

As Climate Shocks Multiply, Designers Seek Holy Grail: Disaster-Proof Homes

The homebuilding industry has been slow to adopt changes that can better protect against extreme weather. Some architects are showing what’s possible.



By Christopher Flavelle

Christopher Flavelle, who has long covered the intersection between climate shocks and the homebuilding industry, reported this story from Washington.

July 16, 2023

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Jon duSaint, a retired software engineer, recently bought property near Bishop, Calif., in a rugged valley east of the Sierra Nevada. The area is at risk for wildfires, severe daytime heat and high winds — and also heavy winter snowfall.

But Mr. duSaint isn’t worried. He’s planning to live in a dome.

The 29-foot structure will be coated with aluminum shingles that reflect heat, and are also fire-resistant. Because the dome has less surface area than a rectangular house, it’s easier to insulate against heat or cold. And it can withstand high winds and heavy snowpack.

“The dome shell itself is basically impervious,” Mr. duSaint said.

As weather grows more extreme, geodesic domes and other resilient home designs are gaining new attention from more climate-conscious home buyers, and the architects and builders who cater to them.

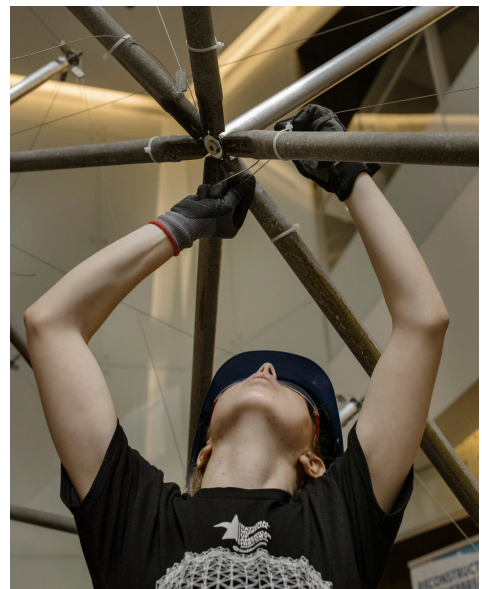
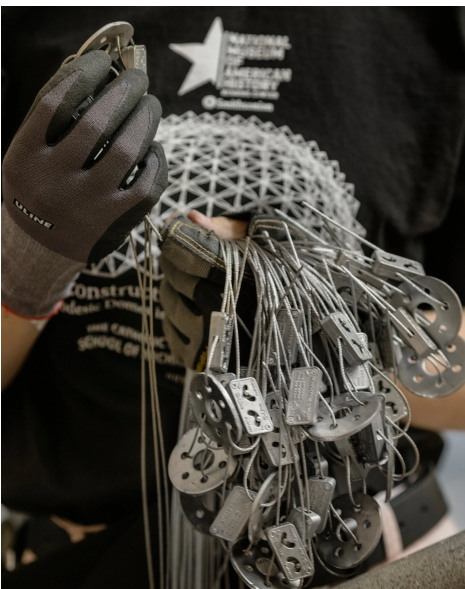
The trend could begin to dislodge the inertia that underlies America’s struggle to adapt to climate change: Technologies exist to protect homes against severe weather — but those innovations have been slow to seep into mainstream homebuilding, leaving most Americans increasingly exposed to climate shocks, experts say.

The result isn’t just greater risk of death or injury, but also financial calamity, as homeowners struggle with declining property values, an inability to get insurance, or the loss of what is often their most valuable asset. And the emotional and social toll of losing homes to disasters is only beginning to be understood.

Weather-related disasters pushed more than 3.3 million American adults out of their homes in 2022, census data shows. Of those, at least 1.2 million people were out of their homes for a month or longer; more than half a million of them never returned, fueling a growing diaspora of domestic climate refugees.



The “Weatherbreak” dome under construction after 40 years in storage at the Smithsonian National Museum of American History. Jason Andrew for The New York Times



Technicians helped students from Catholic University’s School of Architecture and Planning to install the dome at the museum. Jason Andrew for The New York Times

Riding out the storm

In the atrium of the Smithsonian’s National Museum of American History, students from the Catholic University of America recently finished reassembling “Weatherbreak,” a geodesic dome built more than 70 years ago and briefly used as a home in the Hollywood Hills. It was avant-garde at the time: roughly a thousand aluminum struts bolted together into a hemisphere, 25 feet high and 50 feet wide, evoking an oversize metal igloo.

The structure, designed by Jeffrey Lindsay and inspired by the work of Buckminster Fuller, has gained new relevance as the Earth warms.

“We started thinking about how our museum can respond to climate change,” Abeer Saha, the curator who oversaw the dome’s reconstruction, said. “Geodesic domes popped out as a way that the past can offer a solution for our housing crisis, in a way that hasn’t really been given enough attention.”

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Domes are just one example of the innovation underway. Houses made from steel and concrete can be more resilient to heat, wildfire and storms. Even traditional wood-framed homes can be constructed in ways that greatly reduce the odds of severe damage from hurricanes or flooding.

But the costs of added resiliency can be about 10 percent higher than conventional construction. That premium, which often pays for itself through reduced repair costs after a disaster, nonetheless poses a problem: Most home buyers don't know enough about construction to demand tougher standards. Builders, in turn, are reluctant to add resilience, for fear that consumers won't be willing to pay extra for features they don't understand.

One way to bridge that gap would be to tighten building codes, which are set at the state and local level. But most places don't use the latest code, if they have any mandatory building standards at all.

Some architects and designers are responding on their own to growing concerns about disasters.

On a piece of land that juts out in the Wareham River, near Cape Cod, Mass., Dana Levy is watching his new fortress of a house go up. The structure will be built with insulated concrete forms, or ICF, creating walls that can withstand high winds and flying debris, and also maintain stable temperatures if the power goes out — which is unlikely to happen, thanks to the solar panels, backup batteries and emergency generator. The roof, windows, and doors will be hurricane-resistant.

The whole point, according to Mr. Levy, a 60-year-old retiree who worked in renewable energy, is to ensure he and his wife won't have to leave the next time a big storm hits.

“There's going to be a lot of people spilling out into the street seeking sparse government resources,” Mr. Levy said. His goal is to ride out the storm, “and in fact invite my neighbors over.”

Mr. Levy's new home was designed by Illya Azaroff, a New York architect who specializes in resilient designs, with projects in Hawaii, Florida and the Bahamas. Mr. Azaroff said using that type of concrete frame adds 10 to 12 percent to the cost of a home. To offset that extra cost, some of his clients, including Mr. Levy, opt to make their new home smaller than planned — sacrificing an extra bedroom, say, for a greater chance of surviving a disaster.

Building with steel



Joel and Deborah Veazey of Pecan Island, La. “People came to my house and apologized to me and said, ‘We

made fun of you because of the way your house looks,” Mr. Veazey said. Bryan Tarnowski for The New York Times

Where wildfire risk is great, some architects are turning to steel. In Boulder, Colo., Renée del Gaudio designed a house that uses a steel structure and siding for what she calls an ignition-resistant shell. The decks are made from ironwood, a fire-resistant lumber. Beneath the decks and surrounding the house is a weed barrier topped by crushed rock, to prevent the growth of plants that could fuel a fire. A 2,500-gallon cistern could supply water for hoses in case a fire gets too close.

Those features increased the construction costs as much as 10 percent, according to Ms. del Gaudio. That premium could be cut in half by using cheaper materials, like stucco, which would provide a similar degree of protection, she said.

Ms. del Gaudio had reason to use the best materials. She designed the house for her father.

But perhaps no type of resilient home design inspires devotion quite like geodesic domes. In 2005, Hurricane Rita devastated Pecan Island, a small community in southwest Louisiana, destroying most of the area’s few hundred houses.

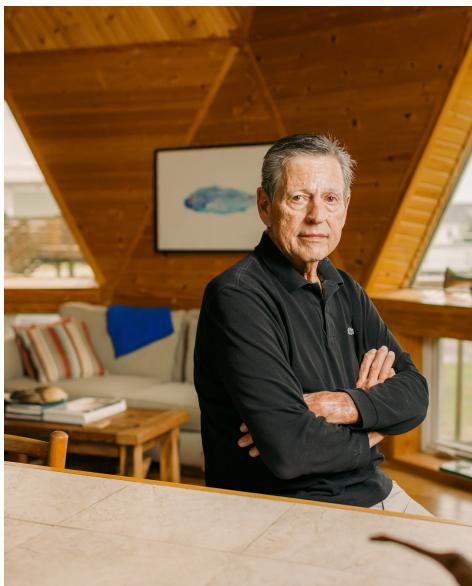
Joel Veazey’s 2,300-square-foot dome was not one of them. He only lost a few shingles.

“People came to my house and apologized to me and said: ‘We made fun of you because of the way your house looks. We should never have done that. This place is still here, when our homes are gone,’” Mr. Veazey, a retired oil worker, said.

Dr. Max Bégué lost his house near New Orleans to Hurricane Katrina. In 2008, he built and moved into a dome on the same property, which has survived every storm since, including Hurricane Ida.

Two features give domes their ability to withstand wind. First, the domes are composed of many small triangles, which can carry more load than other shapes. Second, the shape of the dome channels wind around it, depriving that wind of a flat surface to exert force on.

“It doesn’t blink in the wind,” Dr. Bégué, a racehorse veterinarian, said. “It sways a little bit — more than I want it to. But I think that’s part of its strength.”



Dr. Max Bégué, who lost his home near New Orleans to Hurricane Katrina, built a dome on the same property and has suffered little damage since. Bryan Tarnowski for The New York Times



“It doesn’t blink in the wind,” Dr. Bégué said of his new home. “It sways a little bit — more than I want it to. But I think that’s part of its strength.” Bryan Tarnowski for The New York Times

‘Looking for something different’

Mr. Veazey and Dr. Bégué got their homes from Natural Spaces Domes, a Minnesota company that has seen demand jump the past two years, according to Dennis Odin Johnson, who owns the company with his wife Tessa Hill. He said he expected to sell 30 or 40 domes this year, up from 20 last year, and has had to double his staff.

The typical dome is about 10 to 20 percent less than expensive to build than a standard wood-frame house, Mr. Johnson said, with total construction costs in the range of \$350,000 to \$450,000 in rural areas, and about 50 percent higher in and around cities.

Most customers aren’t particularly wealthy, Mr. Johnson said, but have two things in common: an awareness of climate threats, and an adventurous streak.

“They want something that’s going to last,” he said. “But they are looking for something different.”

One of Mr. Johnson’s newer clients is Katelyn Horowitz, a 34-year-old accounting consultant who is building a dome in Como, Colo. She said she was drawn by the ability to heat and cool the dome’s interior more efficiently than other structures, and the fact that they require less material than traditional homes.

“I like quirky,” Ms. Horowitz said, “but I love sustainable.”

A correction was made on July 16, 2023: An earlier version of this article misspelled the given name of a retired software engineer who recently bought property near Bishop, Calif. He is Jon duSaint, not John.

When we learn of a mistake, we acknowledge it with a correction. If you spot an error, please let us know at nytnews@nytimes.com. [Learn more](#)

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and industries try to cope with the effects of global warming. More about Christopher Flavelle

A version of this article appears in print on , Section A, Page 16 of the New York edition with the headline: As Climate Shocks Multiply, There's No Place Like a Dome to Withstand Weather Disasters