Cultivating Resilience

Opportunities for Action

CULTIVATING RESILIENCE: OPPORTUNITIES FOR ACTION

A companion resource to the *Community Resilience Reader*

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BUILDING RESILIENCE? THERE'S A STANDARD FOR THAT

Laurie Mazur is editor of the *Island Press Urban Resilience Project*, which is supported by The Kresge Foundation and The JPB Foundation.

In this era of frequent and costly disasters—both natural and manmade—there is an urgent need to upgrade the resilience of the built environment. Planners and builders are stepping up to the challenge. Public officials, too: In July, local elected officials gathered at the Resilient Cities Summit in Vermont and New York City hosted a major meeting of urban resilience practitioners at the first 100RC Urban Resilience Summit.

To complement these efforts, various public- and private-sector groups have issued voluntary resilience standards—a rapidly proliferating array of certifications, benchmarking systems and design principles. The creators of these standards hope to catalyze a shift in building norms, much as the LEED (Leadership in Energy and Environmental Design) program fostered a move toward more sustainable buildings.

But while LEED has won broad acceptance, resilience standards are at a much earlier stage of development. For one thing, In our interview research, many developers did not know the standards existed," says Kathryn Wright of Meister Consultants Group in Boston. "When they are asked to plan for resilience, they wind up reinventing the wheel." Wright recently co-authored a new report that sorts through the emerging resilience standards, in order to help practitioners make better decisions and improve the state of practice for the field as a whole.

The report reveals a crowded landscape of standards addressing a range of hazards, from flooding to earthquakes and terrorism. The standards' creators are an equally wide-ranging group—from the U.S. Green Building Council to the Department of Defense. Some standards, for example, operate at the facilities level, focusing on a single building or a campus-level electrical grid. Others, still under development, will operate at the district scale, assessing the vulnerabilities of larger systems such as waste and transportation.

Inevitably, the standards offer differing measures of resilience. Many are narrowly performance-based, assessing how a building (or a system within a building) will withstand certain shocks or stresses. Others take a more holistic approach, helping decision makers assess their facilities' vulnerabilities and prioritize responses accordingly.

A few pioneering standards—including the Resiliency Action List (RELi), Building Resilience—Los Angeles (BRLA), and the Enterprise Green Communities certification—consider buildings within their larger social context, and seek to build cohesive, adaptive communities. For example, BRLA

encourages facilities managers to engage with neighbors and think expansively about investments in community resilience.

Confronted with this vast array of standards, what's a resilience-minded planner to do? The Meister report offers a good starting point; its matrix can help identify the right standard for a particular project, saving time and resources.

More broadly, how does resilience planning become the norm? Many players have important roles here. Major real estate industry associations could raise awareness about standards and share information about resilient building techniques. The insurance and reinsurance industries—which stand to benefit mightily from risk mitigation—could incentivize the adoption of resilience standards. Lenders and financiers, as well as regulators and state and local officials, could follow suit. In short, industry outreach, combined with opportunities to monetize investments in resilience, could greatly speed the uptake of resilience standards.

This summer's conferences on resilience are evidence of growing political will to address this issue. "Local officials understand the urgent need to advance the preparedness of the built environment," says Jon Crowe, vice president at Meister Consultants Group, who attended the Resilient Cities Summit. "Real progress on resilience will require a cooperation and commitment from both the public and private sectors," he adds.

Planners and builders have an immediate role to play. Today, they can choose from an ever-growing menu of resilience standards. And, as with early adopters of LEED, they can improve the system by communicating challenges and results to the organizations developing the standards. "The standards are out there," says Kathryn Wright, "it's time to put them to use."

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SOUTH FLORIDA COMPACT IS A MODEL FOR LOCAL CLIMATE CHANGE SOLUTIONS

John Dos Passos Coggin, a freelance writer with experience in the energy sector at the nonprofit, corporate and government level, is also the author of *Walkin' Lawton*, an authorized biography of the late Florida U.S. senator and governor Lawton Chiles.

The White House denies the reality of climate change. It pursues a U.S. withdrawal from the Paris accord. It has removed climate change from its mission across federal agencies. Some state governments, such as Florida's, are equally defiant of the scientific consensus and look to the White House for cover. But many localities across the country are addressing the climate crisis, investing in mitigation and adaptation policies that will save lives and protect critical economic assets.

The Southeast Florida Regional Climate Change Compact is an example of the impact that regional actors can make with little state or federal support.

The compact is an agreement adopted by the Broward, Miami-Dade, Monroe and Palm Beach county commissions in January 2010. Dozens of municipalities within these counties have joined the compact. The founding counties, home to nearly 6 million residents and 30 percent of Florida's population, have recognized the stakes of climate change for their region.

The compact founders and their partners understand the havoc that climate change will bring to South Florida, a region whose economy is based on sand, sun and waves — a region whose tourist destinations must match the dreamy picture postcard of American mythology to survive.

Planners from West Palm Beach to Key West know that three-fourths of the state's population lives in coastal counties that generate 79 percent of the state's annual economy. According to the Florida Oceans and Coastal Council, these counties represent a built environment and infrastructure whose replacement value in 2010 was $2 trillion and by 2030 is estimated to be $3 trillion.

The compact's Unified Sea Level Rise Projection, updated in October 2015, projects sea level rise of 6 to 10 inches by 2030, 14 to 26 inches by 2060, and 31 to 61 inches by 2100.

Long-term sea level rise will endanger coastal real estate, which is connected to tourism and local property tax revenue. Should the coastal real estate market collapse due to sea level rise, counties and cities could see their revenues evaporate just when critical infrastructure investments are most urgent.

But that's just one of many conceivable nightmares for South Florida.

Hotter, longer summers mean higher energy bills. They also create good growing conditions for mosquitoes and mosquito-borne illnesses like Zika. Rising sea levels mean more saltwater intrusion into the local aquifer, harming drinking water. Commercial and recreational fishing are at risk. So are coral reefs, which are economic assets as well as aesthetic ones; from 2013 to 2014, John Pennekamp Coral Reef State Park, in Key Largo, generated $65.5 million in direct economic impact.

The centerpiece of the compact is the Regional Climate Action Plan. Implementation has been successful across South Florida, as cities and counties share best practices and reduce their carbon footprint.

Monroe County, home to the Florida Keys, will soon conduct surveys of all county roads. With this and other data, it will be able to determine how much to adjust road elevation in preparation for rising sea levels.

Monroe County is also addressing carbon emissions. It is targeting a reduction in greenhouse gas emissions of 40 percent by 2030 using a 2012 baseline. Monroe County has already achieved a 20 percent emissions reduction from a 2005 baseline.

Miami Beach is transforming its stormwater system and elevating roads. The conversion of the old gravity stormwater system to a pumped system, an adaptation to sea level rise, is estimated to cost $500 million. Work on the pumped system began in 2014 with the goal of finishing in five to seven years.

The work of the Southeast Florida Regional Climate Change compact is essential. Its adaptation and mitigation effort supports Florida's economy. Recently, the cities of Miami and Boca Raton formally joined the compact, strengthening its influence.

The compact should be a national model for how regional actors can address the climate crisis, despite White House intransigence.

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HOW TO TURN NEIGHBORHOODS INTO HUBS OF RESILIENCE

Taj James, is the founder, executive director, and a board member of Movement Strategy Center, a national nonprofit that promotes movement-building strategies and supports organizations to work more collaboratively and sustainably.

Rosa González is the center's director of applied practice and leads the Community Climate Solutions program to advance transformative resilience strategies that accelerate the emerging transition to a regenerative and interconnected world.

Think of it as a silver lining to the gathering dark clouds. We live in an era of extraordinary disruption, from the serial crises of a changing climate to the wrenching shifts of a globalized economy. But in that disruption lies the potential for positive transformation.

Addressing climate change requires adapting to the impacts that are already here—heat waves, droughts, superstorms and more—while preventing and mitigating future impacts. Taking these challenges seriously calls for radical changes in the way we live. It calls us to zero out our carbon emissions, and to rethink the systems that shape our lives, including the economy, food and power. It calls us to fundamentally transition from a world of domination and extraction to a world of regeneration, resilience, and interdependence.

It's a tall order, no doubt, but that transition is already underway. In our work with movement builders on the front lines of the transition, we've identified two key guideposts—connectedness and equity—that point us toward the world we want.

Connectedness is the recognition that our well-being is inextricably tied to that of other people and the planet itself. It means there are no throwaway people, no throwaway places, no throwaway anything. In fact, there's no "away"; there's just here. In practice, connectedness is about lifting up the voices of the marginalized, and it means regenerating forgotten places, from industrial brownfields to hollowed-out rural towns and Rust Belt cities. The second guidepost, equity, is about recognizing and repairing the harm generated by situations of extreme power imbalance. Equity is about building power from the bottom up.

When communities are fully engaged in problem-solving, they come up with holistic solutions that address complex, interlocking challenges. Here are three.

Sunset Park, Brooklyn, New York

When Superstorm Sandy ripped through the Eastern Seaboard in 2012, the waterfront neighborhood of Sunset Park was hit hard. Power lines toppled and businesses were shuttered. The neighborhood's industrial district flooded, washing toxic residue into nearby residential areas.

But as the people of Sunset Park worked together to rebuild, a hopeful possibility emerged. What if the neighborhood rebuilt in ways that made the local economy more resilient and equitable, while limiting the impact of climate change? That's the vision of UPROSE, a grassroots environmental justice group that took root in Sunset Park 50 years ago.

"Superstorm Sandy was a real wakeup call for our community," says UPROSE director Elizabeth Yeampierre. "Climate change is here now, and waterfront communities like ours are extremely vulnerable." The neighborhood's low-income, immigrant residents were especially at risk, so in the aftermath of Superstorm Sandy, they turned to UPROSE for a community organizing effort to prepare for a wetter, more uncertain future.

The plan they came up with builds climate resilience while protecting the environment, health, and—crucially—jobs.

The point is not simply to rebuild what was there before; UPROSE members don't want more jobs in the same dirty industries that had polluted the neighborhood for decades. "We have a lot of businesses on the waterfront, and we want to keep them here because people need places to work," Yeampierre says. "But we want *safe* places to work." To that end, UPROSE has joined forces with labor unions, the Center for Working Families, and business owners to transform Sunset Park's industrial space into a manufacturing hub that produces environmentally friendly building and construction materials, powered by renewable energy. And they are encouraging these industries to hire locally.

It's a plan that addresses many problems at once. In a city with skyrocketing inequality and rampant gentrification, it could help preserve the blue-collar jobs that once anchored the middle class. At the same time, it could reduce toxic hazards and make Sunset Park a safer, healthier place to live. And it could reduce the carbon emissions that are driving that change.

The process of developing the plan was as transformational as the plan itself. UPROSE consults with residents on the future they want, then arms them with the tools they need to make that vision a reality. Some residents take on the role of block captains and gather input and educate their neighbors on city planning processes. Through partnerships with researchers, residents conduct participatory action research on issues of concern. It's a deeply democratic, holistic approach that builds local power and increases community control over resources—key elements of community resilience.

Buffalo, New York

Left behind by the globalized economy, Buffalo has lost more than half its population since 1950. By 2005, when the community group People United for Sustainable Housing (PUSH) Buffalo was founded, residents of the West Side neighborhood were struggling with unemployment, rampant blight, and high energy costs.

At that time, there were an estimated 23,000 vacant homes in Buffalo. PUSH took on a state

housing agency that was using vacant buildings to speculate on Wall Street, and got the buildings turned over to the community—with funding to fix them up.

Next, PUSH brought together hundreds of community residents to craft a plan for a large, blighted area. The result is a 25-square-block Green Development Zone (GDZ), which is now a model of energy-efficient, affordable housing. PUSH and its nonprofit development company rehabilitate homes in the GDZ, installing efficiency upgrades, like insulation and geothermal heating, that dramatically lower residents' utility bills. The organization won a New York state grant to build 46 new homes, including a net zero house, which produces as much energy as it consumes.

The GDZ doubles as a jobs program. Through its construction projects, PUSH has cultivated a growing network of contractors who are committed to hiring locally. And PUSH successfully advocated for New York's Green Jobs-Green New York program, which seeks to create 35,000 jobs while providing energy upgrades and retrofits for 1 million homes across the state.

Across the West Side, PUSH has transformed the urban landscape. In partnership with Buffalo Niagara Riverkeeper and the Massachusetts Avenue Project, PUSH has turned trash-strewn, vacant lots into state-of-the-art rain gardens, small urban farms, and aquaponics greenhouses. These urban oases bolster food security, while providing much-needed green space.

Richmond, California

A predominantly low-income community of color is challenging the oil giant that has long dominated their city.

In Richmond, the 3,000-acre Chevron refinery looms over the city with towering smokestacks and tangled pipes going in every direction. The largest of its kind in California, the Chevron refinery showers Richmond with unpronounceable toxic chemicals and periodic fiery explosions that put residents at risk. As a major source of jobs and tax revenue, Chevron has long held outsized influence on the city's politics. But, fed up with their toxic neighbor, residents are working to counterbalance the company's political muscle.

The first step was to activate community power. A coalition of local nonprofits including the Asian Pacific Environmental Network (APEN), Communities for a Better Environment (CBE), the Alliance of Californians for Community Empowerment (ACCE), the Richmond Progressive Alliance, and Faith-Works brought residents together to devise solutions to community problems.

The coalition organized forums and rallies, held regular learning institutes for decision-makers, and encouraged public participation at planning commission meetings. In this way, residents reshaped their city's General Plan to make Richmond less reliant on Chevron. The new General Plan emphasizes green industries, anti-displacement policies, and better mass transit systems. Now, the coalition is at work translating the plan into projects, programs, and laws.

At the same time, the Our Power campaign in Richmond is working to build community control over essential resources, such as food, land, water, and energy. Our Power partners with Cooperation Richmond, a local co-op incubator and loan fund that helps low-income residents create their own cooperatively owned businesses. The group holds the annual Our Power Festival, which brings together residents, small businesses, and the public sector to envision a transition to local energy management.

Despite this groundswell of community organizing, Chevron continued to hold sway on the City

Council. So the organizers switched to electoral tactics to supporting progressive candidates who would stand up to the oil giant. And it worked. In 2014, despite millions of dollars invested in the election by Chevron, residents voted in candidates aligned with community values and renewable energy.

"Winning political power, especially in this political moment, is critical for communities at the intersection of poverty and pollution," says APEN Action executive director Miya Yoshitani. "If we are going to win back our democracy from the hands of corporations, and win the powerful vision we have for living local economies, we need to invest in organizing the power of the people and the polls in all our neighborhoods."

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THE CLIMATE CHANGE DEBATE: BLACK PEOPLE ARE BEING LEFT OUT AND THAT CAN BE DEADLY

Charles D. Ellison is a veteran political strategist and a contributing editor at The Root. He is also Washington correspondent for the Philadelphia Tribune, a frequent contributor to The Hill, the weekly Washington insider for WDAS-FM in Philadelphia and host of The Ellison Report, a weekly public-affairs magazine broadcast and podcast on WEAA 88.9 FM Baltimore.

When Bloomberg Media convened an invitation-only forum of notables on "The Future of Climate Change" during the first weekday of the Democratic National Convention in Philadelphia last summer, there was only one black person at the table.

When that person, economist Julianne Malveaux, finally asked what that event's cross section of environmentalist elite were doing about the disproportionate impact of climate disaster on black people, the reaction was quizzically tense.

"But, well, what do you recommend we do?" was the response from one white woman, who seemed to pose it more as a challenge than a question.

And when the other black person in the room (a silent observer for the only two black media outlets present) suggested that they could start by purchasing ads in black newspapers—such as the big daily one in Philly—the room was dumbfounded for a few seconds.

The exchange captures the level of diversity in the mainstream environmental movement: that is, not much. Instead, it's unrepentantly white. Green activism is a massive nonprofit industry with green-economy market potential, but it's constantly shaped by white voices: a national "green conversation" unfairly bathed in the stereotype of long-haired, tree-hugging white college kids road-tripping from one protest to the next.

Blame falls mostly on the movement itself. While the recent stand by indigenous tribes at the Dakota Access Pipeline site in North Dakota might have briefly changed perceptions of the popular green movement's complexion, it didn't fix the broader problem of a space stubbornly dominated by white faces.

For Green 2.0 Executive Director Whitney Tome, that's nothing but green-movement business as usual. "While working in oceans, fisheries and national parks for a decade, I noticed a pattern: I was often the only woman of color," Tome pondered recently. "I often found it hard to offer any solutions because I, like many others, had to overcome implicit and often explicit barriers where people may think I am less qualified, less knowledgeable and less able to provide insight."

Impending policy fistfights over climate change are already rattling Washington, D.C., as a climate-change-denying Trump administration takes over. There are signs that the Trump White House, with congressional Republicans, will gleefully roll back hard-fought progress on climate change and air and water issues. But the open battle over national environmental policy—certain to hog up many headlines over the next few years—will find black voters, advocates and politicians largely absent. Lead environmental advocacy organizations from the Environmental Defense Fund to billionaire Tom Steyer's hyped NextGen Climate PAC are overwhelmingly white either in their staff makeup or in their leadership.

"Without people of color in positions with policymaking capacity, it means that the perspectives of people of color are less likely to be included in the deliberations or outcomes," Tome noted.

Yet, when human-made or human-instigated disasters inevitably hit, black folks are on the front lines. Bad water in Flint, Mich. Lead poisoning in an East Chicago project. Historic flash flooding in Baton Rouge, La. Superstorms along the Northeast. City-flattening hurricanes in New Orleans.

But the lack of a black presence in the climate fight is one cruddy outcome of a broader environmental conversation dominated by white voices. And it's not helped when mainstream environmental organizations welcome very little diversity within their ranks, much less black representation. In its "The State of Diversity in Environmental Organizations: Mainstream NGOs, Foundations & Government Agencies" report, Green 2.0 found that diverse populations often hit a "green ceiling"; people of color barely account for 16 percent of environmental-organization staff (even though they are 36 percent of the U.S. population), and 5 percent of nonprofit boards. The situation worsens at upper-management levels, or what's called the executive "C-suite."

"The lack of racial, ethnic and class diversity in the environmental movement is not news," Denise Fairchild, president and CEO of the Emerald Cities Collaborative, explained to *The Root*. "What is news is the urgency to rectify this long-standing problem. Now, more than ever, racially diverse leadership in the environmental sector is central to resist current and long-standing efforts to dismantle the environmental and climate agenda."

That's a hard ask when people-of-color interns in environmentally focused nongovernmental organizations, government agencies and foundations outnumber the few people of color in leadership and board slots by a factor of two or three. Fewer of those people of color represent the black Diaspora, much less African Americans.

Politically, it's bad enough that black elected officials—especially on the federal level—won't jump in on climate talk. But when environmental organizations need to change the electoral map, black candidates don't get checks, and black voters are lucky to get noticed. Even NextGen Climate couldn't say for certain whether any of its $6.8 million media ad buy was dropped into black media outlets during the 2016 election cycle. One black advocacy group, Color of Change, did receive $74,000 (out of $92 million spent), but NextGen simply outsourced black outreach through a $5 million partnership with big labor's Service Employees International Union.

Still, a finger bow to NextGen for the effort: It was better than other green political titans like the Environmental Defense Fund, which didn't bother giving any money to black House or Senate candidates this past election cycle.

Funny, though: It's not as if black people don't care about climate change (even though they don't talk it up enough). As a matter of fact, they do: Roughly "three in five rate global warming and

air pollution as serious problems," according to a 2015 Green for All poll. Nor is it that there aren't black voices lighting up the talk on climate change and other green topics—in fact, there are *quite a few*. Topping most lists of notable black greens is Van Jones, the once-estranged Obama White House point man on green issues, now of CNN fame, who heads up Green for All. NAACP Environmental and Climate Justice Director Jacqui Patterson led an unofficial delegation of color to the 2015 Paris Climate Summit and demanded that the U.S. government pony up $5 billion for a Green Climate Fund.

But there are scores of others who have long been in the streets either creating movements, like environmental-justice "father" Robert Bullard, or carrying green flags and studying climate trends, like J. Marshall Shepherd at the University of Georgia and "urban scientist" DNLee. Brentin Mock, justice editor at must-read enviro mag The Grist, roundly schooled this writer about the black folks shaking up the climate debate. And the Kresge Foundation-funded Urban Resilience Project touts an impressive pool of black minds on the subject, from Danielle Hilton and Seandra Pope down South to the Los Angeles County Bicycle Coalition's Tamika Butler out West.

Obviously we can't name every black environmentalist on climate duty, but operations like Kresge are funding a hard push to help us find more. That's resulted in efforts like Green 2.0 (and those groundbreaking diversity reports) to supporting the Building Equity and Alignment Initiative, another effort encouraging links among big greens, the grass roots and philanthropic organizations, as well as partnerships with groups like Sierra Club, 350.org and the Union of Concerned Scientists.

Still, LACBC's Butler looks for answers from the black and brown leaders of environmental-justice outfits rather than blank stares from the "mainstream" ones.

"As a person of color living in a historically black neighborhood in Los Angeles, I can't go on a walk in my local park without seeing active oil fields," Butler told *The Root*. "If those leading the fight to protect our planet only talk about resources and never mention race, they'll never represent or understand the forgotten casualties as our planet changes."

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THIS IS HOW WE CAN TACKLE CLIMATE CHANGE, EVEN WITH A DENIER IN CHIEF

Laurie Mazur is editor of the *Island Press Urban Resilience Project*, which is supported by The Kresge Foundation and The JPB Foundation.

President-elect Donald Trump doesn't believe the climate is changing. Alone among world leaders, he has called climate change a "hoax," perpetrated by the Chinese. Accordingly, he appointed a prominent climate denier to head the Environmental Protection Agency; fossil-fuel industry lobbyists are advising him on energy policy.

Here in the real world, of course, the climate is changing. We just experienced the warmest five-year period in recorded history, according to the World Meteorological Organization. Human-induced climate change is increasingly to blame for the extreme weather that wreaks havoc on American cities and towns—from Alaska's thawing permafrost to the flooded streets of Miami and Norfolk. Even as we work to cool the planet by reducing greenhouse gas emissions, there's an urgent need to adapt to the changes that are now unstoppable.

With Trump at the helm, the prospects for addressing climate change in the United States seem bleak. But in the absence of federal leadership, we may see an explosion of climate action at the local level. In fact, some communities are already stepping up and preparing for a warmer, wilder future.

According to a new study—the first in-depth assessment of climate adaptation in the US—communities are busily preparing for risks by moving people out of harm's way, reducing the vulnerability of vital systems, and building capacity to deal with disaster. The study, a two-year research project conducted by environmental research firm Abt Associates with support from the Kresge Foundation, shows that communities are taking action in red states and blue states, in big coastal cities and small rural towns—even where the phrase "climate change" is rarely uttered in public. All while avoiding the political polarization that has led to gridlock at the national level.

With a new administration predisposed to deny climate change, these local works-in-progress will become even more important to the safety and security of Americans.

Disaster focuses the mind

Fighting climate change requires a wholesale rethinking of how we power our economy, grow our food, and move from place to place. Perhaps that's why it has taken the international community two decades to produce a non-binding climate agreement. So, how have cities and towns managed

to move forward on an issue that has been so challenging for nations and the world?

In many cases, they were pushed into action by disaster. While some communities (including Miami, Seattle, and Oakland) developed forward-thinking plans informed by climate science, most received a wake-up call in the form of a flood, fire, or drought.

In Flagstaff, Arizona—a town that draws 5 million visitors a year—the 2010 Schultz fire was that wake-up call. Kindled by an abandoned campfire, the conflagration torched 15,000 acres of ponderosa pine forest. Like many recent wildfires in the west, the Schultz fire was accelerated by unusually dry conditions, which are likely to intensify in a changing climate. And, soon after the fire, exceptionally heavy rains (another climate impact) poured down the denuded mountain slopes, flooding the town and killing a 12 year-old girl. Those events spurred voters to pass a $10 million bond measure that improves forest management and reduces the risk of catastrophic fires.

In the crimson-red city of Tulsa, Oklahoma, decades of flooding along the Arkansas River and its tributaries made many Tulsans question the wisdom of building in the floodplain. A citizen-led effort to limit construction was met with serious pushback from development interests, especially during the years that climate denier James Inhofe served as Tulsa's Mayor. But the naysayers were largely silenced after a calamitous flood killed 14 people and damaged 6,800 homes. Ultimately, the city bought up over 1,000 repeatedly-flooded properties, converting them to public parkland.

And in the college town of Fort Collins, Colorado, threats to the beer supply galvanized action. A series of droughts raised fears about water shortages—an existential threat to local breweries that collectively suck up more than a billion gallons of water each year. In response, the town's 16 breweries adopted—and championed—voluntary water conservation strategies that reduced water use by 25 percent over the last decade, even as the population grew.

One size does not fit all

The Abt study profiled 17 communities and found their adaptation strategies are as varied as the places that employ them. "Climate adaptation is not a paint-by-numbers exercise," says Garrett Fitzgerald, strategic partnerships advisor for the Urban Sustainability Directors' Network, who served as an advisor to the study. But three general approaches are widely used.

First, a community can—in adaptation-speak—reduce exposure. That means removing people and property from paths of destruction. Tulsa's flood-prevention strategy falls into this category. The seaside town of Avalon, New Jersey used this tactic, too: repeated nor'easters and hurricanes prompted the town to buy up storm-damaged homes, restore sand dunes, and block development in vulnerable shoreline areas. Exposure reduction is especially useful in coastal communities facing inundation—at least those that are not doubling down on denial.

Second, communities can reduce sensitivity. Essentially, this means recognizing that bad things will happen, and working to limit the damage. In Norfolk, Virginia, where rising seas now send water streaming into the streets on sunny days, the city changed a zoning ordinance to raise new construction at least three feet above the anticipated flood level. And Chula Vista, California is dealing with soaring temperatures by planting shade trees and requiring new housing to be built with light-colored "cool roofs" that reduce the urban heat island effect.

Finally, communities can enhance adaptive capacity. This is about supporting the hard-to-measure qualities that enable people to cope in challenging times—like strong social ties, good health,

economic well-being, and a general sense of empowerment and engagement. Not surprisingly, poverty and marginalization eat away at adaptive capacity; that's why low-income communities and communities of color often bear the brunt of climate disaster.

Building adaptive capacity starts with the most vulnerable, but not by parachuting into disadvantaged communities with a ready-made plan. "You need to actually work with the real-life people who will be affected," says Fitzgerald, who partnered with community groups in Oakland to develop that city's forward-thinking Energy and Climate Action Plan.

In Baltimore, the City's Office of Sustainability has cultivated the art of engaging at-risk communities in adaptation planning. One secret, says Climate and Resilience Planner Kristin Baja, is to make it easy for residents to attend meetings by providing free transportation, food, and childcare. And at those meetings, city staff do more listening than talking: "PowerPoints are banned," says Baja.

Some of the most innovative adaptation projects result from vulnerable communities taking the lead on adaptation planning. For example, in Cleveland, Ohio—where one in three residents live in poverty—local community development groups helped start the Bridgeport Café, a gathering place in the struggling Kinsman neighborhood. "A corner café might not seem like a top priority for climate adaptation," says Missy Stults, another project researcher for the report, "but this is the kind of place that brings people together and strengthens communities."

Strong communities literally save lives in times of disaster, according to sociologist Eric Klinenberg. Klinenberg studied a devastating 1995 heat wave in Chicago, which killed nearly 800 people. He found disproportionately high mortality rates in low-income, African-American neighborhoods where many lacked air conditioning, but there were telling exceptions to this rule. Auburn Gresham, a poor, black neighborhood on the city's south side, reported fewer deaths than in many affluent communities. What made the difference, Klinenberg found, was the neighborhood's strong social fabric. It was the "sidewalks, stores, restaurants, and community organizations that bring people into contact with friends and neighbors" that mattered, nurturing a community where residents checked on the elderly, sick, and vulnerable.

Good signs and next steps

The Abt investigation found that communities are, in fact, reducing their vulnerability to climate impacts. In Tulsa, no one was hurt—and no homes were destroyed—during recent severe flooding. And Avalon, New Jersey was largely spared the devastation of Hurricane Sandy, while neighboring communities got hammered.

Importantly, many of the actions they are taking to adapt—restoring ecosystems, strengthening neighborhoods, conserving resources—are improving people's quality of life right now. In Oakland, for example, community groups are rolling out an adaptation plan that calls for affordable, renewable energy; healthy, locally grown food; and emergency preparedness. "Every one of those actions is justified even without considering climate change," says Joel Smith, a researcher for the study.

Despite such successes, it's not enough. While some communities, like Oakland, are preparing for future climate impacts, others are simply seeking to prevent the recurrence of a previous disaster. But a changing climate means the future will not look like the past—so preparing for a disaster like the last one may mean underpreparing for the future.

There are limits, also, to what communities can do on their own. Many of the local actions profiled in the study had significant help from the feds. Flagstaff worked with the US Forest Service on its plan to save local forests; Tulsa got funding from FEMA to buy up properties in the floodplain; Cleveland's Bridgeport Café won financial support from the US Department of Health and Human Services. And FEMA and the National Oceanic and Atmospheric Administration provide communities with essential information about climate hazards. But adaptation assistance rarely—if ever—comes in the form of a "climate change" program or project; instead it comes as community development block grants, disaster recovery funds, and forestry initiatives. So, even if the Trump Administration dismantles his predecessors' work climate, continued federal funding of various kinds could support local adaptation efforts.

Even in the worst-case scenario, a lack of federal leadership on climate could create a vacuum, which localities—understanding the urgency of action on both mitigation and adaptation—may rush to fill. In fact, it is exactly what we saw during the George W. Bush Administration. In 2005, Seattle Mayor Greg Nickels launched the U.S. Conference of Mayors Climate Protection Agreement, which secured pledges from 1,060 mayors to reduce their city's emissions by 7 percent below 1990 levels, in line with the never-ratified Kyoto Protocol goal for the United States.

It was also during the Bush Administration that nine northeastern states signed an agreement to form the first (and only) regional greenhouse gas cap-and trade-system in the United States—the Regional Greenhouse Gas Initiative. Emissions in the RGGI states have declined by 45 percent since 2005, while state economies have grown by 8 percent, proving that economic growth need not be sacrificed in pursuit of clean power.

"There is a silver lining to the possibility that climate change may be a low priority under a Trump presidency," says Jason Vogel, a lead author of the Abt study. "Our research shows that mayors, county commissioners, grassroots activists, and municipal staff are already taking action to reduce climate vulnerability while pursuing other important goals."

Do it. Do it now.

This is the central message of the adaptation study: if your community has not begun to plan for a changing climate, now is the time to start. And although the Abt study is focused on adaptation, it carries a powerful (if unstated) message about mitigation and the need to slow climate change. If emissions are not curbed and the worst-case scenarios come to pass, some of the adaptation strategies recounted here could be rendered useless. Those raised buildings in Norfolk? They could be under water by the end of the century if current trends continue. Same for Avalon, NJ, with its carefully restored beaches and sand dunes. If climate change brings a megadrought to the American west, even state-of-the-art management may not save Flagstaff's ponderosa pine forests—and beer could be the least of the worries for people in Fort Collins.

Still, there is hope. In communities of every description, people are working across political, social, and economic divides to build resilience to a changing climate. There is much we can accomplish, even in Trump's America, if we join forces to protect the places we call home.

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WHAT CAN THE ABOLITIONISTS TEACH US ABOUT CLIMATE CHANGE?

Denise Fairchild, is the inaugural president of the Emerald Cities Collaborative, a national nonprofit organization dedicated to building a sustainable, just and resilient U.S. economy. She is the co-editor of the book Energy Democracy: Advancing Equity in Clean Energy Solutions.

At the Paris climate conference (COP21) late last year, 195 countries adopted the first-ever universal, legally binding global climate accord. It is a big deal that world leaders have finally acknowledged the climate crisis and committed to do something about it. But let's not kid ourselves. As Bill McKibben, founder of 350.org put it, "This agreement didn't save the planet, but it may have saved the chance of saving the planet."

To actually save the planet—and ourselves—we need to get beyond the scientific and technological solutions that comprise the Paris Accord. Indeed, we must transform the cultural, economic and political conditions at the heart of the climate crisis. It sounds impossible, but history offers a model for this kind of transformative change: the dismantling of the slave economy in the 19th century. Understanding the centuries-long abolitionist movement offers insight into the vision, the structural changes, the personal commitments, the political struggles, and the global movement required to stave off catastrophic climate change.

TOO WEAK AND TOO LATE

The changes called for in the Paris Accord are meager in relation to the global climate crisis. The strategies outlined are not specific enough, nor are they likely to be quick, deep, or distributive enough to change the status quo. The agreement's carbon targets are too weak and too late to stem the negative effects of climate change on our environment, food, water, air, and overall quality of life. A Paris Accord with teeth would have demanded the elimination of fossil fuel combustion as an uncompromising solution.

It's time to get serious about our climate crisis. And, in fact, a host of actors—governments, corporations, nonprofits and consumers—are advancing a range of climate mitigation and adaptation initiatives. We are greening our buildings to increase energy and water efficiency. We are decarbonizing our transportation systems with mass transit solutions. And, even though the EPA's Clean Power Plan is held up in litigation, MANY states are moving forward with plans to decarbonize the power sector. Solar and wind farms are harvesting renewable energy. Distributed energy, food, and water systems are answering the call to mitigate and adapt to a changing climate.

These efforts are necessary but not sufficient for tackling global climate change. Many are transactional, not transformative. They operate at the edges of substantive issues of property, profit, power and privilege. They do not get at the root cause: a globalized fossil fuel economy committed to extraction and exploitation of our natural and human resources, without regard for short- or long-term consequences of diminished biodiversity, resource depletion, income inequalities, and toxic communities.

Moreover, climate change is narrowly framed as an "environmental issue," when in fact it is tightly interwoven with the crucial economic and social issues of our time, like inequality and structural racism. To say that climate change is about the environment is like saying that slavery was about farming practices.

Going deep on climate change means disrupting the status quo. The climate goals and challenges we face today are existential in nature, requiring re-examination of our cultural values and the workings of our industrial economy. We need a movement that is the vanguard of all other movements, one that seeks to make the way we live not only more sustainable and resilient, but also socially and economically just.

But for the most part, this is not the change we seek or even envision. Even the most radical and transformative vision of Buckminster Fuller—to "make the world work, for 100% of humanity, in the shortest possible time, through spontaneous cooperation, without ecological offense or the disadvantage of anyone"—while squarely addressing interrelated issues of environment, economy and equity—assumes that change can come without struggle, that it will be "spontaneous and cooperative."

If we are serious about climate change, we need to dismantle the fossil fuel economy and replace it with a moral economy that values ecosystems, sufficiency, distributive justice, and real democracy. And that kind of transformation will not come without struggle. The only precedent that comes close in scope is the movement to dismantle the slave economy: the abolitionist movement.

PARALLELS BETWEEN THE SLAVE AND FOSSIL FUEL ECONOMIES

The abolitionist movement offers a playbook for advocates working for climate, economic, and social justice. That movement challenged the very foundation of the global slave economy by dismantling the pillars that supported it: **property rights, profits, privilege, and power**.

Property Rights. The abolitionists successfully challenged the idea that some people were property to be bought, sold and owned. Building a sustainable and just economy requires a similar shift in thinking about nature.

The bedrock of climate change is an industrial economy rooted in exploiting and commercializing the environment. The earth's natural resources—water, minerals, forests, the atmosphere—are enslaved to the global market economy in a way that is analogous to Africans under the slave economy. Like human slaves, our natural resources are devalued and chained to private interests by legal protections.

Just as slaves were denied agency and self-determination, we now prevent nature from regenerating—with consequences that are both immediate and intergenerational. We have, for example, diminished the quality and supply of our freshwater resources—rivers, lakes, ponds, aquifers—denying their capacity to nourish the coral reefs, and the fish, animal, and human species

dependent upon them.

And yet, the right to extract our water supplies (and other natural resources) is fiercely protected by private property laws and public indifference to their mistreatment. Advocates for water are losing the battle against private property rights in the US courts. Twenty-seven states are currently suing EPA's latest effort to define and protect the Waters of the United States (WOTUS). Opponents of the EPA ruling charge that it is "unconstitutional," "communism," and a "land grab."

The Abolitionists faced a similar challenge. Dismantling the slave economy required a long, global struggle to outlaw the right to own, control and exploit African labor for commercial gain. Whether or not the US Constitution directly sanctioned and defined slaves as property is debated. What is clear, however, is that three clauses in the Constitution clearly permitted exploiting African slaves for their commercial value: the three-fifths compromise; the slave trade clause (Article I, Section 9.); and the fugitive-slave law (Article IV, Section 2). But those "rights" fell to a constitutional challenge, and ultimately to the thirteenth amendment, which outlaws the right to own slaves.

Similarly, dismantling the fossil fuel economy requires challenging the right to own, extract, and exploit the environment as personal property. These rights are scattered throughout the Constitution, with private property protections supported by "due process," the "takings" clause and "contracts," found in the fifth and fourteenth amendments and in Article 1 of the Constitution's main text.

A constitutional challenge and an amendment to the US Constitution are essential for protecting our environment. A credible climate change movement must integrate with the efforts of the global south and the Global Alliance for the Rights of Nature, which argues that "there is no justice as long as nature is property in law." This movement is a worldwide effort to challenge constitutional rights to hold nature as property and to acknowledge "that nature and all its life forms has the right to exist, persist, maintain and regenerate its vital cycles." *The Alliance's eco-centered approach balances the needs of humans and other species without exploiting one to the detriment of the other.*

Profit. Profit generation is a fundamental, but hidden, driver of climate change. Massive accumulation and maldistribution of wealth in the slave and fossil fuel economies occur from exploiting and controlling the engines (sources of energy) that drive production. Three hundred years of free slave labor fueled the growth of the agricultural and domestic economies, only to be replaced by fossil fuels as the fuel of choice in the industrial economy.

In the antebellum South, slaves—and wealth—were concentrated in the hands of an estimated 3,000 owners of large plantations, creating considerable political and economic power where "cotton was king." Many northern industrialists supported the abolition of slavery in order to shift political power and wealth from the South to the emerging class of industrial robber barons. For those industrialists, coal [and other fossil fuels] was king for fueling factories, trains, ships, and more.

Dismantling the slave economy—while partly religious and humanitarian in intent—was, in the main, a fierce struggle for power and control over the means of production and the wealth it generated. There is a lesson here for climate change advocates: As we transition our economy once again to a new source/form of energy, we must be mindful of the economic consequences and struggles behind our decisions.

This is likely to be a long-term struggle. Notwithstanding the moral, environmental, and other costs of fossil fuels, they have made a small group of people very rich. In the fossil fuel industry,

wealth is concentrated in the top five oil companies, which made [a total of $93 billion in profits in 2013; forty percent of those profits were used to repurchase stock to increase the wealth of shareholders. The CEOs of the top five oil companies were paid $96 million in that same year (not including bonuses), which was 400 times the US median family income [see note].

The fight for sustainability, therefore, is also a fight for economic justice. The base struggle is over fossil fuels vs. renewables, as it means the demise of a legacy industry and the emergence of a new one. Beyond that, however, is the ethical question of who will own and control the new industry—the harvesting of the sun, wind and other renewable energy sources. And at a deeper level is the question of who controls the engines of the economy. But economic issues of profit and wealth distribution get lost when climate discourse is focused on incremental solutions like living buildings, greening the economy, or winning a university divestment.

The structural changes in the transition to a clean energy economy could be as profound as those that accompanied the transitions from the agricultural to the industrial and digital economies. We need to widen the lens and take a holistic view of what's at stake. A growing number of climate justice advocates have framed these changes as a "just transition," seeking to create a sustainable economy that is fair and inclusive for everyone. For example, a Just Transition could include a shift from energy monopolies to "energy democracy," community-owned renewable energy that is treated as a public "commons."

Power and Privilege. Finally, the transition to a sustainable future requires grappling with questions of power and privilege—who has it, how it is used, and how it is distributed and controlled.

The slave economy created a society of haves and have-nots separated by race, class, gender and privilege. The US Constitution, for example, counted African slaves as three-fifths of a person. Notwithstanding the larger premise that all men are created equal, the slave economy baked structural inequalities into all aspects of society. The Constitution, laws and informal sanctions denied African Americans access to citizenship, voting rights, education, health, family life, quality housing, food, clothing, language, religion, culture and more. These denials were essential to maintaining power and control over property and profits.

Dismantling the slave economy was the earliest effort to eradicate such privilege and inequities. The ratification of the 14th Amendment to the Constitution, in 1868, granted citizenship to "all persons born or naturalized in the United States." Unfortunately, the vestiges of inequality persisted post-slavery and adapted to support the power and privilege of the fossil fuel economy. Dismantling the fossil fuel economy should entail another effort to contest all the ways that our institutions support inequalities. Again, there are parallels between slavery and the fossil fuel economy:

Religious institutions once ordained dominion over slaves as divine providence; similar doctrines sanction human dominion over nature.

- Pseudoscience is used to justify privilege: Just as slaves were deemed inhuman and intellectually inferior, pseudo-science now claims climate change is a hoax.
- Educational institutions institutionalize power and privilege through textbooks that transfer culturally biased "knowledge and values" in favor of privileged groups.
- Laws and legal institutions are used to protect property rights and discriminatory practices that serve the affluent.
- Financing institutions are used to grow power and privilege through preferential lending.

Building a Transformative Movement

If the abolitionist movement teaches us anything about how to save ourselves from climate change, it is this: We need a movement for transformative societal change. It won't be easy. In some ways, we are all slaves to the fossil fuel economy. It is embedded in all aspects of our economy and lives and entails a deeply entrenched culture and mindset. "Abolition" of climate change requires changing norms, values, and strongly held beliefs about property, profit, power, and privilege. But, while the challenges are great, we don't have an option.

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A COMMUNITY APPROACH TO CLIMATE RESILIENCE

Rebecca Wodder was President and CEO of American Rivers for 16 years and currently serves as Vice Chair of the Board of Directors of River Network.

In New Orleans, a devastated neighborhood seeks to revive their community after Hurricane Katrina. They begin by regaining access to a bayou where earlier generations hunted and fished.

In Toledo, Ohio, 400,000 people go without drinking water for two days, due to a toxic algal bloom brought on by water pollution and high temperatures. In response, low-income residents work together on green infrastructure projects that can reduce polluted runoff while improving property values.

In Fredericksburg, Virginia, an historic community comes together to protect their river from development and pollution. Working collaboratively with builders, a low-impact development ordinance is unanimously adopted and a new riverside trail becomes a place where residents connect with each other and with nature.

In Portland, Oregon, a watershed association unites urban, suburban and rural neighbors in support of creek restoration projects that reduce frequent episodes of flooding and restore salmon habitat.

As these examples show, water is a ready source of common cause. Neighbors come together to defend against floods, droughts and water pollution, and to obtain the quality-of-life benefits of being near, on, or in clean, sparkling water. There is a vital lesson here for freshwater organizations and agencies. Projects to build *natural capital* in the form of protected or restored rivers, wetlands, watersheds and green infrastructure that mimics the natural water cycle can also build social capital, in the form of trust, collaborative skills and shared values. In return, social capital can strengthen and sustain freshwater natural capital.

The synergistic role of freshwater in building natural and social capital becomes increasingly important in a changing climate. Since most of the ways in which Americans experience climate change are connected to the hydrological cycle, freshwater organizations and agencies can make important contributions to help communities and regions become more resilient to extreme weather events.

Yet too often, freshwater conservation strategies focus solely on protecting, restoring and replicating natural hydrological functions. But, social capital is also extremely important to community resilience. A recent report finds that "promoting social cohesion—in which a society's members cooperate to achieve shared well-being—in communities is an additional and overlooked tool for strengthening climate resilience, with particularly good outcomes in low-income communities."

Social capital improves freshwater plans and projects, thanks to the knowledge and support provided by engaged local residents. The resulting freshwater assets can then be monitored and maintained by involved neighbors whose collective efforts to rescue a local stream or protect a watershed reinforce social capital by delivering results that people can see, touch and feel. Shared success builds community pride and reinforces the value of learning to work together.

In his classic book, *Bowling Alone: The Collapse and Revival of American Community*, Robert Putnam details four features of social capital that enable people to work together on a common cause. First, "social capital allows citizens to resolve collective problems more easily." Second, it "greases the wheels that allow communities to advance smoothly." Third, it "widen[s] our awareness of many ways in which our fates are linked." And, fourth, social networks act "as conduits for the flow of helpful information to achieve common goals." Experts distinguish between two types of social capital, bonding and bridging. Bonding social capital exists within a homogeneous community, while bridging develops between dissimilar communities. Putnam puts it memorably, "Bonding social capital constitutes a kind of sociological superglue, whereas bridging social capital provides a sociological WD-40."

Communities that invest in both bonding and bridging social capital are better at solving large, complex problems like climate change. Successful collective efforts require trust, shared values and norms and social networks. Trust is most important and depends on equity and fairness. But, social capital is undermined by poverty, inequality and environmental injustice.

Freshwater initiatives to benefit the most vulnerable communities should be especially careful to prioritize both natural and social capital in their design and execution. Freshwater non-profit and government agencies are well-equipped to do so. These organizations are trusted because of their public service mission to protect and restore the shared water resources of their community. They are also respected, thanks to technical knowledge they possess about how to sustain the hydrological commons in the face of climate change and other challenges.

Furthermore, their freshwater protection and restoration plans and projects can create engagement opportunities to bring people together across cultural divides. And these projects often deliver rapid, tangible and comprehensible results that reinforce the good feelings that come from accomplishing something together.

Freshwater groups also have much to gain from engaging their community in efforts to enhance climate resilience. As community members begin to see the many economic, ecological and social advantages of protecting and restoring their freshwater, they will be more likely to turn out for volunteer work days, support local ordinances for low impact development, and be less likely to waste or intentionally pollute water. Small-scale, distributed green infrastructure alternatives to large, single-purpose storm water or wastewater treatment plants are easier to build and maintain with the support of engaged neighborhoods and informed residents.

The positive feedback loop between freshwater-related natural and social capital can produce economic, technological, and social benefits for communities and regions.

Economically, ecosystem services provided by healthy hydrologic features and green infrastructure can reduce energy consumption, diminish flood damage, improve public health and save money on treating water-borne illnesses and lost productivity, as well as reduce the construction and operating costs of water-related infrastructure. This leaves more money for

other community priorities —and in people's pockets.

Technologically, green infrastructure depends upon and supports social capital. These nature-mimicking infrastructure projects are generally smaller and more localized than traditional water infrastructure projects. They offer multiple benefits to their community versus serving a single, and often unseen, purpose. As Milwaukee Mayor Tom Barrett testified to Congress regarding the social benefits of natural storm water infrastructure, "You can't hold picnic or a tailgate party on a Deep Tunnel." Green infrastructure is flexible and adaptive versus fixed and prescriptive, enabling projects to be adapted to a community's particular needs. And, these small scale, widely distributed projects offer ongoing opportunities for involvement in establishment, maintenance and monitoring.

Socially, time spent in nature makes us feel happier and more connected. Neurological research reveals a linkage between human well-being and natural environments, especially those with water elements. "In study after study, those who choose to spend time in nature speak about its ability to make us feel more connected to something outside of ourselves—something bigger, more transcendent, and universal…In another study, people who viewed nature scenes and imagined themselves fully immersed in nature were more concerned with prosocial goals and more willing to give to others."

Rivers and lakes provide attractive, close-to-home spaces where people can gather and relax. And freshwater restoration projects are especially valuable for building a community's social cohesion. "Designing experiences where people come to know each other, where they can expect to encounter one another repeatedly, and where the quality of life is increased for all if each individual thinks of himself as a steward" increases trust and collaborative skills.

That is why environmental justice activists are turning to their freshwater assets as a means of creating positive changes in their communities. For example, in Toledo, Ohio, a task force "is exploring ways to bring green infrastructure to disadvantaged areas…to help reduce threats and damage from flooding and water pollution and build home equity. [T]hese projects help address other community priorities, including reducing crime by turning vacant lots into community gardens, beautifying neighborhoods, and improving access to waterways. Community members work together to maintain green infrastructure, which supports local project ownership and community."

The city of Philadelphia's response to a problem plaguing cities across America – combined sewer overflows – illustrates the economic, technological and social benefits of tapping natural capital. Rainstorms regularly overwhelmed the capacity of combined storm and sanitary sewers and resulted in raw sewage being discharged to the Schuylkill River. A study done for the city detailed the "triple bottom line benefits" – ecological, economic, and social – of green versus traditional infrastructure solutions to the problem. Ecological benefits included water quality improvements and wetland creation. Economically, green infrastructure was cheaper to build and maintain and contributed to poverty reduction by providing local green jobs and energy savings. And, Philadelphians benefited from improvements in recreation opportunities, livability, heat stress reduction, and air quality.

A key challenge for freshwater organizing efforts is that "smaller is better" for tapping and building social capital, while freshwater problems generally require larger-scope solutions. A watershed approach can resolve this "dilemma of size and scope." Because every piece of land—whether urban, suburban or rural—resides in a particular watershed and because a

watershed is made up of nested drainage basins of smaller rivers and streams, the connectivity and scalability of freshwater hydrology can be used to link the concerns of communities up and downstream.

Another dilemma facing freshwater stewards is how to achieve social cohesion while prioritizing diversity and inclusivity. Ties that link dissimilar groups are harder to build, but ultimately more valuable. "Crafting cross-cutting identities is a powerful way to enable connection across perceived diversity." The common identity of living in the same watershed and depending on the same water resources and hydrological functions offers important opportunities for building bridges between different groups.

Freshwater organizations are well aware of upstream-downstream conflicts and the value of creating common cause to resolve them. As some have observed, "What they call an 'unfunded mandate' upstream looks like raw sewage downstream." Similar upstream-downstream conflicts can arise when there is too much or too little water. Increased awareness of impacts on trusted and valued neighbors downstream is an important benefit of strengthened social capital.

Whether the challenge is pollution, flooding or drought, engaging and working effectively with diverse populations within a watershed requires the ability to recognize, tap, build and sustain the social capital that binds people together in a common cause. Five basic principles can guide collective efforts to protect and restore freshwater resources and build a community's climate resilience:

- **Work with the most trusted members of a community.** Learn and honor their history and knowledge. Identify mutual concerns and shared values. Ensure equitable opportunities for community engagement and shared decision-making. Share resources and credit.
- **Prioritize diversity and inclusiveness.** An inclusive approach can increase the depth and range of knowledge available for problem-solving. To be successful in engaging diverse participants requires attention to chronic environmental justice concerns and other community problems that compete for time and attention.
- **Identify existing strengths and adaptive mechanisms for climate resilience, in both natural and social capital.** Especially for the most vulnerable neighborhoods in a community, these resources have been tested and refined over years of serving as their own "first responders" to natural and man-made disasters.
- **Build cohesion among the social networks that make up your community.** Focus on bridging diverse interests and finding common cause. Take small, tangible steps framed in terms of a larger vision, so that success will breed success. Ensure that participants are empowered to make choices and see them enacted in their communities.
- **Support visionary leaders.** Collective efforts require a special type of leader – one who has the ability to see the larger system and build a shared understanding of complex problems, to encourage reflective group dynamics that lead to appreciating each other's reality, and to shift the group's focus from reactive problem-solving to jointly creating a common future.

Finally, recognize that building climate resilience requires an integrated approach for both people and nature. Avoid focusing on a single scale or single outcome. Instead, think and act

at multiple scales and aim for win-win-win outcomes. Watersheds are well-suited to nested, connected solutions. Healthy freshwater ecosystems and green infrastructure are good at improving economic, ecological, social and political outcomes. And, freshwater organizations are most successful when they tap the synergy that flows between water-related natural and social capital to help communities become more resilient to climate shocks and stresses.

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GETTING REAL ABOUT RESILIENCE IN SOUTH BROOKLYN

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Beverly Corbin is disabled; she navigates the courtyard at Wyckoff Gardens—the South Brooklyn public housing complex where she lives—on a scooter. But that didn't stop her from mobilizing to help her neighbors when Superstorm Sandy hit in 2012. "I took hot meals to the building on my scooter," she said in an interview. "People would grab the meals and run up the stairs with them. I carried water on the front of my scooter."

Corbin's response to Sandy says a lot about the prospects for resilience in a changing climate. The challenges, of course, are huge. Corbin's neighborhood, like many low-income urban areas, is dealing with climate impacts layered on top of other, long-standing problems— poverty, industrial pollution, the legacy of racist housing policies. A map that charts geographic and social vulnerability shows that much of South Brooklyn is at serious risk for a Katrina-like disaster.

But Corbin shows us what the maps can't capture.

For one, her neighborhood has a tradition of community self-help, which was a lifeline after Sandy. When a 14-foot storm surge inundated South Brooklyn, some public housing residents went without water, heat, and electricity for more than two weeks. Corbin and her neighbors rallied to provide food, clothing and shelter to those in greatest need.

"It was an amazing community effort," says Karen Blondel, who lives in a Red Hook public housing complex. Blondel could have evacuated before the storm, but chose to tough it out so she could look after her elderly neighbors. "I just couldn't leave them," she said.

Nor do the maps show that South Brooklyn is home to some powerful organizers, like Corbin and Blondel, who are using the post-Sandy rebuilding process to make transformative changes in their neighborhoods. As public and private money flowed in after the storm, organizers launched an initiative called "Turning the Tide" to make sure that low-income public housing residents have a say in in how that money is spent.

"People try to come in and tell us what we need, and what we think," said Blondel, "but we're the experts."

Led by the Fifth Avenue Committee, Turning the Tide is a collaboration of the Red Hook Initiative, Families United for Racial and Economic Equality, and the Southwest Brooklyn Industrial Development Corporation, in partnership with New York City Housing Authority (NYCHA) . Its goal is to amplify the voices of low-income South Brooklyn public housing residents in implementation and policy decisions about environmental cleanup and climate adaptation.

Turning the Tide is working, first, to make sure that South Brooklyn's public housing residents weather the next storm. That means making needed changes to buildings—like moving mechanical equipment out of flood-prone basements and fixing leaky roofs. Importantly, it means ensuring that NYCHA's resilience and sustainability plans squarely address public housing residents' needs.

And the collaborative has taken on neighborhood-wide measures like an integrated flood-prevention plan that includes greenways and parks, deployable flood walls, elevated streets, improved drainage and more. It's also working to deal with the combined sewer overflows and former industrial sites that have long spilled raw sewage and coal tar waste into the Gowanus Canal during heavy rains.

But Turning the Tide recognizes that real resilience is not just about infrastructure and buildings; it's about people.

While the people of South Brooklyn drew on deep reserves of strength during Sandy, it's also true that poverty increases vulnerability to climate disaster. To reduce that vulnerability, Turning the Tide is working to lift South Brooklyn's public housing residents from poverty—by leveraging some $500 million in rebuilding for local workforce development and job creation.

For Karen Blondel, that means focusing on HUD Section 3, which requires that recipients of federal housing dollars (including NYCHA) draw 30 percent of new hires from the low-income communities they serve. Today, it's a rule that's mostly honored in the breach; contractors working on public housing projects get around the rule by simply not making any new hires. "Thirty percent of zero is zero," Blondel observes drily.

So Blondel and other activists pushed for a rule change that requires thirty percent of wages paid to go to local folks—and other measures to make sure public housing residents benefit from recovery spending. They found a champion in Rep. Nydia M. Velázquez (D-NY), who took their concerns to Congress—and continues to press for change.

While they are doing everything they can to fight poverty and build resilience, Corbin, Blondel and their neighbors know that adaptation has its limits. If greenhouse gas emissions are not curbed, and sea levels rise by more than six feet, much of South Brooklyn will be under water. So, Turning the Tide is also working to hold NYCHA – New York City's single largest landlord – accountable to mitigate climate change by reducing the carbon footprint of New York City's public housing, as part of a larger effort to reduce the City's emissions by 80 percent by 2050.

This includes plans to generate power with a "microgrid" that offers mitigation *and* adaptation benefits. Because it is powered by solar and other renewable energy sources, the microgrid will substantially reduce carbon emissions. And the microgrid can detach from the larger grid

in a crisis: that's how Co-op City, a housing complex in the Bronx, kept the lights on during Superstorm Sandy.

Turning the Tide is helping public housing residents prepare for the next storm—while also making climate disaster less likely. "Sandy laid bare the vulnerabilities that we all knew were present in our communities," says Michelle de la Uz, Executive Director of the Fifth Avenue Committee. But it also offers opportunities to transform those communities for the better. "By addressing our vulnerabilities collectively," says de la Uz, "we can 'turn the tide and create a more just, equitable, sustainable and resilient future for *all*."

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IF ROADS ARE GRIDLOCKED IN RUSH HOUR, WHAT HAPPENS WHEN DISASTER STRIKES?

Laurie Mazur is editor of the *Island Press Urban Resilience Project*, which is supported by The Kresge Foundation and The JPB Foundation.

I was late for an appointment, sitting in traffic on one of the major arteries out of Washington DC. It was miserable, barely moving traffic of the kind that makes you whimper with frustration as yet another green light turns yellow, then red, as you inch along.

Then I happened to notice a roadside sign that read: "Evacuation Route." And I tried to imagine fleeing from a major crisis – a terrorist attack, say, or climate-change enhanced superstorm – on a road that can't even handle the daily evacuation called "rush" hour.

Here in DC, we claim the worst traffic in the US. Non-apocalyptic events, such as the lighting of the National Christmas Tree or a couple of inches of snow, routinely induce gridlock. An ice storm or rare earthquake can mean commuters spending the night in their cars.

Washington may be an extreme case, but it is not alone. In many American cities, transportation systems are dysfunctional on a good day, much less in a crisis. In a world that is increasingly prone to extreme weather and other disruptions, our transportation systems may fail us when we need them most.

That's what happened when Hurricane Katrina slammed the Gulf Coast in 2005. Millions fled by car before the storm, creating monumental traffic and fuel shortages. But a quarter of New Orleans's residents, including many of the poorest and most vulnerable, did not have access to cars. More than 100,000 people were left in the city when the levees broke, creating a humanitarian disaster that took nearly 2,000 lives and displaced hundreds of thousands more.

Moreover, the sorry state of our nation's infrastructure (which has earned a grade of D+ from the American Society of Civil Engineers) means greater vulnerability to damage from climate and other disasters. When Superstorm Sandy came ashore in 2012, it flooded New York's subway system and submerged runways at La Guardia Airport. And the 2010 "superflood" in Tennessee and Kentucky destroyed highways and bridges; people drowned in their cars on the flooded interstate.

Our transportation systems are frustrating on a good day, and potentially deadly on a bad one. But what could a more resilient system look like? First, it wouldn't be all about cars.

"Dedicating all of our right-of-way to car movement leaves us in a very precarious position when there is a disaster," says Gabe Klein, author of *Start-Up City* and former transportation commissioner for DC

and Chicago. A "multimodal" system, which includes trains, buses, bike paths and ferries in addition to cars, will fare better in times of crisis and upheaval – and is, of course, much more equitable.

Such a transportation system requires an upgrade of our crumbling infrastructure with an eye to the new climate reality. According to Emil Frankel, who served as assistant secretary for transportation policy at the US Department of Transportation, many highways, rail lines and airports on the East and Gulf Coasts are in danger of being inundated by sea-level rise. That means planners must deal with those challenges up front. "Anticipating sea-level rise will add costs to projects," says Frankel, "but it costs less to build a bridge higher and stronger than it does to replace it after it's destroyed."

As we upgrade our ageing infrastructure, however, it's important to remember that hi-tech solutions aren't always the answer. Gabe Klein recalls that when Superstorm Sandy hit, New York City had upgraded some trains to a sophisticated IT-based dispatch system. "When the tunnels flooded, guess what?" says Klein. "Those trains were the ones that didn't work. It fried all the systems. The old electro-mechanical systems that hadn't been switched over were the only trains that ran."

Klein also notes the importance of "redundancy" in electronic systems. "I'm not going to name them," he says, "but there are systems – signal systems, critical infrastructure and even entire transit systems – that are completely unprepared and subject to one single point of failure. You have to have a lot of redundancy, so that all your information isn't subject to one massive server failure."

Money, of course, is a challenge – especially when Washington's political gridlock is as bad as its traffic. Frankel is not optimistic about the prospects for proactive federal funding: "We have a shortfall of over $2 trillion to bring the nation's infrastructure to a state of good repair — and that does not include the cost of also making it resilient."

The federal government steps in only after a disaster, with FEMA emergency funds. But while regulations state that those funds must be used to "build it back to what it was", in fact the feds "are now allowing states, localities and transportation authorities to rebuild to higher and more resilient standards with FEMA money," Frankel says.

Still, with all the immediate needs facing cities today, it is difficult to muster funds to prepare for crises that may or may not occur. That's why we need a new way of thinking about resilient transportation, says Sue Zielinski, who runs SMART – a transportation thinktank at the University of Michigan.

"Resilience is not just something we do in case something terrible happens," Zielinski says. "It's about creating the kinds of places we want to live in that work for us in good times and bad."

Many of the qualities that define a resilient transportation system – robust infrastructure, many ways to get around, access for all – would also make our cities better places to live. And by shifting the focus away from cars, we will also reduce our carbon emissions and slow the advance of climate change. The best way to weather a disaster is to make sure it doesn't happen in the first place.

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BOUNCE FORWARD: BUILDING RESILIENCE FOR DANGEROUS TIMES

Laurie Mazur is editor of the *Island Press Urban Resilience Project*, which is supported by The Kresge Foundation and The JPB Foundation.

When Superstorm Sandy came ashore in 2012, thousands of New Yorkers were plunged into what seemed like an earlier century. No lights. No heat. No refrigeration. No elevators. On the upper floors of high-rise apartment buildings, the taps went dry and toilets would not flush.

For the poorest New Yorkers, this went on for weeks. Less than a mile from the seat of global capitalism where stock traders were back at work soon after the storm, residents of public housing rifled through dumpsters full of discarded food looking for something to eat.

Sandy was many things: a disaster that cost hundreds of lives and billions of dollars, a wake-up call on climate change, and a reminder of the fragility of the systems that hold our civilization together.

It is a reminder we would do well to heed. We live in a time of wrenching change and widening inequality; of growing vulnerability to disaster. The good news is that there is much we can do to make our communities stronger, fairer, and more resilient. That does not, however, mean "bouncing back" to the status quo that got us into this mess in the first place. Instead, it means bouncing forward to a world that is more sustainable and just.

The New Normal

It's safe to say that we've never been here before. While change is a constant in natural and social history, the pace, scale, and impact of change today is utterly without precedent.

Part of that change is environmental, reflecting our wholesale transformation of the natural world. Over the last half century or so, human beings have altered the planet's ecosystems more than in all of previous history combined—clearing forests, diverting rivers, replacing the riotous diversity of nature with uniform monocultures. Those changes have improved the lives of many, but they have weakened nature's ability to protect and sustain us in the long term.

Most ominously, we are changing the climate. Through industry, agriculture, and the business of daily life, humans have increased the carbon dioxide in the atmosphere by 40 percent above pre-Industrial Era levels, trapping heat and warming the planet. The impacts are increasingly

visible: in monstrous storms and devastating droughts, in spiking food prices, and wrecked infrastructure. Climate-related disasters in North America have nearly quintupled since 1980.6

On our altered planet, the past is no longer a reliable guide to the future. Temperature records are broken on a regular basis and "hundred-year storms" arrive every few years. October 2015 was the warmest in recorded history by a wide margin—a record that may be broken again by the time you read this. And 2015 is shaping up to be the warmest year ever.

As the planet warms and climate disasters multiply, there are more people in harm's way than ever before. The global population has tripled in the last hundred years, with most of that growth taking place in coastal areas that are exposed to rising sea-levels.

At the same time, our world is rocked by enormous technological and social changes. More than any previous generation, we are connected by dense global networks of commerce and communication. Those networks can accelerate the spread of innovation, information, and opportunity, but they can also spread disaster. For example, the financial crisis that began in 2007 was triggered by risky mortgage lending in the United States, but in an interconnected global economy, its impacts continue to reverberate around the world. Other threats—from Ebola to terrorism—can easily hop a plane and go from local to global overnight.

The complex systems that keep our lights on and our refrigerators full would have dazzled our agrarian ancestors—but they are surprisingly vulnerable. For example, Big Food's globe-spanning supply chains are easily disrupted and its vast monocultures susceptible to drought and disease. The electrical grid is ridiculously fragile. According to the Federal Energy Regulatory Commission, if saboteurs or disaster were to destroy just nine substations and one transformer manufacturer, "the entire United States grid would be down for at least 18 months, probably longer." A massive solar storm, similar to one that occurred in 1859, could take down the grid and interfere with essential electronics—putting the world as we know it on indefinite hold.

In the face of these new and sobering risks, all people are not equally vulnerable. That's because we live in an era of stark and growing inequality. The richest one percent of the world's population lays claim to 46 percent of the world's wealth; the bottom half—some 3.5 billion people—together possess less than one percent of global assets. Not surprisingly, the poor bear the brunt of climate and other disasters. In this unequal world, the affluent seize opportunities and shield themselves from harm, while the poor face greater risks with fewer resources. These dynamics are self-reinforcing: the rich get richer while the poor fall farther behind.

Defining Resilience

In these turbulent times, the concept of "resilience" has growing appeal. Lately it's been the subject of serious books and breezy articles, of high-minded initiatives and countless conferences. After Sandy, it was triumphantly plastered on city buses, declaring storm-ravaged New Jersey "A State of Resilience."

But what is resilience, exactly? Recently, Island Press—a nonprofit that provides ideas and information on environmental problems and solutions—set out to answer that question. To that end, we reviewed relevant literature in the natural and social sciences and interviewed dozens of scholars, activists, and practitioners. Based on that inquiry, we define resilience as "the capacity of a community to anticipate, plan for, and mitigate the risks—and seize the opportunities—associated with environmental and social change."

Resilience is an idea with potentially transformative power. The need to protect our communities from climate impacts and other threats asks us to rethink the systems that supply our basic needs. It asks us to live within planetary limits and to avoid further destabilizing natural systems. It asks us to eradicate the inequities that magnify vulnerability to disaster, and to distribute opportunities more fairly—so that all people have a chance to adapt and thrive in a fast-changing world.

But the transformative potential of resilience is far from assured. Too often, resilience is defined narrowly as a community's capacity to "bounce back" after a disaster. For example, the self-declared "State of Resilience" rebounded after Sandy by building even *bigger* houses on the Jersey Shore. Bouncing back to a status quo that degrades the environment, increases greenhouse gases, and widens inequality will only make us more vulnerable in the longer term.

Here, we offer an alternative path—a framework for communities to consider as they endeavor to become more resilient to the shocks and surprises of the future. This framework is neither definitive nor universal; it is best seen as a jumping-off point for communities to begin their own conversation.

Ask–Analyze–Act

ASK	ANALYZE	ACT
Resilience of what? • What do we need? • What do we value? **Resilience to what?** • Hazards • Environmental/ social changes **Resilience for whom?** • Who is vulnerable? • Who decides?	**Is it:** • Diverse • Redundant • Modular **Does it have:** • Tight feedbacks **Does it promote:** • Social capital • Agency • Equity • Inclusiveness • Innovation	**Persist** • Protect/restore system in current form **Adapt** • Modify system to increase resilience **Transform** • Replace with more resilient system

The process of building resilience is not value-neutral; decisions about what to protect and strengthen reflect deeply entrenched values and power structures. Should public funds be used to build seawalls around Wall Street or to put solar panels on a housing project? The first step is to ask what in the community must be strengthened, against what threats or changes, and for whose benefit.

The next step is to ***analyze*** the systems that supply a community's needs. Resilient systems and communities have certain characteristics in common:

- **Diversity**: A system with diverse components will have a wide range of responses to change and is therefore unlikely to fail all at once. This is why a healthy, mixed forest is less

vulnerable to fire or disease than a tree farm. Similarly, a city with a diverse economic base is less vulnerable to economic upheaval than one that relies on a single industry.

- **Redundancy**: A resilient system has multiple ways to perform basic functions, so that the failure of any one component does not cause the entire system to crash. For example, a multimodal transportation system that includes a variety of public transit options as well as opportunities for walking and bicycling will weather disruptions better than a system that relies wholly on automobiles.

- **Modularity**: Modular systems that can be self-sufficient when disconnected from larger networks will fare better in times of change. For example, people living in a city with a robust local food culture (nearby farms, a farmer's market) will be less likely to go hungry if there is a disruption in national or global supply chains. Modularity allows a community or system to manage its connectivity to larger regions and the world; it is a way to guard against "contagions" from a hyper-connected, globalized economy.

- **Tight feedbacks**: A resilient system has tight feedbacks, allowing it to quickly detect changes in its constituent parts and respond appropriately. If a reservoir is low, for example, water conservation measures may be put in place. But in today's globalized economy, consumers may be thousands of miles away from the source of resources on which they depend—so feedback loops go slack. Inequality also weakens feedbacks, as affluent communities routinely outsource production and pollution to poorer ones.

- **Social capital**: For an individual, social capital is about relationships with family, friends, and colleagues. In communities, social capital can be measured by levels of trust, cohesion of social networks and the quality of leadership. In a disaster, social capital can literally mean the difference between life and death. Resilient communities build social capital with public spaces that encourage interaction and with traditions and institutions that enable neighbors to help one another.

- **Agency**: Resilient people have a sense of control over their destiny; resilient cities fully engage their citizens in decision making. Fundamentally, agency is about power: personal and political. Strategies to build agency include community organizing, education, public health and society initiatives, and civic engagement.

- **Equity**: Equity means that opportunities—and risks—are equally shared. It is a building block of social cohesion—the sense that "we're all in it together" that enables communities to cooperate in times of disaster. And equity improves performance on a broad range of human development indicators—physical and mental health, public safety, social capital—that form the bedrock of individual and community resilience.

- **Inclusiveness**: Inclusive social institutions—economic, political, and cultural—can strengthen resilience at every level, by increasing social capital, agency, and equity. In an inclusive society, power and opportunity are shared broadly, not concentrated in the hands of a few. Inclusive governance has practical benefits. For example, it tightens feedback loops so that problems are more readily detected, and it expands the depth and diversity of knowledge available for problem solving.

- **Innovation**: A resilient system generates novel responses while learning and adapting to changing conditions. In nature, this is accomplished by evolution. In human society, it

requires innovation—the ability and willingness to try new things. The capacity to innovate derives from the qualities described above. A diverse system generates more novelty than a monoculture; in social systems, innovation often comes from the margins. An inclusive society is better able to engage the agency and creativity of all of its citizens. And tight feedbacks provide timely and accurate information about changing conditions, which is essential for appropriate innovation.

Finally, communities must act by protecting, restoring, adapting—and, if necessary, transforming—the systems on which they depend. Building resilience in complex systems may require all of the above.

Take, for example, the electrical grid, which, as noted above, is staggeringly vulnerable to disruption. A more resilient grid requires *persisting*—urgent action to protect vulnerable links in the chain. It also requires *adapting*—measures to make the grid more redundant and modular, as some are doing now. For example, Co-Op City, a housing complex in the Bronx, kept their lights on during Superstorm Sandy with a microgrid that disconnected temporarily from the larger system. But ultimately—given the limited supply and disastrous climate effects of fossil fuels—the existing electrical grid must be *transformed* to one that relies instead on a diverse array of renewable power sources.

Resilience requires a holistic view: focusing myopically on the system at a single scale, or managing for a single outcome, is likely to yield surprises from unanticipated feedbacks. So managing resilient communities begins with an understanding of systems and their functions at many scales, from many perspectives. And, it calls for a certain amount of humility; an admission of what we cannot know.

To avoid a narrow focus, interventions to build resilience can try to solve more than one problem. For example, energy efficiency in affordable housing can help low-income people save money on utilities. It also makes homes more habitable during power outages, so that residents can shelter in place during a disaster. And it reduces energy usage, mitigating climate change and improving air quality and public health.

There are many other such win–win solutions. For example, the Evergreen Cooperatives of Cleveland are employee-owned, for-profit companies—laundry services, urban farms, and renewable energy—whose green jobs pay a living wage and enable workers to build equity. Because Evergreen is linked to the supply chains of the city's anchor institutions, it helps keep financial resources in the community. Evergreen builds resilience by protecting workers from the vicissitudes of the global economy and also by protecting the ecosystems on which the city depends.

Bounce Forward

Facing an unknowable future, we can build resilience with win–win strategies like distributed, renewable energy; local food; and greater social equity. These strategies will help protect our communities from a broad range of disruptions, and help create a world that is more sustainable and just.

Resilience, in essence, is about strengthening our connections to the natural world and to one another. We may live in cities, divorced from nature, but we are not exempt from nature's laws. To survive and thrive in these disruptive times, we need to reconnect to the values that enabled

our species to overcome hard times through the millennia.

Those values were out in force after Superstorm Sandy, when "Occupy Sandy" mustered volunteers to provide food, clothing, transportation, generators, and other vital assistance to storm victims. One Occupy supporter summed up the group's philosophy: "We're all in this

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GOT FOOD? HOW LOCAL FOOD SYSTEMS CAN BUILD RESILIENCE FOR TURBULENT TIMES

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Consider, for a moment, that lettuce leaf on your plate. It probably traveled a long way to get there—about 1,500 miles, on average. In fact, your dinner has probably seen more of the world than you have: the average American meal contains ingredients from at least five countries outside the United States.

The complex, globalized system that puts food on our plates is a technical and logistical marvel, delivering unprecedented quantities of food at historically low prices.

But that system is surprisingly fragile. Its globe-spanning supply chains are easily disrupted and its vast monocultures are vulnerable to drought and disease. And, because the system is entirely dependent on fossil fuels, it is subject to the shortages and price swings that afflict those commodities.

New Yorkers got a firsthand look at the fragility of the food system when Superstorm Sandy pummeled the city in 2012. Days after the storm, trucks were still stranded on roadsides, unable to make deliveries. Some grocery stores saw their stocks destroyed by the storm surge; others lost power and trashed their perishable goods. Thanks to "just-in-time" supply chains that kept inventories to a minimum, shortages set in quickly. As a result, hungry New Yorkers stood in line for hours, waiting for emergency supplies of food and water.

Most New Yorkers weathered those shortages, and a massive crisis was averted. Still, Sandy should serve as a wake-up call. In the era of climate change, our cities will face more monster storms, floods, and other extreme weather events. At the same time, a wide range of natural and human-made crises—from epidemics to terrorism—have the potential to bring our food system to its knees.

In these turbulent times, we need to make our food supply systems more resilient. Producing and distributing food on the local level could help us weather disruptions of all kinds.

Local food systems have taken root across the country in recent years, with a proliferation of farmers' markets, community-supported agriculture, and farm-to-table restaurants. There were more than 8,000 farmers' markets across the U.S. in 2014, up 180 percent since 2006. Locally marketed food topped $6 billion in sales in 2012.

As food author and activist Michael Pollan has observed, those smaller-scale local and regional food systems are better able to withstand shocks than their massive, globalized counterparts. And because they are decentralized, local food systems offer less tempting targets to terrorists and saboteurs.

Local food systems support the resilience of people and communities in other ways as well. Because it travels shorter distances, locally grown produce is able to conserve nutrients better, making it more nutritious. It also tastes better, which encourages people to eat more of it. Better nutrition means better public health—a cornerstone of disaster resilience.

And, while farmers growing for a global market must choose varieties that are uniform and ship well (hence the tasteless square tomatoes found in supermarkets year round), those growing for a local market can choose varieties for their nutrition and taste. The greater crop diversity found on local farms means more nutritional diversity for consumers and more resilience to pests and drought.

Local food systems also generate more jobs than conventional agriculture leading to increased economic resilience for communities. The U.S. Department of Agriculture found that produce growers supplying local and regional markets generate 13 full-time jobs for every $1 million earned, compared to just three jobs per $1 million for farms that do not serve local markets.

Finally, by reducing the miles between farm and fork, local food systems limit greenhouse gas emissions. Food systems account for between 19 and 29 percent of emissions worldwide. Reducing the carbon footprint of agriculture would go a long way toward mitigating climate change, which poses mounting threats to global food security. Preventing the worst effects of climate change is a better resilience strategy than trying to adapt after it's already occurred.

So, local food makes all kinds of sense and is growing in popularity. But food grown for local markets still accounts for only 1.5 percent of U.S. agricultural production. That's because the mostly small farmers who sell their produce locally struggle to compete with industrial farms whose economies of scale, hefty public subsidies, and sheer domination of the market enable them to sell their food more cheaply.

But with effort, those challenges can be overcome. One effective strategy is to create local "food hubs" that aggregate locally sourced food to meet demand. These collaborative enterprises enable small farmers to access wholesale, retail, and institutional markets they couldn't reach on their own. This strategy is catching on: the number of food hubs across the U.S. grew nearly threefold between 2007 and 2014.

Communities can help by nurturing vibrant local food systems. For example, citizens in Placer County, California—a rapidly suburbanizing area with a rich agricultural heritage—took action to sustain nearby farms. They created an agricultural marketing organization called PlacerGROWN

that launched farmers' markets, festivals, and fairs featuring local produce, meat, and wine. PlacerGROWN educates the public about the benefits of local food and forges connections between the community and farmers. As a result, much of the county's best farmland has been protected from development, and in 2007, the county's farms, ranches, and vineyards generated almost $60 million worth of agricultural products.

Others are bringing the farm to the city. In Milwaukee and Chicago, a group called Growing Power, Inc. has built state-of-the-art greenhouses in urban food deserts, engaging people from low-income communities in the production of nutritious food. In Cleveland, the worker-owned Evergreen Cooperatives manage a sprawling greenhouse that provides jobs and fresh produce in an impoverished neighborhood.

The scale of these efforts remains small, but history shows that local food production can ramp up quickly when it needs to. During World War II, Americans planted "Victory Gardens" to help the war effort and produced 40 percent of the vegetables grown in the U.S. More recently, when food prices spiked in 2008—touching off riots around the world—many Caribbean countries invested in local agriculture to reduce reliance on imported food. It worked: today Antigua and Barbuda produce nearly half of their own food, up from only 20 percent in 2009.

There are many reasons to embrace local food: it's healthier, it tastes better, and it's better for the planet. Here's one more: it can make us more resilient, in good times and bad.

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AFTER DISASTER, TACTICAL URBANISM BUILDS RESILIENCE

Mike Lydon is Principal of The Street Plans Collaborative and co-author of *Tactical Urbanism: Short-term Action for Long-term Change*

When two major earthquakes hit Christchurch, New Zealand in 2010 and 2011, this coastal city of 400,000 was all but destroyed. What remains—historic facades propped up by shipping containers, buildings crumbling in on themselves, razed blocks covered in well-mowed grass— looks as though multiple post-apocalyptic movie sets were placed side by side.

But, walking around post-disaster Christchurch, it becomes clear that the earthquakes also shook loose a deep reserve of creative talent. Soon after the quakes, activist groups like Gap Filler and Greening the Rubble began developing temporary projects designed to bring community life, joy, art, and commerce back to the decimated city center.

In this way, Christchurch has become an epicenter of tactical urbanism – a strategy that harnesses the ingenuity and spirit of communities to improve city life. Tactical (also called emergent, adaptive, and user generated) urbanism deploys a broad range of short-term, low-cost, scalable interventions. It is audacious—breaking through the gridlock of planning processes and responding to city-dwellers' needs in real time. City dwellers around the globe are using these strategies for everything from guerilla wayfinding to pop-up retail and DIY traffic calming.

And, as I learned on a recent trip to Christchurch, tactical urbanism really shines in times of crisis. As I toured the city, I got to see the stunningly simple Cardboard Cathedral, built as a temporary replacement for the city's badly damaged 19th-century cathedral. I lingered in a community gathering space called The Commons, which until recently included the Pallet Pavilion, a venue for live music constructed entirely of wooden shipping pallets. Throughout the city, I encountered community gardens, bike repair kiosks, container markets, streetscape installations—and even a mini-golf course spread out across the rubble. What struck me about these projects was their variety, but also their human scale, use of recycled material, and their "world made by hand" aesthetic.

Developed by artists, organizers, academics, developers, small business owners—and yes, even architects and planners—small-scale projects emerged as the dominant paradigm for remaking the city while the Crown government got its house in order. Together, these projects proved that social networks could mobilize faster than any government agency (though the city's local government deserves much credit, for investing in grassroots groups and giving them wide berth.)

What has transpired in Christchurch over the past four years is nothing short of remarkable.

These projects have mobilized the ingenuity of the city's people. They created precedents for open and participatory city planning. And importantly, they helped the city heal by bringing people together—drawing residents and visitors back into the physical and cultural heart of the city.

In this way, tactical urbanism has also made the city more resilient. An emerging body of literature shows that resilient cities are characterized by innovation, participatory governance, and strong social ties—all of which are celebrated and strengthened by tactical urbanism.

Today, as Christchurch begins to rebuild in earnest, the fate of its quirky, post-disaster projects remains unclear. The City and the Crown-appointed rebuilding authority (CERA) are moving forward on a recently completed master plan. Dollars—big dollars—are flowing into the city, as evidenced by the half dozen cranes and roadwork projects seen around nearly every corner.

While the cranes and construction crews are a welcome sight in this battered city, let's hope they don't signal a return to the *status quo ante*. In the wake of disaster, the people of Christchurch mustered great creativity and solidarity—building their own resilience and that of their city. In a century that promises many shocks and surprises—from extreme weather events to financial crises and terrorism—that resilience will serve them well. And we have much to learn from their response to an extraordinary challenge.

Perhaps the work they accomplished has served its initial purpose, as an effective transition between what was and what will be. But maybe, just maybe, the upstart energy of tactical urbanism can be married to well-considered financial capital, and something altogether transformative will emerge and be sustained. We're all watching.

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Are you working to improve your community? Have ideas about building a world that is sustainable and just? Consider collaborating with URP. We can help you hone your ideas and get your message out to audiences that matter. Contact resilience@islandpress.org for more information.

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