Managed retreat increasingly seen as necessary in response to climate change's fury

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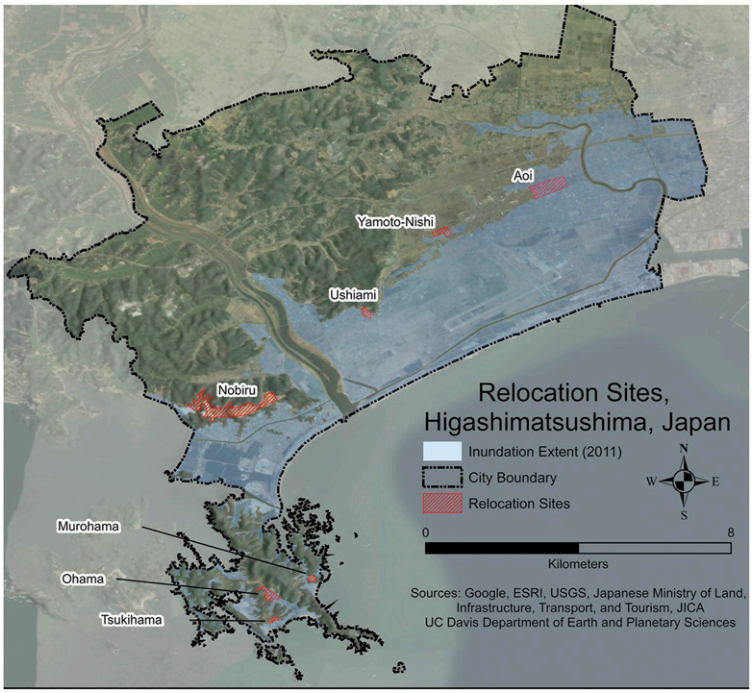
As climate change causes seas to rise and fuels ever-stronger storms and droughts, humanity faces a stark choice. Communities can seek shelter from rising waters and battering storm surges by building fortifications such as the sea walls planned in Boston or Miami. Or people can figure out how to live with the new climate reality, such as by perching homes on 10-foot stilts on the North Carolina coast to stay high and dry above surging storm waves. Or they opt for a third option that's increasingly getting attention: "managed retreat" away from the problem area. Managed retreat is "the purposeful, coordinated movement of people and assets out of harm's way," according to assistant public policy professor A. R. Siders of the University of Delaware's Disaster Research Center in Newark, who's an expert on the topic (1).

Although moving a group of people is not a new concept, managed retreat presents numerous complex challenges—legal, logistical, ethical, political, financial, and architectural. Communities, and community cultures, aren't easily transported and retained. But all indications are that researchers, policymakers, and the general public will need to confront these challenges with increasing frequency in the coming decades.

Historic Retreat

Simply retreating to higher ground in the face of nature's fury is hardly new. Prehistoric tribes regularly packed up settlements along riverbanks when periodic floods struck. In modern times, the earliest well-documented relocation of an entire town in the United States dates back to 1881, says geologist and flood

In 2016, Louisiana won a $48 million federal grant to resettle the roughly two dozen families from Isle de Jean Charles to a site 40 miles north. Most of the isle has vanished under the waters of the Gulf of Mexico. Image credit: Shutterstock/ Andy Levin.



In the wake of the 2011 tsunami, Japan planned several new towns outside of the inundation zone, which would be increasingly vulnerable with climate change. For example, the city of Higashimatsushima began building seven all-new communities for displaced residents. Image credit: Reprinted by permission from ref. 6, Springer Nature: Natural Hazards, copyright (2019).

risk expert Nicholas Pinter of the University of California, Davis. Residents of Niobrara, Missouri, used oxen and horses to pull their buildings a mile and a half to higher ground after a major flood. Since then, some two dozen communities in the United States, including Niobrara again in 1971, have pulled up stakes to head for safer terrain. And as far back as the 1940s, Gilbert White, known as the "father of floodplain management," included relocations (or abandonment of vulnerable areas) among his key "adjustments" for reducing risks from floods—part of a pioneering strategy to anticipate and reduce threats from all sorts of natural hazards (2).

It is not unprecedented to force or entice people to relocate, as when urban neighborhoods were demolished to build interstate highways or when homesteaders were lured out to the American West in the late 1800s. "We have moved people around this country for a long, long time, sometimes with a carrot and sometimes with a stick," says Mark Davis, professor of river and coastal studies at Tulane University in New Orleans, LA, and director of the Tulane Institute on Water Resources Law and Policy.

So what's different now? Put simply, climate change. Sea levels could climb as much as six feet or more by century's end (3), inundating hundreds of coastal cities, and intense storms and floods, heat waves, and wildfires are already striking communities around the globe. Unlike in the past, the number of people who will be forced to move is likely in the hundreds of millions—more than 300 million globally by 2050 just from sea level rise alone—according to new, more precise measurements of land heights that show that more people than previously thought are living just a few feet above sea level (4). To meet that staggering challenge, the historical pattern of relocations—typically just a few homes at a time, largely *ad hoc*, and almost invariably after a disaster has left a trail of damage and destruction—is woefully inadequate, researchers say. Relocations now and in the future must be many orders of magnitude larger in number and size, and, ideally, proactive rather than reactive. That means "a tremendous increase in the need for managed retreat," says Pinter.

Already, governments have floated ambitious plans. Indonesia has proposed moving its capital to Borneo Island, because up to one-third of Jakarta could be underwater by 2050. The low-lying Pacific island nation of Kiribati has bought land in Fiji to allow a future migration. In 2016, Louisiana won a $48 million federal grant to resettle the roughly two dozen families on Isle de Jean Charles, 98 percent of which has vanished under the waters of the Gulf of Mexico, to a site 40 miles north (5). And Japan is spending $265 billion to build at least nine new towns after the 2011 tsunami that destroyed 400,000 structures and displaced a half a million people (6). Although climate change did not spur the move, it does make these hard-hit areas increasingly vulnerable.

Politically Perilous

In a world where building levees and walls for protection has always been the clear preference, "the conversation about managed retreat is just beginning," says Siders. But it's rapidly gaining steam. In 2018 and early 2019, the Georgetown Climate Center held four meetings on managed retreat (in Miami, Long Beach, Boston, and Washington, DC) with more than 300 state, federal, and local government officials, academics, and other experts to pinpoint effective policies and strategies. In July 2020, the Center will release a report with 17 case studies, lessons learned, and a tool kit for action (7). In June 2019, more than 400 researchers, city leaders, industry reps, and others gathered at Columbia University's Earth Institute in New York for what was billed as the first major academic conference on managed retreat (8). And at the University of Delaware, Siders has studied buyouts of more than 40,000 properties funded by the Federal Emergency Management Agency (FEMA) since 1989, most in small actions of 5–10 homes at a time. The new focus is urgently needed, says Jason Thistlethwaite, weather and climate change risk expert at the University of Waterloo in Ontario, Canada: "We simply can't keep building walls big enough to protect us from these hazards."

All of these new studies and meetings show, however, that "retreat is hard to do and even harder to do well," write Siders and co-authors in a recent article published in *Science* (9). After a flood or other natural disaster, the typical response has always been to simply restore what had been there: A home in Mississippi worth only about $70,000 has been rebuilt or restored 34 times in 32 years, for example, at a cost of

$663,000 in federal tax dollars (10). "Sadly, our experience is that people only move when forced to, or often not even then," says Pinter.

Pushing for managed retreat can be politically perilous as well. At recent meetings, environmental justice advocates and tribal leaders voiced fears of repeating the dark history of past relocations in the United States, including forced marches on the "Trail of Tears" that drove tens of thousands of Native Americans from their homes in the American Southeast in 1830s. The White House of President Barack Obama considered trying to develop a national strategy for managed retreat, but the idea of large-scale relocations was politically unpalatable, recalls Alice Hill, former special assistant to Obama and senior director for resilience policy on the National Security Council. "It is like a third rail."

Fraught Plans

Indeed, moving an entire community out of harm's way, while keeping its culture and cohesiveness intact, is extraordinarily difficult. Consider the example on everyone's short list of success stories—the Illinois town of Valmeyer. Located about 30 miles south of St. Louis on the Mississippi River, Valmeyer flooded in 1943, 1944, and 1947 before the US Army Corps of Engineers stepped in to build higher levees (11). In the great Midwestern flood of 1993, those levees failed. As torrents of water ripped through homes, "it was clear that many of the folks had had all they wanted from flooding," recalls then-mayor (and current village administrator) Dennis Knobloch. "But they also wanted to keep the town together."

With Knobloch leading a community-wide effort for what was then called "planned relocation," Valmeyer was able to buy a 500-acre farm on a bluff 400 feet higher just a mile and a half away and navigate through the often-conflicting rules and requirements of 26 different state, federal, and local agencies for funding and permits. Plus, the town was able to keep its K–12 school system going in temporary quarters for the three years it took to relocate, "and the three churches never missed a week," says Knobloch. "Keeping the institutions alive and well enabled us to turn a cornfield into a town."

Yet not everyone relocated to New Valmeyer. Two hundred fifty of the original 900 residents dispersed to different towns, and 50 more stayed behind in the floodplain. More concerning, local businesses, including a cherished grocery store that had lured customers all the way from St. Louis to buy meat products, couldn't survive the three years of transition. Valmeyer has now grown to 1,300 residents, "but we're still struggling to get businesses up and running," says Knobloch.

And for every success story like Valmeyer, there are countless failures where efforts are tripped up by barriers and pitfalls. For a coastal town, abandoning waterfront property can mean taking a huge hit to the tax base and the pocketbooks of property owners. So when the California Coastal Commission asked the San Diego-area town of Del Mar to consider a managed retreat plan for its vulnerable beachfront community,

Repeated flooding in Valmeyer, IL—most recently during 1993's great Midwestern flood—prompted a community-wide effort to relocate the town to a 500-acre farm on a bluff a mile and a half away. Image credit: St Louis Post-Dispatch/ Polaris.

city officials declined. They'd rather bet on an expensive beach replenishment scheme aimed at protecting property values (12).

Opposition can take other forms as well. After land was purchased in early 2019 to move about 30 families in the Biloxi-Chitimacha-Choctaw Tribe off of the sinking Isle de Jean Charles, some tribal members balked at the resettlement plan. In another case, when the state of Louisiana tried to buy undeveloped land to move about 40 predominately African-American homeowners from Pecan Acres, which had flooded at least 17 times since the 1970s, to a nearby town in 2018, the sale was blocked by the largely white town, on the grounds that the move could cause property values to decline.

And if finding a new spot for 40 Louisiana families is difficult, imagine a future in which millions of people fleeing rising seas or searing heat need new homes. Where will they go? "To me, the missing piece of managed retreat is where is the receiving community?" says Tulane's Davis. "Few people are thinking about that."

Strategic Moves

What they have begun to think about are strategies for encouraging or requiring managed retreat. In Canada, for example, there's growing anger at the cost and futility of rebuilding the same flooded houses over and over, says Thistlethwaite. In the wake of 100-year floods in 2017 and 2019 in Gatineau, a city across the Ottawa River from Ottawa, the government is telling people that they must leave if damage to their homes is more than 50% of the value (up to a value of $200,000). It's also capping buyout payments at $250,000 regardless of market value. Gatineau will be "the prime test case" of this new approach, says Thistlethwaite. He notes that in Canada, in contrast to the United States, "there's less emphasis on defending individual property rights when it is clear that doing so puts a greater burden on the community."

Governments and researchers are also turning to other tools, such as restricting development in risky areas. For example, Kaua'i, HI, requires that new buildings be set back at least 40 feet from the expected shoreline (with climate change) 70 or 100 years from now (13). Rhode Island is experimenting with issuing permits for new coastal property development that include "triggers" forcing the structures to be removed if the sea comes too close. And recently introduced New Jersey legislation would require builders to take climate change and sea level rise into account to get government approval for projects. Overall, a national policy that withdraws disaster support for development in risky areas would be "huge," says Hill.

Governments could also provide incentives for relocation, such as by helping to create jobs in safer regions. "I somewhat jokingly talk about moving Wall Street to Albany," says Siders. "The response is dumfounded silence, but at 60 feet of sea level rise, New York City will move." In fact, discussions about whether it's still possible to continue living in many risky areas already are "happening around the dining room table," says Davis, as families face challenges such as rising flood insurance costs, the loss of cherished churches or local businesses, or the growing chances of suffering from future floods.

Ultimately, researchers hope, countries and communities will come to see retreat from climate change's impacts as not just a problem to be solved, but also as a chance to build a better future.

One way to underscore that message, they suggest, may be to replace the term "managed retreat," which evokes a sense of defeat and which few in the field like. They are thinking about more positive and proactive terms such as "strategic relocation," "planned relocation," "strategic advance," and "aggressive resilience."

But whatever the name, contemplating the movement and rebuilding of communities well in advance has its upside. Says Siders, "It is such an opportunity to redesign the way we live with nature and with floods, and completely change how we deal with risk."

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