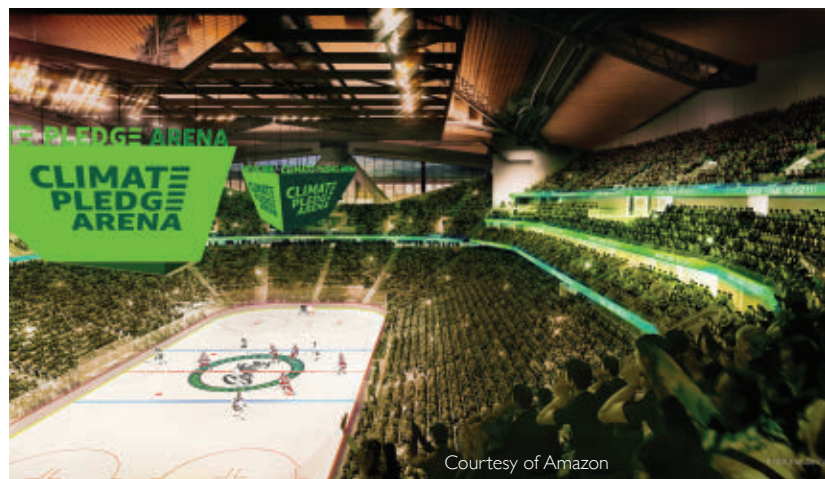


Climate change has created a new set of “filters” through which the commercial real estate industry must process almost all decisions, Dollhopf said.

The environmental, social and governance investing movement (ESG) is one of those filters. The movement is all about steering investors to companies that rate highly on environmental and social responsibility scales. Another is the Climate Pledge. Led by Amazon, the pledge challenges other companies to join Amazon in committing to net-zero-carbon emissions by 2040.

While responding to those initiatives is voluntary, the Securities and Exchange Commission (SEC) recently issued a proposed ruling requiring all publicly traded companies to include standardized assessments of their climate-related risks in their financial reports to the SEC and explain how those risks are expected to affect their business and strategy. Companies that have pledged to shrink their carbon footprint would have to state how they plan to meet their goal and to share relevant data.

Resilience is an essential theme in commercial real estate.



Courtesy of Amazon

# NEW CHALLENGES for the National Flood Insurance Program

The Federal Emergency Management Agency (FEMA) recently requested public comment on a raft of updates to the National Flood Insurance Program (NFIP), including new minimum requirements in order for communities to participate in the program.

The NATIONAL ASSOCIATION OF REALTORS® (NAR) supports providing incentives for communities to adopt higher building standards in order to avoid future flood damage and costly retrofits. NAR also calls for FEMA to disclose the flood claims history of properties to home buyers and renters as well as owners to provide another data point in addition to existing state disclosure requirements.

However, NAR would not support excluding states from NFIP if they don't adopt or enforce a standard flood specific disclosure form to be produced by FEMA. The Legal Research Center has documented that all 50 states

already require the disclosure of known adverse facts or conditions, including past flood damage, while many states also have existing requirements aimed specifically at flood risks.

While some environmental advocates assert that many existing disclosure requirements are too vague and often result in a “buyers beware” scenario, NAR questions the benefits of a FEMA disclosure form, noting that the agency has not identified any authority, expertise or data to show how such a requirement would discourage development in flood zones, reduce flood damage or improve land management as required by statute. In addition, if flood-prone states without conforming disclosure requirements — such as Florida, New Jersey and South Carolina — were excluded from the NFIP, it would deal a heavy blow to both property owners and taxpayers.

REALTORS® support full transparency of flood risk, including providing accurate flood insurance prices upfront under FEMA's Risk Rating 2.0. In addition, the NAR recommends that FEMA follow up by moving toward property specific flood maps for all areas of the United States so consumers can make more informed real estate decisions.





“When it comes to the SEC requiring compliance for disclosure and having the metrics in place to disclose exactly your carbon footprint, that makes you enter a whole new realm of how you manage your facilities and lease your facilities and acquire your facilities,” Dollhopf said.

Although private companies would not be subject to the new rules, they still would face pressure to respond based on the changing demographics of consumers. “The millennials and Gen X are all much more environmentally and socially conscious,” Dollhopf said. “If you’re not telling everyone your goals and how you’re addressing climate change ... you may fall out of grace with your customer base.”

The pressure on the commercial real estate industry to both adapt to climate change and fight climate change by reducing carbon footprints results in a long list of tough choices.

On the adaptation side, companies in threatened locations must weigh the costs and benefits of moving to safer locations versus retrofitting existing ones. Either way, the cost to design and construct buildings to withstand natural disasters, consume less energy and utilize green materials is going up and up.

“We have such a substantial installed infrastructure, right now — buildings and systems already in place — the first step has to be ... doing what you can to your existing footprint to [adapt] to issues related to climate change,” Dollhopf said. “It is easier to build more resilient when you construct something new, but you are not going to tear down everything that is already built and installed,



The millennials and Gen X are all much more environmentally and socially conscious ... If you’re not addressing climate change, you may fall out of grace with your customer base.

so you have to modify your existing structure and systems to meet climate change risk.”

Fighting climate change is full of equally difficult questions. Based on emissions from shipping goods and materials, is it better to be near suppliers or customers? Is the local energy supply dependent on fossil fuels or are renewable sources of energy available? Will extreme temperatures drive exorbitant cooling and heating cost? Is the location prone to flooding and extreme weather events?

“It’s a tremendous amount to consider,” Dollhopf said, “and you’re trying to run a business at the same time.”

One thing is for certain in today’s climate. From large commercial industries to the small business operator, from multifamily complexes to the individual homeowner, climate risk will be a major consideration in the planning, designing, retrofitting, marketing, buying, selling, investing and financing of real estate — bringing with it many challenges, but opportunities as well. ●

Brad Broberg is a Seattle-based freelance writer specializing in business and development issues. His work appears regularly in the Puget Sound Business Journal and the Seattle Daily Journal of Commerce.



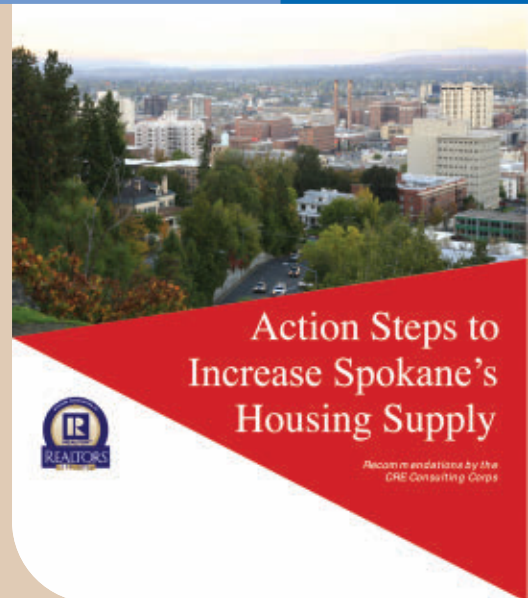
# Take Action: **THAT'S WHO WE**

## Making Smart Growth Happen

### REALTORS® In Action: Spokane National Experts Provide Solutions for Spokane's Housing Crisis

The math is pretty simple. When there are more people than housing; availability goes down and prices go up. In Spokane, Wash., the math may be straightforward, but the answers are much more complex. That's why when the Spokane Association of REALTORS® looked for solutions to the city's housing crisis, it sought expert help.

The Spokane Association of REALTORS® and collaborative partners, which included the state association and the local Home Builders Association, turned to the Counselors of Real Estate's CRE® Consulting Corps — a team of experienced and nationally recognized experts in real estate and policy. After an arduous selection process that involved a detailed application, screening and interviews, the Counselors came to Spokane. A Housing Opportunity Grant from the REALTOR® party helped with funding the project. Darin Watkins, government affairs director for the Spokane Association of REALTORS®, estimates that an investment of approximately \$35,000 in the consulting project has yielded more than \$400,000 in results.



“The breadth of experience available from the Counselors is phenomenal,” Watkins explains. He says the report developed by the Counselors entitled “Action Steps to Increase Spokane’s Housing Supply” included data illustrating Spokane’s current housing situation, detailed recommendations on how to address the crisis and examples of best practices from around the country to serve as a guide. Watkins says the combination of the third-party expertise of the Counselors and the collaborative efforts of local groups are helping convince even the most reluctant politician of the necessity to address housing now.

“The key to advocacy is to convince someone of your viewpoint and then include your friends to help convince others,” Watkins says. “This has helped us build a better coalition. We’re all working on this together. We all have the same voice and it’s hard to say no if you’re a politician. The good news is this isn’t a red or blue issue. Red folks see the business endeavors and blue folks see the social issues. Everything is tied to housing and housing availability.

“Spokane has one of the worst housing availability rates in the country. We have approximately 100,00 families in Spokane and only 92,000 housing units,” Watkins explains.

Spokane has a half-percentage vacancy rate and double-digit price increases. Several years ago, there were 2,000 homes for sale at any given time but as of mid-March 2022, there were only about 150 homes for sale. And the prices of those homes have skyrocketed. Five years ago, 52 percent of Spokane's available housing sold for less than \$200,000. In the first eight months of 2021, only 5 percent of homes were selling at that price point. About one in four owners and nearly half of renters report being cost-burdened by housing. Hardest hit are first-time buyers, young people and buyers needing 'missing middle' housing that includes more affordable options like attached housing, accessory dwelling units and zoning that allows for smaller lots and greater density.

State and local restrictions have also added to the housing crisis. Washington state mandates growth management, which basically draws a circle around a city and requires internal growth before expansion outside of the city is approved. There are also height restrictions in parts of Spokane that impact housing development.

"Every restriction we put on housing, limits housing. It's supply and demand," Watkins says. But he adds, "now we have a map of where we need to go. We have the data and we can be a solution provider."

The Counselors' recommendations are ambitious. They fall into the areas of zoning, housing type and incentives for development. Recommendations include zoning and density changes that support a variety of housing, addressing growth management restrictions, increased engagement of the city's planning department and stabilizing and streamlining the process for developers. Watkins adds that the report's inclusion of best practices around the country are particularly helpful because they illustrate real successes and can help Spokane officials more easily see what could work locally.



Courtesy of Joanne C Sullivan on flickr

In Spokane, housing is not just a local issue, but a regional one. And one of the first steps in implementing solutions will be to bring together all the various stakeholders. Watkins says that a regional housing summit will be held in the next few months. The Spokane Association of REALTORS® has also met with the city's recently hired Planning Director. Working with the Planning Director is essential because the director acts as the public interface, the gatekeeper for developers, coordinator with the city council and manager and influencer throughout the process.

Watkins acknowledges that change can be scary and hard, but the pieces are now in place for meaningful solutions. "REALTORS® have the data and information and can be the driver for change," Watkins says "I'm really hopeful. This is the most hopeful thing we've done to affect true change." ●

# RECOVERY TO RESILIENCY

Greensburg, Kansas, turned its complete devastation by a tornado in 2007 into an opportunity to build a greener, more sustainable and more resilient community. Additional information on creating sustainable communities is available in this issue of *On Common Ground*.



REALTORS® & Smart Growth

on common ground

