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THE GREAT CONVERSION

In the post-pandemic era, offices and malls become apartments, industrial spaces go wild, and young adults return to their geographic roots.



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PEOPLE MIGRATE FOR SIMPLE REASONS

The reasons Americans move have everything to do with quality of life, and almost nothing to do with the stuff politicians and climate scientists talk about.

We melting pot people have always been migratory. In the 1990s, about 15 percent of Americans moved every year. That rose another percent or two by the early 2000s and appears to have dropped off a couple of points in 2023. On average, we now stay in our homes about 13 years, then move on in search of better (or different) lodging, although that average varies widely by region and demographic.

Given our daily doomscrolling about floods, tornadoes and wildfires, you might expect population to drift toward more resilient areas. Not so. Instead of moving to Vermont or upper-state Michigan, where climate predictions say families are least likely to suffer climate calamities, most nomads roll the dice on Texas, Arizona or Florida. But why? Are they attracted by the right-wing politics of these states? Are they running from climate crisis anxieties? Or is it something simpler?

Florida, for example, saw 214,000 new families arrive between 2019 and the end of 2020. During that time, at least five surveys asked people why they moved:

1. **United Van Lines 2020:** Retirement (24 percent), family (21 percent), lifestyle (20 percent), work (18 percent), and health (9 percent) were top reasons.
2. **Redfin 2021:** Better weather (45 percent), lower cost of living (39 percent), lower taxes (34 percent), outdoor recreation (18 percent), and no state income tax (14 percent).
3. **Move.org 2020:** Weather (31 percent), cost of living (22 percent), job opportunities (19 percent), family (13 percent), and entertainment (9 percent) were top reasons.
4. **U.S. News & World Report 2021:** Weather (44 percent), affordability (19 percent), job opportunities (18 percent), healthcare (14 percent), and quality of life (13 percent).
5. **SmartAsset 2020:** Retirement (25 percent), job opportunities (17 percent), cost of living (15 percent), family (15 percent), and lifestyle (12 percent) were top reasons.

Note that there was not a SINGLE instance where existential climate fear ranked as a serious concern. At the same time, not a single mention was made of the state's extremist legislative moves, the so-called "culture war" salvos. There's no hint of "woke" sensitivity in these new arrivals; no mention of anti-abortion laws, no concern about transgender bathrooms, no fist pounding about illegal immigration, and no mention of the



WRONG MESSAGE? People don't care about extremist culture war issues. They just want safe, comfortable neighborhoods and low taxes.

right for untrained people to carry loaded guns around in public.

In fact, these fabricated issues have rarely been mentioned by these new Florida residents. Florida had 133,333 housing permits issued in 2020.

As the surveys above show, it's weather, affordability and taxes that compel people to move. Even the risk of hurricanes and sea level rise barely shows up on their psychological radar.

Neither do the culture wars, but their hangover surely will. Thousands of newly settled New Yorkers, for example, are **boomeranging back to New York**, fed up with right-wing politics (and extreme heat).

It's not hard to see why. Legislation that makes the place less safe for kids, less attractive to good teachers, protects insurers over citizens, and terrorizes immigrants who do the heavy lifting of building labor is destructive and foolhardy.

A great conversion is coming to this country. Millions of units of new housing will be needed to meet demand. But people want to live in places where tolerance and diversity are normal, where good jobs, safe schools, and kind people go hand in hand with balmy weather. The real question now is not whether or when the conversion will happen. It's happening now.

The question is whether a few selfish and ambitious people in positions of power will continue to try to derail progress, or realize the folly of resistance, and reap the benefits of prosperity with the rest of us. **GB**



Matt Power
Editor-in-Chief

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Boom Coming for Solar, EV Industries in 2024

Rising utility costs are sending consumers toward alternative energy-driven cars and photovoltaics.

Seven percent of U.S. internet households now own solar panels and 5 percent own an electric vehicle (EV), with purchase intentions increasing for both products, according to a survey by Parks Associates. EVs, in particular, are on the rise: 20 percent of the 10,000 internet households surveyed say they plan to buy an EV within the next 12 months.

“Consumer familiarity with EVs and solar solutions is growing,” notes Parks Associates Research Director Chris White. “[Rising] energy costs and favorable policies [with] new and extended incentives make these solutions more attractive.”

Drones Pose Danger to Builders

High-flying technology could take away workers’ attention from the task at hand, leading to potentially deadly falls.

The more drone technology is used, the greater the danger to the workforce due to distraction, according to a study by CPWR—The Center for Construction Research and Training. A behavioral analysis of 153 construction specialists found that working near drones “reduces the attention workers devote to the task at hand, which could result in falls when they are at height.”

Additionally, working with drones at any distance contributes to “significant” psychological or emotional distress. “Workers may feel as though they’re constantly being monitored,” the study notes. “They also might be fearful of being struck by a drone, as they already operate in high-risk environments at height.”

The distance of the drone from the workers played a significant role in the degree of risk. Workers operating while drones were 12 and 25 feet away looked away from job tasks more frequently than



Bright future ahead. More people are learning about the impact of solar power at home—something that the nation’s power grid will also soon discover.

CREDIT: JONSOMAN/FICKR

The survey findings also outline the importance of energy management. “Leveraging the growing number of smart home products and services to help manage energy consumption is important to stabilize the grid and shift load from peak times,” White says. “As electrification drives increased demand, aligning consumption patterns with local supply becomes critical to reliable grid operation.”



High-flying hazard. Drones are great for obtaining information during construction, but they can also be dangerous to construction workers.

when drones were 1.5 and 4 feet away, according to the study. CPWR’s study is available at www.cpwr.com/wp-content/uploads/SS2022-UAV-safety-integration.pdf.

Seawater-Powered Batteries Could Flood Market

New storage capability could enable sodium-sulfur batteries to leapfrog current technology and become an affordable, clean power source.

Researchers at Australia's University of Sydney (AUS) have built a new, inexpensive household battery with four times the energy storage capacity of lithium. The source? Sodium-sulfur, a molten salt processed from sea water. The super high-capacity device is more environmentally friendly than existing lithium, graphite and cobalt versions, according to AUS lead researcher Dr. Shenlong Zhao.

Metals for current batteries pose an environmental risk. For example, lithium extraction can result in water shortages, biodiversity loss, damage



Benefits Galore. Compared to the lithium version, a sodium-sulfur battery is longer lasting and far less environmentally damaging.

to ecosystem functions and soil degradation. In contrast, sea salt is abundant and easily accessed, making a sodium-sulfur battery less environmentally damaging. The battery charge degrades very little over time. And the battery is easier to dispose of.

"When the sun isn't shining and the breeze isn't blowing, we need high-quality storage solutions that don't cost the Earth and are easily accessible on a local or regional level," Zhao says. The researchers now plan to improve and commercialize the new cell.

Continued Focus on Lithium Batteries Undermines the EV Transition

Despite destructive mining impacts and operational risks, lithium continues to dominate plans for the next generation of batteries.

America's transition to electric vehicles (EVs) could require three times as much lithium as is currently produced for the entire global market, causing water shortages, indigenous land grabs and ecosystem destruction, according to a study from the Climate and Community Project and the University of California at Davis.

However, investing in mass transit, walkable towns and cities, and robust battery recycling in the U.S. would slash the amount of extra lithium required in 2050 by more than 90 percent.



Crossroads ahead. As EV ownership rises, an unhealthy boom in lithium mining is expected over the next 25 years.

"Preserving the status quo might seem like the politically easier option, but it's not the fastest way to get people out of cars or the fairest way to decarbonize," says study lead author Thea Riofrancos, in a report in *The Guardian*. "We can electrify the status quo to reach zero emissions, or the energy transition can be used as an opportunity to rethink our cities and the transportation sector so that it's more environmentally and socially just, in the U.S. and globally." **GB**

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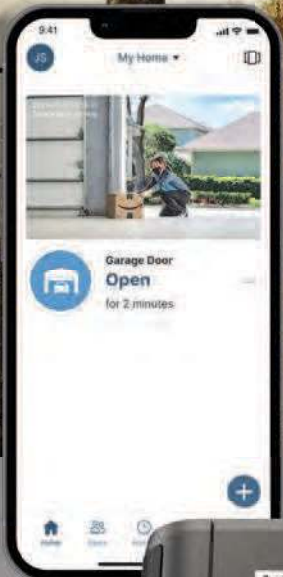
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"Millennials aren't looking to companies to be perfect. They're looking to companies to be human and participatory in society." **PAGE 25**

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THE GREAT CONVERSION

THE TIDE IS TURNING: As old ways of living and working fall away, malls, neighborhoods and homes are being re-engineered for the future. Here's how the future is shaping up.

A vibrant, stylized illustration of a futuristic city. In the foreground, a river flows over dark, jagged rocks, creating white water. To the right, a red construction truck and a yellow forklift are parked on a dirt path. Several workers in orange safety gear are visible. The background features tall, modern buildings and lush green trees, suggesting a blend of nature and urban development. The overall color palette is dominated by greens, yellows, and oranges, with a hazy, atmospheric background.

SOME OF THE IMAGES IN THIS STORY, INCLUDING THIS ONE, WERE CREATED USING AI TECHNOLOGY. THIS TOO, FOR BETTER AND WORSE, IS PART OF THE GREAT CONVERSION. —EDITOR

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THE GREAT RE-HUMANIZING

EFFORTS TO TRANSFORM VACANT BUILDINGS INTO RESIDENTIAL UNITS CAN RETURN LIFE TO COVID-IMPACTED DOWNTOWNS—AND HELP CURB THE HOUSING CRISIS.

BY GREEN BUILDER STAFF



It comes as no surprise that the nation is experiencing a growing housing shortage—Harvard’s Joint Center for Housing Studies cited a deficit of more than 3 million homes in 2022. Meanwhile, the amount of vacant office space nationwide has increased by about 25 percent from 2020 to 2022. Almost 1 billion square feet, or roughly 13 percent of the market, now sits unused, according to the New York Times. That has major cities such as New York, Washington, D.C., San Francisco and others asking the same question:

What if all of that empty office were turned into housing?

Such an effort, known as “adaptive reuse,” would solve many problems. In addition to bringing purpose to buildings that might otherwise only collect cobwebs, and giving people a chance to become homeowners—or at least get a place of their own, something that a Department of Housing and Urban Development (HUD)-estimated 600,000 homeless people would love to be a part of. And, there are economic, cosmetic and psychological benefits.

While it’s not considered an instant go-to for solving the nation’s housing crisis, acceptance of adaptive reuse is growing. According to commercial real estate firm CBRE, there was an average of 36 office conversions per year nationwide from 2016 to 2021. Forty-two conversions were completed in 2022. But 217 more are on the way or planned over the next several years.

It’s no easy feat, however. Some cities have been trying for years with little or no success due to legal red tape; others are seeing their efforts slowed or stalled due to the pandemic and a shaky economy. But some localities have pushed ahead with positive results.

FROM TOP

Hard work ahead? An increase in the number of office conversions would mean more projects for construction workers, and ultimately boost the economy.

Up, up and away. Vanbarton Group’s plans for 160 Water Street include adding six floors to an already-tall building as it undergoes a conversion from office space to residential dwelling.

COURTESY OF VANBARTON GROUP

Saved by geography.

Existing building restrictions would have made it impossible for the commercial-to-residential project at 160 Water Street to occur anywhere in New York City except in Lower Manhattan—which is where the structure happens to be.

COURTESY OF COLLABORATIVE CONSTRUCTION MANAGEMENT



AHEAD OF ITS TIME

By mid-2024, conversion will be completed at 160 Water Street, a 24-story, 525,000-square-foot downtown New York City office building that is being transformed in a 588-unit mix of studios, and one- and two-bedroom market-rate apartments for up to 1,000 residents. It will mark the climax of a four-year effort to give a 53-year-old skyscraper a new life that is beneficial to both residents and the city.

The project didn't start out quite so grandiose. When real estate firm and building owner Vanbarton Group first discussed a plan with New York City-based architect Gensler in 2020, the idea was to turn an empty, obsolete office building into a classy locale that could turn a profit and hold its own within the Financial District of Lower Manhattan. The company had already completed several successful office-to-residential conversions in Manhattan—including one next

door to the current building—which made 160 Water Street an ideal candidate.

It was also evident that the office space market was teetering. Vacancy rates in Manhattan had risen for several years, from 8.9 percent in 2017, to 15.2 percent by 2020, and rental prices by 2017 had stalled at about \$72 per square foot after six years of increases, according to market analyst Cushman & Wakefield. (Manhattan's office vacancy rate has since reached 18 percent and rental prices are down to \$69 per square foot.)

Factor in the continual, growing shortage of available housing, a city that was hard-hit by COVID-19, and a workforce that suddenly did not want to go back to the office after a couple years of telecommuting, and the project took on a new light, according to Joey Chilelli, Vanbarton Group's managing director. "We're taking a vacant building and pouring life not only into this building, but this entire neighborhood," he says.

Land of emptiness. An estimated 1 billion square feet of all office space nationwide is unoccupied, and could be converted to residential space.



Image created with AI technology.

Small (yet big) solution.

Micro apartments—typically under 800 square feet—could be a stylish and low-cost result of adaptive reuse. Such an effort could make a huge dent in the nation's 3-million-unit housing deficit.

Roughly half of the units will include a home office, an acknowledgement that working from home is still a key factor among the city's employed, according to Chilelli. "The building has been designed to maximize flexibility for residents seeking space that caters to a live-work-play lifestyle," Vanbarton Group notes. The company adds that the site includes a newly created five-story rooftop amenity space, fitness center, co-working space, play space for young children, athletic facilities, smart building technology, and plentiful outdoor space.

SELLING POINTS

To make conversions more attractive, cities are loosening up their building requirements. For example, in most parts of New York City, building ordinances prohibit office-to-residential conversion of any commercial structure constructed after 1961. The exception is Lower Manhattan, where the cutoff is 1976. That 15-year difference is a big deal. Vanbarton Group and Gensler, for example, would not have been able to undertake the

160 Water Street building, which was built in 1970. That's a lot of economic dollars lost, according to New York City Mayor Eric Adams.

"We must make it easier to convert office buildings, such as 160 Water Street, into housing for New Yorkers," Adams said during a January press conference. "Just imagine if there are certain buildings we can't convert just because of the year that they were built. We need to look how we could have a different approach to this problem."

The city is now considering pushing out the construction edict to 1990. Recommendations within an adaptive reuse study released in January includes extending the city's least-stringent commercial space conversion regulations to an additional 136 million square feet of office space. This could mean up to 20,000 new homes and 40,000 residents in the next decade, Adams notes.

The study is "a roadmap to deliver on a vision for a more vibrant, resilient, prosperous, and affordable city," Adams says. "The need for housing is desperate," he adds. "The opportunity offered by underused office space is clear."

Cities are also offering tax breaks to developers, but there are strings attached. In many cases, they must offer a percentage of the apartments at below-market prices. For example, in January, Washington D.C. officials unveiled the Housing in Downtown Tax Abatement program. Builders can receive 20 years of reduced taxes, but they are required to make 15 percent of units affordable housing, and employ local contractors and workers for at least 35 percent of the construction.

While developers say such requirements will prevent them from making a profit with the project, there's also acknowledgement that housing affordability is a huge issue, especially for downtown districts. Making the units more affordable will draw more residents to the conversions, which will stimulate the local economy, restore tax revenue and restore life to empty downtowns. Many efforts are underway.

Pittsburgh has begun accepting proposals from developers, private groups and others to

produce more affordable housing through the conversion of empty or underutilized office space.

Boston's plan for revitalizing downtown includes an emphasis on additional housing, some of which would come from office conversions.

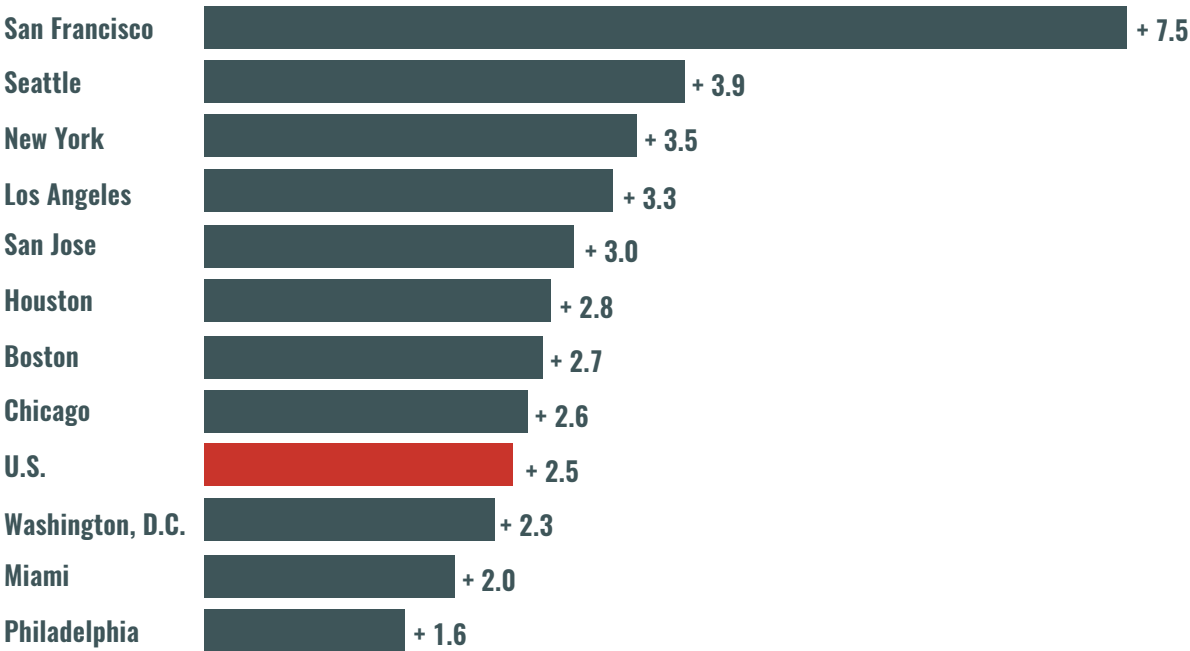
Seattle has launched a competition for downtown building owners and design firms to come up with conversion ideas.

Oregon lawmakers are considering a bill that would require local governments to allow for the conversion of commercial buildings without needing a zone change or conditional use permit, as long as the property is already inside the city's urban growth boundary.

In California, legislation has been introduced that would prevent local officials from blocking an office-to-housing project so long as 10 percent of the units are affordable, and they don't exceed basic height and density limits. It would also require conversions to be allowed anywhere, regardless of zoning laws.

CHANGE IN U.S. OFFICE VACANCY, 2020-21

Percentage point change in major metro areas



SOURCE: BARCLAYS RESEARCH



Dark times. With close to one-third of its office space sitting empty and no corrective plan in place, San Francisco has earned the unenviable title of “The Most Empty Downtown in America” from the New York Times.

CREDIT: KEN LUND/FLICKR

DOWN AND OUT BY THE BAY

If any city needs help with its building conversion efforts, it’s San Francisco, which has one of the country’s worst office vacancy rates. CBRE data places the city’s non-occupancy total at 29.4 percent, versus 18.6 percent nationally, as of Q1 2023. Commercial real estate firm Savills paints an even more dire picture, placing the first quarter 2023 rate at 32.7 percent. Analysts expect those dismal figures to be even worse after Q2 and possibly through the end of the year, courtesy of the tech industry’s struggles and a stubbornness by building owners to reduce rents.

To make matters worse, The New York Times recently referred to San Francisco as having “The Most Empty Downtown in America.” A recent report by the city’s budget and legislative analyst estimated that more than 40,000 units—a combination of office space and multi-family housing—sit vacant.

In response, city lawmakers are considering a vacancy tax, similar to one implemented in Vancouver, British Columbia in 2018. That tariff

saw the number of empty units drop by almost 20 percent during its first year of implementation, according to San Francisco Board of Supervisors member Dean Preston. Owners were suddenly very cooperative at cutting rents or making concessions to attract tenants, he notes.

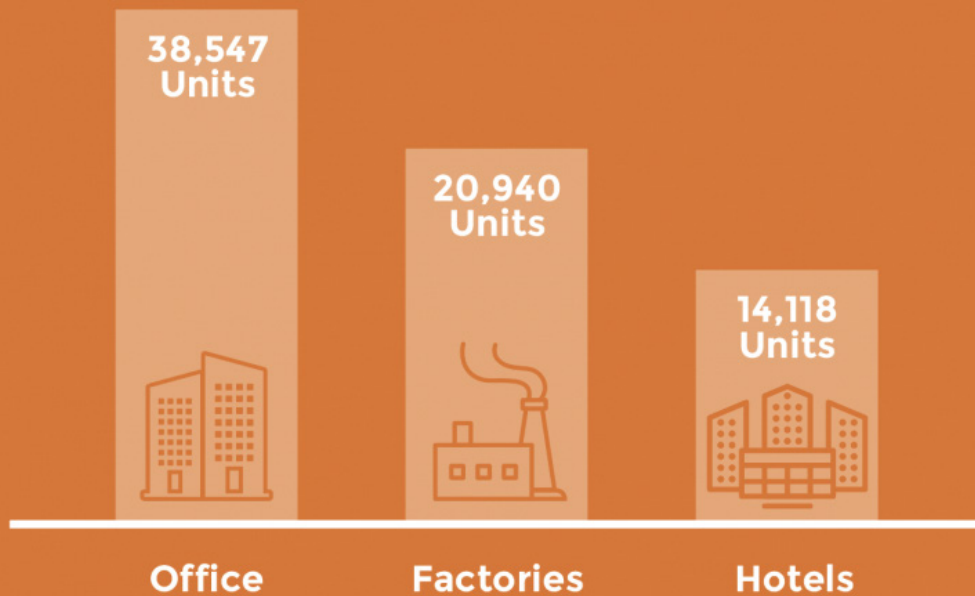
A vacancy tax in San Francisco would actually only apply to roughly 8,000 units, but it could nudge some investors and wealthy corporations away from buying a property and doing very little with it until market prices go back up, according to Preston.

Conversion then steps in. Gensler, which also has an office in San Francisco, has identified 12 office buildings in the financial district that are good candidates for adaptive reuse. More than 2,700 homes could theoretically be built in those structures, Gensler notes.

San Francisco Mayor London Breed notes that office-to-housing conversions hold a lot of promise. The city has other plans under discussion that would make it easier and faster for builders to complete. “The challenges facing downtown

MULTI-FAMILY CONVERSIONS

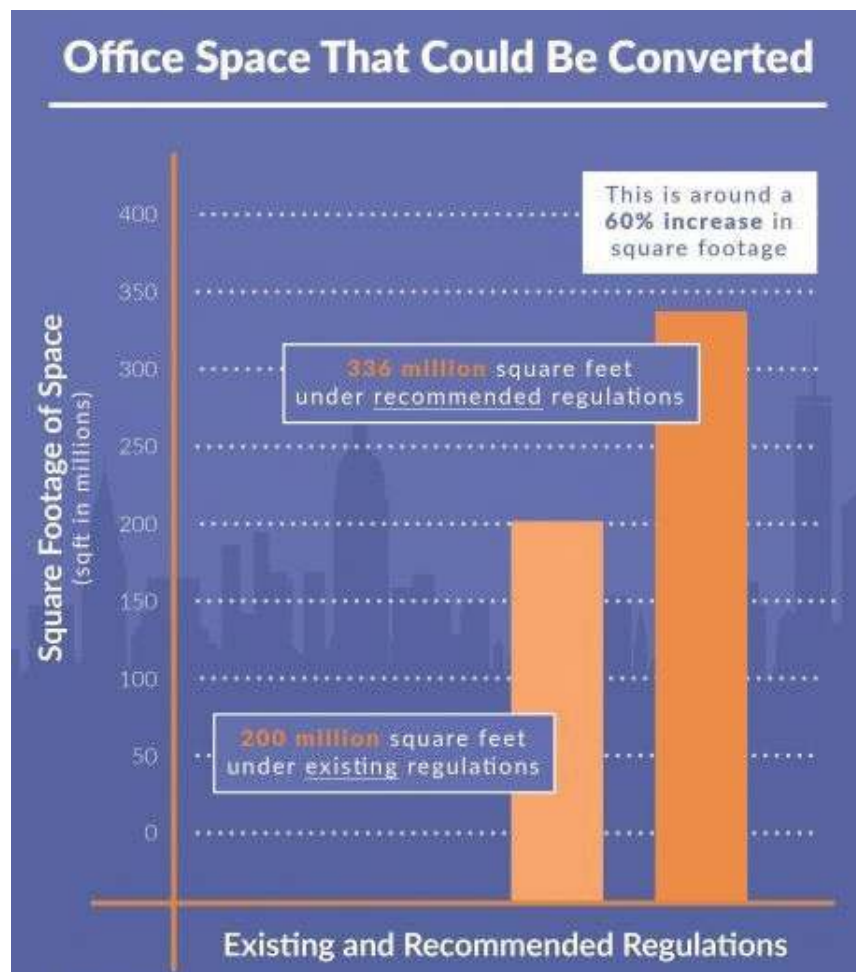
BY PROPERTY TYPE AS OF Q4 2021*



Supplier of homes. In theory, a lot of potential new homes are available with proper public effort. Most can come from converted office buildings, which could produce more housing units than factories and hotels combined.

SOURCE: REALOGIC

Conversion-minded. New York City, with one of the nation's highest office vacancy rates, could cut deep into that total with changes in existing construction regulations, according to New York City Mayor Eric Adams. SOURCE: NYC





Solid management. An experienced consulting team can help prevent miscommunication and efficiently complete reuse projects.

require us to imagine what is possible and create the foundation for a stronger, more resilient future,” she says. “We need to make the process easier for getting our buildings active and full.”

IMPROPER MATH

For all of their benefits, not everyone is on board with conversions. There are developers who say conversions can be a less-expensive option than building from scratch, largely due to rising construction materials costs during the pandemic era. But for many builders and city entities, the cost of a redevelopment outweighs that for a complete rebuild.

Infrastructure is an issue. The concept of taking a two-story commercial building with 20 offices and turning it into a residential complex with 12 apartments sounds wonderful—until the need for 10 more toilets and a dozen kitchens are factored in.

Uncertainty among builders and architects can rear its unhappy head. According to Chilelli, new construction features numerous “knowns” in terms of design. Conversions aren’t always as worker friendly.

One key, Chilelli notes, is having an experienced consulting team—a group that can efficiently coordinate and complete reuse projects.

In some places, many of the buildings that are better suited to conversion, such as those that are

completely vacant, have large meeting areas, or on lots with ample street lighting, have already been acquired or repurposed. “What remains are difficult properties that need significant reworking or tearing down,” notes The Washington Post Editorial Board. “The costs add up.”

A cloudy financial scene hasn’t helped matters. In the past year, average mortgage interest rates have climbed from 3.75 percent to nearly 7 percent and could go higher as the government tries to stabilize the economy, according to Freddie Mac.

Such uncertainty is driving away some developers—and, ultimately, prospective homebuyers—who can’t get or don’t want loans. As a result, others are taking the chance that adaptive reuse is a solid bet.

Silverstein Properties, one of the nation’s largest commercial landlords, plans to spend \$1.5 billion to convert unwanted office space into residential housing in markets from New York to San Francisco. It’s a sizeable chunk of an estimated \$10 billion market, but CEO Marty Burger believes it’s a win-win proposition.

“Now is the perfect storm, where office is not in favor, and the residential market is very hot,” Burger told Bloomberg. “Hopefully we can acquire some of these office buildings that may be obsolete or may not be their highest and best use as an office building, and convert them to residential use, which cities desperately need.” **GB**

Sky's the Limit

THE COUNTRY'S BIGGEST OFFICE-TO-APARTMENT CONVERSION IS UNDERWAY IN NEW YORK CITY. IT'S A REAL PIECE OF WORK—AND THAT'S A VERY GOOD THING.

BY DAVID BRAND

More than 1,300 apartments will fill an empty office building in Lower Manhattan, making it the biggest residential conversion project in the country, its owners say.

The building at 25 Water Street was once home to the Daily News and JPMorgan Chase, which cleared out earlier in the pandemic. New owners are using [decades-old rules](#) that ease residential conversions in the Financial District to gut the offices, carve out courtyards and add 10 floors to the 22-story structure.

The owners have not submitted the residential plan for final approval from the city's Department of Buildings, but city signoff is a formality in Lower Manhattan office conversions as long as the new design meets zoning and construction rules. Mayor Eric Adams and Gov. Kathy Hochul both [say these types of conversions](#) can help supercharge housing supply in places like Midtown and Flushing, Queens but first need the state to tweak zoning rules. State lawmakers are considering those changes, along with a new office conversion tax break, in the state budget currently being negotiated.



Big plans. Construction is underway in Lower Manhattan to convert the 22-floor former Daily News building into a 1,300-unit apartment complex. CREDIT: DAVID BRAND/GOHAMIST

Repurposing an office building is usually quicker than erecting a new structure from the ground up, says architect Eugene Flotteron, whose company CetraRuddy is designing the 25 Water Street floor plans. The developers say the apartments should open in about two years.

But changing cubicles and water coolers into bedrooms and kitchens isn't as simple. Nor is it cheap.

Owners GFP Real Estate and Metro Loft plan to scoop out two courtyards from the center of the building and wrap apartments around them, says GFP head Brian Steinwurtzel. That'll allow the building to meet light and air requirements. The owners also plan to raise the height to 32 stories while still complying with density restrictions, Steinwurtzel says.

"I think this one is more complex than other ones that have been done," Steinwurtzel says. "There's significant structural work that needs to be done, and that is very expensive."

The two firms bought the building, until recently known as 4 New York Plaza, in December [for about \\$250 million](#) and will spend hundreds of millions more on the conversion. Steinwurtzel declined to give a total cost estimate but cited a \$400 to \$500-per-square-foot rate for most conversions. The building at 25 Water Street is more than 1.1 million square feet.

Steinwurtzel said the new building will attract a range of tenants motivated by a massive planned gym, ground-floor shops and two swimming pools.

"The expectation is that there certainly will be younger single folks who are just sort of starting out in New York, up to families with children that will be looking for these larger units," Steinwurtzel says. "It'll help to continue the transition of the financial district into a 24/7 mixed-use neighborhood."

They plan to squeeze more than 50 market-rate and luxury apartments ranging from studios to four bedrooms onto each of the existing floors, fitting them together like Tetris pieces, according to initial blueprints. The owners and architects allowed Gothamist to view the floor plans but refused to release them for publication. The layout shows the complicated process of carving up commercial spaces set far from windows and turning them into places where people actually live.

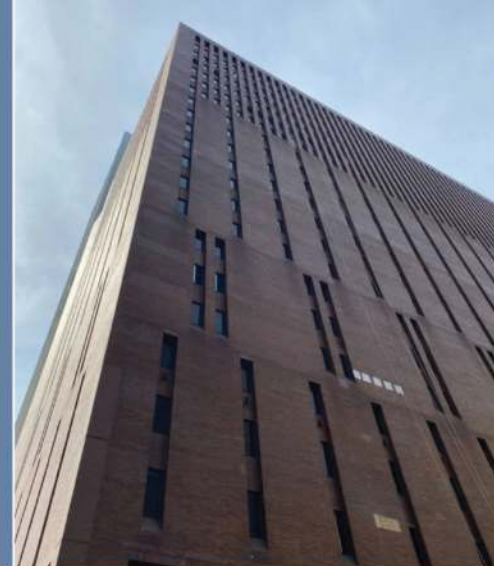
Most of the apartments will have "home offices" that can double as bedrooms, but not all of those will have windows — a [controversial arrangement backed by Adams](#). Other rooms described as offices will face the adjacent Vietnam Veterans Memorial Park, but the windows still won't comply with current bedroom rules because they don't face a street or courtyard.

"Anyone who rents it will have no idea they're not in a pretty awesome bedroom with the windows," Flotteron said.

For now, the imposing facade and narrow window slits give off prison vibes, but the building actually won an architectural award when it first opened in the 1960s. It was designed to look like a punch card and housed telecommunications offices and equipment.

The developers plan to expand the windows, tear down the brown brick facade and turn it gray, renderings show.

Construction workers have routinely walked through the dust-filled lobby and loading bay, where asbestos removal notices hung from the walls and jagged scraps of metal stuck out of dumpsters. They



It's (almost) a breeze. One of the challenges in repurposing the old Daily News building is ensuring that its windows comply with city rules. CREDIT: DAVID BRAND/GOHAMIST

out the offices in the floors above to make way for a complicated transformation project.

Flotteron said they will turn the loading docks and existing curb cuts into a parking garage and entryway.

"The great thing for us about conversions is they really are treasure chests that you need to get into and explore and find all this great stuff that you can reuse," Flotteron says.

Despite a deep affordable housing shortage taking the [heaviest toll on the poorest New Yorkers](#), the project will not have any apartments with rents capped for low-income renters. That's typical of office conversions in the Financial District, where there are no affordability requirements.

That makes it more profitable for building owners to take on expensive conversions. But it's also fueling skepticism and opposition from affordable housing activists and local lawmakers contemplating new conversion rules for Midtown, Flushing and the Bronx's Hub.

Members of the city council grilled Adams administration officials on affordability requirements [during a recent Council hearing](#) on his office conversion plans, which would allow owners to turn offices into apartments in buildings constructed before 1991.

"We especially need to build affordable housing with convenient access to well-paying jobs, high-quality schools and other services," said Land Use Committee Chair Rafael Salamanca at the hearing. "Manhattan neighborhoods should be accessible to more than just the wealthiest."

But Steinwurtzel, the 25 Water Street developer, says state and city lawmakers will have to pay up if they actually want to turn office shells into homes.

"The politicians, if they want to create housing in New York City out of these buildings, they will need to provide significant incentives," Steinwurtzel says. "And if they want to provide affordable housing, those incentives would have to be even higher."

This article was reprinted by permission of [Gothamist](#), a non-profit online newsroom sponsored by National Public Radio.

A New Lease on Life

BY GREEN BUILDER STAFF

Somebody, somewhere, during the height of a holiday shopping season, has probably said something like this:

“I wish I could just live here.”

In some cities, those shoppers are getting their wish. In an effort to restore interest in the old-fashioned, indoor shopping mall—or make use of ones that are now ghostlike commercial hubs—owners are redesigning the structures, adding small residential dwellings that give occupants better access to everyday conveniences, while also easing a growing housing shortage.

Economic difficulties, a pandemic and a shift toward online shopping have put shopping malls on the brink of extinction. According to Coresight Research, in 2022, there were still 700 open across America, down from 1,000 just two years earlier, and but a fraction of the 2,500-plus that existed in the mid-1980s. The future looks worse: retail consulting firm SiteWorks estimates that there will be fewer than 150 catering to customers in 10 years.

In response, mall owners are thinking residential. According to commercial real estate consulting firm Realogic, as of late January 2022, at least 192 U.S. malls were planning on adding housing, and about 33 malls had added apartments since the start of the pandemic. In October 2020, Barclays predicted that 15 percent to 17 percent of U.S. malls will need to be redeveloped into other uses for the long-term.

Here are several that have taken steps to stay relevant in the age of e-commerce.

The Arcade Providence, Providence, Rhode Island

In terms of present-day mall-to-housing conversions—i.e., anything before 2015—this is the one that started it all. Built in 1828 as The Westminster Arcade, the nation’s oldest indoor shopping mall fell on hard times in the late 20th century and closed for good in 2008. But the center now thrives as a residential structure consisting of 48 lofts on the former mall’s top two floors, and 20 retail shops on ground level.

The site reopened in 2014 as The Arcade Providence and offered mostly studio and single-bedroom units as micro-loft rentals. They were “cozy,” ranging from 225-775 square feet (for comparison, a one-car garage is about 200 square feet), with monthly rents of \$550 to \$800. Units were rented out in weeks, and up to 4,000 people appeared on the waiting list over the next

DYING SHOPPING MALLS ACROSS AMERICA ARE GETTING A NEW CHANCE TO WIN THE PUBLIC’S FAVOR—BY ADDING NEW HOMES TO THE BLOCK.

six years, according to building owner Evan Granoff of 130 Westminster Street Associates.

Most units include a kitchen, full bath with shower, built-in beds, a tiny living room, seating and storage. It very likely was the nation’s first micro-apartment project, Granoff noted in a report to GoLocalProv. “Nobody knew what the acceptance or occupancy would be,” he recalled. “There is rarely a vacancy in the building. That is a good measure of success as well as the project’s solid return on investment.”

In 2020, Granoff took his idea condo, and began offering the lofts to renters for purchase, and offering others for sale as they became vacant. Now priced at an average of \$180,000 each, per Zillow—up significantly from the \$130,000 starting point in 2020—they’ve become quite a bargain.

“For 150 years, the building was a business failure,” Granoff said. “Its charm repeatedly saved it from demolition. We finally made it work as a business.”



Avalon Alderwood Place, Lynnwood, Washington

Performing a retail-to-residential conversion on a very successful shopping mall might seem odd. But that’s the course that Alderwood Mall owner Brookfield Properties has diligently pursued over the past few years.

The result is Avalon Alderwood Place, a 328-unit, two-tower apartment complex that was constructed on the mall grounds in 2022, in place of a closed Sears anchor store. Now a part of the mall’s 1.3 million square feet of retail space, Avalon Alderwood is expected to help draw thousands of potential customers to the shopping hub each week, while adding upscale living space for several hundred Lynnwood residents.

CLOCKWISE FROM TOP:

Bold new look. America’s oldest indoor mall, The Arcade Providence, has been given new life following a conversion to a combined condominium-retail locale.

CREDIT: Kaleb Kloppe/Wikimedia Commons

Cozy comfort. Despite its small square footage, a micro-loft at The Arcade Providence has all of the basics, including a bedroom, kitchen, and living area. CREDIT: BEN JACOBSEN/NORTHEAST COLLABORATIVE ARCHITECTS

Surprising new view. Even when viewing the Avalon Alderwood Place project via early floorplans, it’s hard to imagine that a Sears retail store once stood there.

COURTESY OF CITY OF LYNNWOOD

New ‘old’ days. Milwaukee’s historic but recently remodeled Plankinton building has a similar look on the outside but is an all-new world within. COURTESY OF HEMPEL COMPANIES

ABOVE:

Double duty. Avalon Alderwood Place, a two-tower, 328-unit apartment complex, will increase foot traffic to and around the adjacent shopping mall by thousands of potential shoppers every week.

COURTESY OF GGLO DESIGN



According to Adam Tritt, Brookfield's chief development officer for retail business, Avalon Alderwood is an effort to stay ahead of the curve. Conversions usually mean replacing most, if not the entire mall, with some form of housing. Brookfield took the opposite approach: Avalon Alderwood is effectively an anchor store, but not one that offers retail services. It's a different way of addressing the needs of a consumer that leads a faster-paced, convenience-oriented life.

The complex's design, crafted by architecture firm GGLO Design, sticks to that principle. The two six-story towers are joined together by a skybridge. The apartment buildings carry a "biophilic, or nature-inspired, design that emphasized the environment of the Pacific Northwest," and used reusable materials such as wood and stone, and colors that occur in nature, according to GGLO architect and principal James Bradley.

The apartments, available as studios, and one-, two-, and three-bedroom units, range from about 450 to 1,650 square feet and are designed to maximize space. They feature kitchens with quartz countertops, tile backsplash, stainless steel appliances, upgraded lighting, and hard surface flooring. The apartment complex also offers pre-installed high-speed and community-wide Wi-Fi, digital resident services such as the ability to submit service requests and pay rent online, and smart access entry. Monthly rents are about \$1,600 to \$3,300.

The Avenue, Milwaukee

When it opened in 2019, the Plankinton Clover apartments drew a lot of positive attention from downtown Milwaukee residents. Four years later, the complex is an even bigger hit—with Genera-

tion Z. In April, a TikTok user's video review of the 50-unit structure went viral, picking up 1.5 million views and 5,000 comments in about a week.

The comments are what you'd expect from the young college age crowd: "This is so dope!" "Better than clearing trees to build new apartments." "The perfect place to live during a zombie apocalypse."

Plankinton Clover was once the Plankinton Building, a historic part of Grand Avenue, a 1980s-era urban mall that was closed for remodeling in 2018 and reopened as The Avenue a year later. Building owners The Aggero Group and Hempel Companies, and architectural firm The Kubala Washatko Architects (TKWA), repurposed Plankinton's second-floor retail space into market-rate apartments, turning glass-walled storefronts that faced the central atrium into individual "front porches" and live-work spaces, according to TKWA's website.

Apartments, which are roughly 600 to 1,100 square feet and available as studio, one-bedroom and two-bedroom models, feature wood flooring, stainless steel appliances, quartz countertops, in-unit washer and dryers, high ceilings, oversized windows, skylights and more. But Gen Z especially warmed up to features such as pickleball courts, a dog wellness center, bicycle storage, a Walgreens, and access to the area's famed 3rd Street Market Hall, an informal multi-vendor dining area.

The Avenue's owners aren't surprised at how successful the project has been. But there was no way to predict Gen Z's extreme enthusiasm. It bears noting, however, that respondents to the TikTok video admitted that almost no one their age would be able to afford the rent, which



ranges \$1,700 to \$2,200 per month, according to Apartments.com. But the general consensus among TikTok viewers is that the idea is still "pretty cool."

Meanwhile, the person who started the party—who identifies herself as "@saritalatasha"—says she just happened to be walking by during her lunch hour, and decided to look inside. "There's something here," she notes. "I just think it's a whole vibe."

THE GREAT RE-LOCALIZING

A REQUIRED 'STAY AT HOME' PERIOD HAS LED TO ANOTHER, POST-COVID TREND: MOVING BACK TO FAMILIAR STREETS.

BY JIM GUNSHINAN

The global COVID-19 pandemic and shelter-at-home protocols forced a record number of people to stay at home all day, where they learned to live, work, and go to school—for better or for worse. People hungered for the simple human touch and intimacy of being out and about in their area, shopping, and gathering for meals in a shared space.

After restrictions were lifted, plenty of parking spaces disappeared, and more restaurants started serving dinners outside on their sidewalks. But life wasn't perfect: Some people who had worked from home for the past two-plus years continued to work at home. Some moved out of big cities where their companies are headquartered to take advantage of remote work and live in a more-affordable community.

Commercial spaces emptied because of the pandemic. But now, after the pandemic's conclusion, many buildings are still empty. Some are [being converted to affordable housing](#). This makes it possible for those who can't work remotely, such as workers in the service industries, to live closer to their jobs. Cue localization.

The Cambridge Dictionary offers this [description of localization](#): "The process of organizing a business or industry so that its main activities happen in local areas rather than nationally or internationally." An example is small breweries, which have increased close to 50-fold in the last 20 years, from about 50 to 2,000 nationwide. Local coffee houses have shown a similar rise.

There are many factors driving localization. Let's take them one at a time.

THE MILLENNIAL AND GEN Z GENERATIONS

Millennials and Gen Z are known for living at home with their partners for years. (Some millennials are still engaging in this practice as they head into middle age.) They haven't done this voluntarily but out of necessity due to the high cost of rentals and other housing. Localization here is hit or miss: They stay where they are, or they move and need to be convinced to return.

In the latter case, there's an unusual driving force:



The effects of global climate change.

During a recent symposium by Green Builder Media, "[Sustainability Symposium 2023, The Great Conversion](#)," attorney and policy advisor Cheyenne Hunt proved that the two generations, those born roughly between 1981 and 2012, are mad about global warming and won't be taking it anymore. "Much of the passion and effort we need to continue progress in creating a sustainable world will come from this group," she notes.

Members of these generations are more aware of and passionate about fighting the worst effects of global climate change, Hunt notes. They know what happens when the problem is not adequately

FROM TOP:

Changing preferences. Years of working at home have millennials and Gen Z members moving to newer, rural neighborhoods, where they can still work remotely—much to the detriment of urban centers.

Time is short. Gen Z members are feeling more anxious about the environment than any other generation—to the point where they're worried about having kids.



ABOVE:

Home sweeter home. Efforts to improve knowledge of sustainability has helped keep residents of The Bronx in their neighborhoods to teach others.

addressed, despite the work of previous generations. They see it every day in the news and where they live—droughts, flooding, rising sea level, more intense and frequent super storms and tornadoes, and an explosion of people around the world leaving their homes, villages and cities, looking for a better place to raise their families.

“These are the generations that are feeling the weight of climate anxiety so significantly,” Hunt points out, “to the point where 40 percent [of Millennials and Gen Z] have said they have significant fears about having children.” But these people also understand the importance of reevaluation, change, and experimenting with creating a more

livable world. “They aren’t looking to companies to be perfect. They’re looking to companies to be human and participatory in society,” she says. “They want to see that you have weaknesses, areas that you recognize, and you’re self-aware enough to want to fix them. And then, what are you doing about it, and how are you telling a story around that?”

BACK TO A BEGINNING

Localization can take many forms, even an effort to restore a suffering neighborhood to happier times. Real estate developer and urban revitalization specialist Majora Carter, who was also a

presenter at Green Builder Media's sustainability symposium, discussed her and others' efforts to "make neighborhoods where black and Hispanic kids will want to stay in after college." Carter, who is also a [MacArthur Fellow](#) and [Peabody Award](#)-winning broadcaster with a passionate focus rooted in her experience growing up in the Bronx, says she saw the community where she grew up "become a place to escape from."

After getting her education, Hunt decided to return and try to make it a place where she and others want to live. She envisioned a neighborhood where moderate to high-income people would like to stay, with amenities like bars and restaurants and top-notch housing options.

At the symposium, Carter identified the South Bronx as once being far more than it would be just a few years later. She pulled out a photo. "This is the street on Hunts Point in Seneca that I would take from my house to walk down to the subway that took me to one of the best high schools in the country, the Bronx High School of Science," she said. "I was a smart little kid who would grow up and be somebody, which meant I needed the education to get my butt out of there."

She would return, however, to help her old neighborhood through efforts such as helping to prevent a waste processing plant from being constructed in the Bronx; enabling residents to launch green startup companies; and offering consulting services for towns and cities interested in sustainability.

In 2022, Carter published a book that gathers the wisdom of her experience—so far: ["Reclaiming Your Community: You Don't Have to Move out of Your Neighborhood to Live in a Better One."](#) In it, she advocates localization tactics such as:

- Building mixed-income instead of exclusively low-income housing to create a diverse and robust economic ecosystem
- Showing homeowners how to maximize the long-term value of their property so they won't succumb to quick-cash offers from speculators
- Keeping people and dollars in the community by developing vibrant "third spaces"—restaurants, bookstores, and cafes

BEING THE "BEST"

One of Carter's crown jewel accomplishments is establishing a training program (BEST) to prepare the neighborhood's many unemployed for local green color jobs designed to improve the neighborhood. Through BEST job training, residents learned such ecofriendly skills as green roof installation and maintenance, urban

forestry, brown field clean up, and the retrofitting of buildings to increase energy efficiency. When local jobs became available, BEST graduates were the first to be tapped.

Programs such as BEST are a key component to ensuring localization, Carter notes. "Retaining homegrown talent is a critical part of creating a strong local economy that can resist gentrification," she writes. "But too many people born in low-status communities measure their success by how far away from them they can get."

COVID-19, LOCALIZATION, AND SUPPLY CHAINS

The influence of the pandemic on supply chains has been a mixed blessing. Entrepreneurs like Mark Cuban are making it easier for people to shop from local stores online by supporting the tech startups that make that possible, such as [U.S.A. Strong and Nearby](#). This local shopping phenomenon is partly due to the desire that started during COVID-19—people wanted to shop closer to home and are less likely to have loyalty toward a big box store.

"Much of the passion and effort needed to continue progress in creating a sustainable world will come from millennials."

A [recent article in the New York Times](#) covered the progress China is making in creating batteries using sodium rather than lithium. This is not a surprise; China is far ahead of any other nation in researching and deploying new batteries. But the research-related implications here are huge: Sodium has significant advantages over lithium-ion batteries. It's more abundant than lithium, is less expensive to mine, and does not need scarce elements such as cobalt and nickel to function. And, sodium batteries operate at full power in well below-freezing temperatures, whereas lithium-ion batteries lose efficiency in cold weather.

However, two factors in battery production lean toward localization. The U.S. has about 90 percent of the easily processed salt globally. The salt is abundant and easily extracted from fly ash underground in Wyoming. Miners are protected from workplace misuse and exploitation, and sodium is much less environmentally harmful to extract from the Earth.

Also, cars have batteries that can charge at home or during the day on rooftops and parking

garages at the local shopping center, powered by the sun. Batteries are produced locally; and they support [distributed generation](#) goals, making the grid more flexible, efficient, and responsive to local power fluctuations or shortages—meaning fewer power blackouts or rolling blackouts. A more-stable grid might even reduce the chance of forest fires.

THE FEDERAL GOVERNMENT'S ROLE

The Inflation Reduction Act (IRA) reveals that big national government can use its power to support people in local communities outside of Washington, D.C. According to the [Rocky Mountain Institute](#), in the next 10 years or so, the IRA will result in:

- 2.4 million electrification upgrades for low- and moderate-income families.
- 1.2 million whole-house, performance-based energy retrofits of market-rate homes.
- 7.2 million heat pumps installed
- 115 million square feet of retrofitted commercial space

IRA offers states and local governments much leeway in deciding what to do with the money and how to spend it. For example, \$30 billion will go to state and city governments for greenhouse gas reduction programs for local communities.

Also, the Biden Administration, the EPA, and the U.S. Department of the Treasury recently announced changes in the incentives for electric vehicle (EV) adoption. There are now several requirements that help push a localization agenda.

- The Federal government is offering a tax credit of up to \$7,500 for buying certain electric or hybrid vehicles. Only 11 cars made by Tesla, General Motors, Ford and Volkswagen will qualify for the full tax credit.
- Only domestic automakers will qualify. Automakers must get a certain percentage of materials for batteries from the United States or its allies, but not China, to be included in the tax credit program.
- The number of eligible vehicles will gradually increase as more EVs are in domestic manufacturers' lineups. There are income limits for buyers and sales price limits for cars. The Ford 150-Lightning (the electric version of the standard Ford 150, which in 2022 was the most popular vehicle in America) will qualify for the full credit. But the Ford Mustang electric version will be eligible for only half, or \$3,750—sorry, Boomers. **GB**

Friendlier, Faster Food

FRESH EATS YOU CAN WALK TO AND CARRY HOME (ON FOOT OR BY BIKE).

There are now more than 8,000 farmers' markets in the United States that are transforming the way people shop and eat. Locally grown produce tends to be organically grown. It also holds better nutritional value than food grown thousands of miles away, which has to be shipped for long distances by ship or truck before it comes to the local big-chain supermarket.

Local farmers are teaching people how to eat this fresh food, and also to fight ecological injustice. **According to the Farmers Market Coalition:**

- Small farmers that source locally and market directly to customers are more likely to be women and younger than traditional farmers selling to the wholesale market.
- Small farmers that serve a local community experience fewer business closures and bankruptcies than those that market exclusively to the wholesale market.
- Farmers' markets and direct marketing farms help local communities live more sustainably. About 80 percent of small farmers use cover crops, onsite composting, and other healthy soil practices; about the same number practice organic farming.
- The U.S. Department of Agriculture reported that direct-marketing farms made nearly \$2 billion in 2020. Most of those sales took place in farm stores and farmers' markets.
- Good nutrition leads to healthier children, who are more likely to do well in school. The Supplemental Nutrition Assistance Program (SNAP) used at farmer's markets has risen by around 150 percent since 2017. In 2021, \$100 million was spent using SNAP and other food assistance programs.



Green food, greener thinking. Farmers' markets are a major source of healthier, fresher foods—and a way to emphasize sustainability at a business level. CREDIT: GRAPHIC NODE/UNSPLASH

THE GREAT RE-ENERGIZATION

TRANSITIONING TO AN ALL-ELECTRIC CULTURE IS STILL YEARS AWAY. UNTIL IT'S FIRMLY IN PLACE, THERE ARE LOT OF PREPARATIONS TO MAKE.

BY ALEX BOYD

EDITED BY ALAN NADITZ

Imagine, if you will, a post-transition world, sometime in our future:

You wake up early to start your day. It's a chilly winter morning, but since your utility switched to renewables, you confidently turn the thermostat and switch the lights on (rolling blackouts are a thing of the past).

And not only is the electricity renewable, but you're also moving heat from one place to another using a heat pump, the most efficient way to heat spaces.

You meander into the kitchen to fill the espresso machine with water directly out of the tap. Water quality and availability have now dramatically improved; there's no need for extra filtration.

Your teenagers (yes, you have kids now!) are up and dressed, cooking their breakfast on your electric stovetop since gas appliances were discarded years ago. Your induction cooktop creates the heat exactly where it's needed, in the base of the pan. And because drought events have been curtailed, food production has increased, and you have a robust variety of produce to offer your family.

Meanwhile, you're reading the news on your device, and articles about energy security are scarce. Countries have reduced their reliance on oil, gas, and coal imports and are using local, renewable resources instead. You shuttle the kids to their respective schools in your electric vehicle (EV), grateful that all vehicles on the road are now EVs. No more respiratory issues, and the traffic noise has declined. Perhaps you live in the city and your kids walk to school. They're no longer breathing toxic exhaust fumes.

As you progress to work, you see a friend walking her dog at a community park where there was once an industrial site that spewed pollutants into the air. At work, you observe the real-time display in the lobby that tracks the amount of electrical and thermal energy used in the building. The amount equals the renewable energy generated on-site via solar panels, making it a net-zero space.

What a perfect world, as crafted by PSC CEO Alex Boyd in his eBook, "[Perspectives on the Energy Transition](#)." It sounds almost too perfect. And yet, Boyd notes, there's no reason it can't become true. We are, in fact, working toward

an all-sustainable state, gradually transitioning away from fossil fuel dependence. But there are significant—but not insurmountable—obstacles in the way.

THREE WAYS TO START THE CLEAN-LIFE CONVERSATION

Boyd stresses that any dialogue about energy transition must begin by answering three questions:

What is it? The energy transition is about a transformational shift away from fossil-based sources to zero-carbon sources by the second half of this century, intending to reduce energy-related carbon emissions to mitigate climate change and limit global temperature to within 1.5 degrees Celsius of pre-industrial levels.

What's driving the energy transition, and why is it so important? Beyond the urgency of climate change, the need for the global energy transition is emphasized by energy security concerns, high fossil fuel prices, pollution-causing disease, and the conservation of our natural resources. Technology is powering the energy transition, supported by a societal shift towards a sustainable future and facilitated by renewables and electrification. The energy transition represents transformative change across the entire value chain, from generation to consumption. Switching from one energy source to another takes a long time, so part of the importance is the sheer urgency of getting started and creating the necessary momentum to scale up.

How does the energy transition impact me?

The energy transition is not a theory—it is happening now. The energy mix is changing, with renewables outpacing fossil fuels and new technologies taking hold. The benefits of the energy transition mainly affect the environment, but our economy and society also share positive outcomes. "As energy consumers, we should be informed to make the best choices toward a just transition," Boyd notes.





Image created with AI technology.



ABOVE:

Circuit state of mind. An estimated 1 in 12 homeowners have installed solar panels in their homes, while another 4 in 10 are giving it “serious thought,” according to Pew Research.

LEFT:

Old meets new. Until the transition is complete—a process that will take decades—the worlds of clean energy and fossil fuels will need to peacefully coexist.



WHY WE SHOULD CARE ABOUT ELECTRIFICATION

For Boyd, there's a single word for why clean energy should be on everyone's minds: health. Environmental pollution and burning fossil fuels is taking a toll on everyone's health. The World Health Organization (WHO) estimates that **99 percent of the global population is exposed to air pollution levels** that put them at increased risk for heart disease, stroke, chronic obstructive pulmonary disease, cancer, and pneumonia. Additional data on environmental pollution and its effects paint an even more sobering picture. Each year:

- 6.7 million people die from indoor and outdoor air pollution
- \$886.5 billion is spent on the health impacts of fossil fuel-generated electricity
- 50 billion metric tons of greenhouse gasses (GHGs) are emitted
- 350,000 premature deaths occurred due to fossil fuel-related air

In contrast, the growing use of renewable energy sources and mandates focused on elec-

trification and decarbonization are driving the current energy transition:

- Global renewable energy consumption in 2019 increased from **8.7 percent (2006) to 11.2 percent (2019)**.
- The **Paris Agreement** is working to limit global warming levels and reduce GHG emissions.
- In 2021, the U.S. established a new target to achieve **80 percent carbon-free electricity by 2030**.

The data also reveals the health advantages of renewables. In 2021, a team of environmental researchers projected that improvements to air quality and health, per unit of CO₂ reduced and renewable energy deployed, would exceed the costs by approximately one-third.

NO MORE "EITHER/OR"

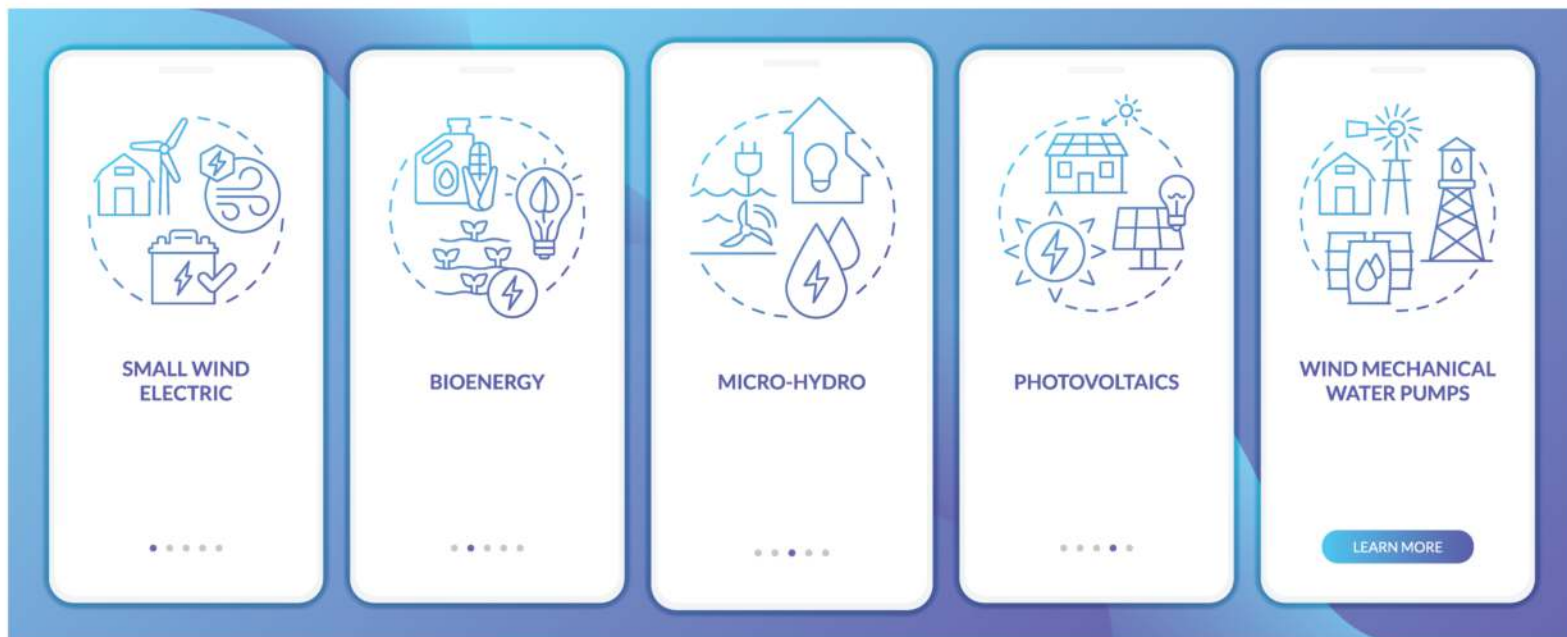
Boyd notes that there have been two sets of arguments when it comes to electrification and conversion from fossil fuels. For example, the EPA states that **EVs typically have a smaller carbon footprint than gasoline cars**, even when accounting for the electricity used for charging.

ABOVE:

Powering up. Electric vehicles currently account for just 1 percent of all vehicles on the road in the U.S., according to the Environmental Protection Agency. That number is expected to at least triple by 2028.

RIGHT:

Tomorrow starts today. With the move to renewables, there will be a substantial positive impact on homes, businesses, services, public spaces, and the supply chain. SOURCE: PSC



ABOVE:

A very 'smart' phone. Information about clean energy, including its various forms and their importance to the environment, can be accessed via apps such as *Renewable Energy Sources* and *Renewable Energy*.

 Energy will become renewable, abundant, and affordable. - No need to ration or avoid energy use - No more rolling blackouts during extreme weather - Most energy needs met by unobtrusive infrastructure - Electricity infrastructure is affordable to build and maintain - Energy equity has been addressed - Clean energy is affordable for all	 Cities will be cleaner and quality of life will soar - EVs eliminated most toxic emissions, resulting in cleaner air - Coal-fired plants no longer belch pollutants into the air - Climate-driven natural disasters are mitigated - Population is healthier and happier - Measurable reductions in respiratory illness - Reduced noise pollution	 Businesses will operate more cost-effectively - Renewable energy sources reduced business overhead costs - Acquiring raw materials and products is less expensive - Heat pumps create more useful space heating compared to the amount of energy needed to produce the heat	 Our natural environment will become healthier - Sea level has been reduced - The frequency and intensity of heatwaves, heavy rainfall, and droughts have been lowered - Wildfires have been mitigated significantly - Less destruction to land and less pollution in the air - Natural ecosystems and the animals that live in them are no longer at risk of extinction	 Wholesome foods will become more plentiful and available - Droughts that affect food production are less frequent - Water quality and availability is improved
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And, as more renewables are used to generate electricity to charge EVs, the associated emissions could be even lower—an evolution not possible with internal combustion engine vehicles.

Also, reducing the use of fossil fuels in transportation and electricity generation will result in cleaner skies, fresher air, access to clean energy, and better overall health—specifically for those exposed to higher levels of air pollution and those who are least able to afford to mitigate its effects.

On the other hand, some consider renewables to be complex due to their intermittent nature (i.e., the wind doesn't always blow, and the sun isn't always shining). Others believe that because distributed renewables are often small and behind the meter, it can be difficult for grid operators to track and complicate load forecasting.

And while moving to green electricity offers many benefits, an adequate infrastructure is required to prepare the grid for the widespread use of fossil fuel alternatives: electric car charging stations, transmission lines to carry electricity from new wind and solar farms, and retrofits in existing buildings.

These types of opinion differences result in a polarization between the pro- and anti-renewables groups. “The current energy transition approach is ‘either/or,’” Boyd notes. “We either continue to embrace our fossil fuel energy system or make a complete shift to renewables.”

This approach is flawed because it assumes there is only one option to resolve a situation (i.e., if ‘X’ is true, ‘Y’ must be false), Boyd writes. It can also encourage extremism, creating a counterproductive environment to achieve workable solutions.

“As we transition to renewables, the only realistic scenario is ‘both/and,’” Boyd notes. “Just because we’re on the path toward integrating more renewables doesn’t mean we aren’t aware of or grateful for the vital role fossil fuels have played in ensuring decades of secure, reliable energy supplies.”

For example, oil and gas companies are plowing money into clean alternatives to fossil fuels and are already emerging as strong contenders in post-transition utility models, Boyd adds.

NO OVERNIGHT SOLUTION

The bottom line is that people need to understand that people can’t just shut off fossil fuels, according to Boyd. A shift of this magnitude takes time and requires thoughtful and strategic planning to support and create an industry ecosystem in which it can thrive. The foundation of this planning is cooperation and collaboration between the renewables sector and fossil fuels stakeholders.



“Fossil fuels will still play a vital role during this multi-decade transition. We have a long way to go,” he notes. “Our best strategy will be an ‘all-fuels-on-deck’ approach with teamwork rather than conflict.”

A key part of that strategy lies with aligning the various stakeholders to sustainable causes—something that may not be as difficult as people think. Many are motivated and support the energy transition:

- **Deloitte’s 2022 CxO Sustainability Report** indicates that businesses are responding to the climate crisis with net-zero commitments and actions.
- The power sector is leading the effort to decarbonize electricity production by transitioning from burning fossil fuels to renewables.
- In 2021, clean electricity sources generated **38 percent of the world’s electricity**, more than coal (36 percent) for the first time.
- Automotive companies are setting long-term goals to end ICE vehicle production, counter to the short-termism often associated with public companies.
- Big oil and gas companies (e.g., Shell, Total) are adopting clean-energy strategies and investing in renewable energy generation and related businesses.
- A **2022 Pew Research Center survey** found that 69 percent of U.S. adults prioritize developing alternative energy sources (i.e., wind and solar) over expanding the production of oil, coal, and natural gas.

“The [energy transition] requires collaboration across all stakeholders: utilities, regulators, governments, consumers, businesses, industry, academia, and others,” Boyd notes, “recognizing that one entity doesn’t hold the reigns.” **GB**

PSC offers independent consulting and engineering solutions for utilities and energy companies.

ABOVE:

Deep impacts. As we become more aware of the deadly effects of air pollution, particularly from fossil fuel burning, changing energy sources gains new urgency.

TRANSFORMING OUR FUTURE: THE FUSION SOLUTION

For the first time, scientists produced a fusion reaction that resulted in a net energy gain. What does that mean for a clean energy future?

BY SARA GUTTERMAN

The recent fusion breakthrough made by scientists at the Lawrence Livermore National Laboratory is a true game-changer for the future of clean power. The process, called internal confinement fusion, has real star power, literally—it uses the same reaction that powers the sun.

According to Carolyn Kuranz, Associate Professor of nuclear engineering at the University of Michigan, fusion is a nuclear reaction that combines two atoms to create one or more new atoms with slightly less total mass. The difference in mass is released as energy, as described by Einstein's famous equation, $E = mc^2$, where energy equals mass times the speed of light squared. "Since the speed of light is enormous, converting just a tiny amount of mass into energy—like what happens in fusion—produces a similarly enormous amount of energy," she notes.

This energy is very clean. Nuclear fusion releases vast amounts of energy without producing toxins like carbon dioxide or other greenhouse gases, unlike fission (the way nuclear power is currently produced), which splits uranium atoms and generates long-lived radioactive waste.

The main byproduct of fusion is helium, an inert, non-toxic gas. Furthermore, there is no risk of a nuclear meltdown with fusion—when the plasma produced during the fusion process cools, the reaction stops.

SO, WHAT NOW?

In an amazing feat of technology, the scientists at Livermore National Lab utilized 192 giant lasers to zap a small hydrogen plasma pellet, creating approximately 3 megajoules of energy, a factor of 1.5 in energy gain.

Until now, fusion processes required more energy than they generated. But with this landmark discovery, scientists have unleashed a possible pathway to provide humans with bountiful clean energy.

According to the U.S. Department of Energy (DOE), nuclear fusion has the potential to produce nearly 4 million times more energy than traditional fossil fuel resources like gas, oil, and coal, offering the amount of baseload energy necessary for our ever-growing electrical needs (especially as we electrify homes, buildings, and vehicles.)

While the commercial viability of fusion is years—perhaps decades—away, the prospect of this low-cost, no-emissions energy is thrilling.

But time is ticking. Most climate scientists assert that if we're going to stay under the threshold of 2-degree Celsius temperature rise (or the more-ambitious target of 1.5 degrees), we need to reach net-zero global emissions by 2050.

To scale an innovation like nuclear fusion in such a short timeframe, we're going to need a veritable moonshot with lightspeed scientific and

technological advancements. Initial costs and investment risk will be high, gradually dropping over time with economies of scale, ongoing innovation, and increased demand.

According to the Fusion Industry Association, more than 30 companies are working on developing nuclear fusion technology, representing more than \$4.8 billion in funding. Will that be enough to make fusion dependable, replicable, and cost-effective in time to meet our changing climate needs?

A CURE FOR ALL OF OUR ILLS?

By the end of the century, demand for energy will have tripled under the combined pressure of population growth, increased urbanization, and expanding access to electricity in developing countries.

While the fusion breakthrough adds an entirely new dimension in our quest for a clean energy future, it's not a total panacea. We have to keep our eye on the ball.

We know the roadmap, which includes:

- Reaching peak emissions by 2025, which is now possible due to advancements in solar, wind, and battery storage technology, as well as heightened financial and political motivation to transition to renewables due to Putin's war in Ukraine.
- Continued funding for climate-positive solutions, such as CarbonTech innovations like carbon-storing concrete, NatureTech solutions that advance forest conservation, recycled steel, hydrogen infrastructure, water filtration and processing technologies, and regenerative agricultural solutions—all of which create new jobs and cut pollution. More than \$850 billion was poured into climate solutions in 2021, equal to the amount of fossil fuel investments during that same timeframe. Investments in climate solutions are expected to exceed fossil fuel investments in 2022 for the first time ever.
- Divesting from fossil fuel companies, which will continue to occur at a quickening pace as the world's largest banks pull their \$1.35 trillion out of this area in the face of mounting stranded asset risk.
- Driving the adoption of science-based targets and aggressive standards for organizations throughout the economy, such as those established by the Science Based Targets Initiative (SBTi): 50 percent reduction of actual emissions within a decade and 95 percent or more reduction by 2050.

It's an exciting time, with ample opportunity for anyone with just a little ambition and imagination. **GB**

THE GREAT REWILDING



THE WORLD'S WILDLAND ECOSYSTEMS ARE ON THE BRINK. HERE'S HOW PEOPLE ARE TRYING TO REVERSE THE DAMAGE.

BY GREEN BUILDER STAFF

The term “rewilding” is hardly a household word. Some may think it’s a fancy moniker for “back to nature,” and they would be partially right. [The Rewilding Institute](#) offers a more complete version: “Rewilding is comprehensive, often large-scale, conservation effort focused on restoring sustainable biodiversity and ecosystem health by protecting core wild/wilderness areas, providing connectivity between such areas, and protecting or reintroducing apex predators and highly interactive species.”

It’s a term that applies to the Earth’s environment more than ever. An apocalyptic [report from the United Nations](#) estimates that up to 75 percent of the planet’s

terrestrial environment has been “severely altered” by human actions. More than 85 percent of wildlands present in the year 1700 had been lost by 2000. Up to 1 million of the world’s 8 million plant and animal species may be extinct by century’s end. And that’s some of the more-positive data.

“The health of ecosystems on which we and all other species depend is deteriorating more rapidly than ever,” notes Sir Robert Watson, chair of the report’s key producer, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). “We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide.”

Rewilding is a way to reverse some of the damage, according to Northwestern University Associate

At the precipice.

The world’s ecosystems are in danger of collapsing due to human interaction, according to the United Nations. But there’s hope if people work toward undoing the damage through rewilding over the next few decades.



Professor of Architecture Marie Law Adams. “Rewilding can’t return landscapes to pre-settlement times,” she notes, in a New York Times report. “Instead, the aim is to encourage natural processes that serve people and wildlife.”

Such an approach could mean removing dams, building tunnels to reconnect migration pathways severed by roads, or reintroducing predators such as wolves to help balance ecosystems, according to NYT.

“The idea might seem best suited to remote areas where nature is freer to heal without interference,” the report notes. “But rewilding also happens in some of the world’s biggest urban centers, as people find mutually beneficial ways to coexist with nature.”

A report from [Zoological Society of London](#) offers quite a few examples, including:

- In Singapore, a 1.7-mile stretch of the Kallang River has been converted from a concrete-lined channel

into a twisting waterway lined with plants, rocks and other natural materials and flanked by green parkland.

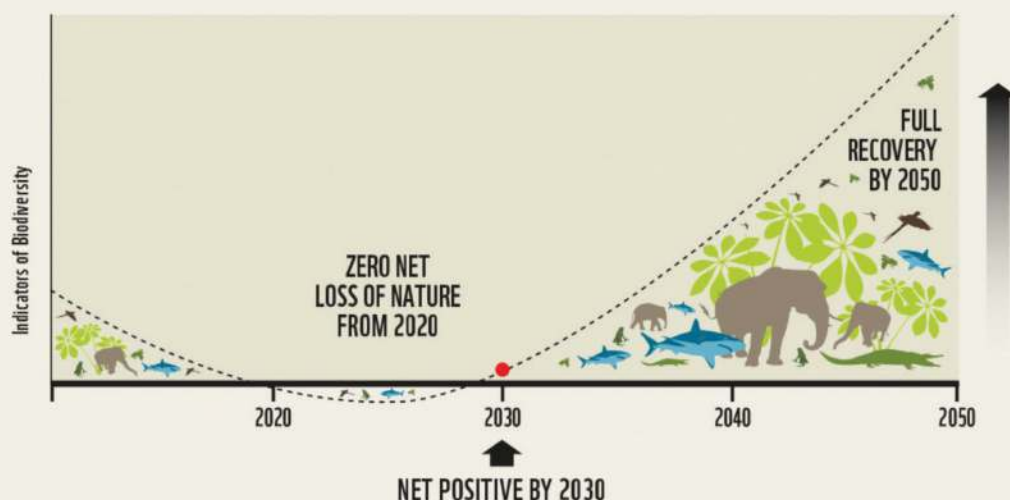
- The German cities of Hannover, Frankfurt and Dessau-Rosslau have designated vacant lots, parks, lawns and urban waterways as areas “where nature could take its course.”
- In 2021, London allocated \$750,000 toward restoring 45 urban rewilding projects to improve habitats for insects, birds and rural water life.
- Chicago’s [Shedd Aquarium](#) and the nonprofit [Urban Rivers](#) are installing 3,000 square feet of “floating wetlands”—a series of man-made plat forms that float on the surface of the water and interlock to form larger islands—along the Chicago River to improve water quality and encourage the return of native species of fish, insects, birds and other wildlife.

Looks like landscape.

Chicago’s Shedd Aquarium and nonprofit Urban Rivers added new habitat to the South Branch of the Chicago River in the form of floating wetlands. They’re meant to mimic the island clusters found in less developed rivers and will provide food and shelter to native wildlife.

CREDIT: BRENNIA HERNANDEZ/SHEDD AQUARIUM

Global Goal for Nature: Nature Positive by 2030



REBUILDING AN ECOSYSTEM

And then there's the Great Cypress Swamp, a 10,600-acre wetland near Delaware's Chesapeake Bay. It's the statewide land trust [Delaware Wild Land](#) (DWL)'s largest land holding and the state's largest contiguous block of forestland. But it's a fraction of its original size—about 100,000 acres a few hundred years ago, according to botanist Dr. Stephen Brewer.

The swamp's deterioration stems from the usual culprits: excessive timbering, agricultural conversion and low-density residential development, as well as two major fires, notes Brewer. He is a member of [Wild Earth Allies](#), a nonprofit that for three years has been working with DWL on restoring the area.

It's a very important project because of the impact the swamp has on the world's environment, Brewer emphasizes. As a vital part of two major watersheds—the Delaware Inland Bays and the Chesapeake Bay—it provides essential ecosystem services to the rapidly developing Delmarva Peninsula, a 170-mile-long region about 100 miles to the east of Baltimore.

Large, forested areas like Great Cypress filter, store, and moderate the availability of rainwater. This protects the flow and quality of water in rivers and streams, critical for biodiversity and for clean drinking water, Brewer notes.

In addition, trees create a major climate benefit over the long term by taking up and storing carbon dioxide in the form of wood, leaves, and roots. They also provide shade, and absorb and release water into the atmosphere, cooling the Earth in the short term. Meanwhile, larger, older trees account for most of the total carbon stored in mature forests.

The swamp is also beneficial to migratory birds along the Atlantic flyway, as well as other species of plants and animals, Brewer adds.

Thus far, Wild Earth Allies and DWL have planted an estimated 13,000 seedlings of native plant species as they

restore 200 acres of swampland. There's also been 37,000 cedar trees planted on priority areas of the swamp.

Combined with restoration efforts by other groups over the past decade, the area has seen a 124 percent increase in plant diversity from 1998 to 2022. "Greater plant diversity makes an ecosystem more resilient and more resistant to catastrophic disturbances—either natural or unnatural," Brewer says. "Forests with higher plant diversity clean and filter water more effectively. The roots of plants hold organic matter together, allowing a more-even waterflow into the system. A lack of plant diversity can lead to flooding and drought."

In addition, the more types of plants the swamp has, the more wildlife of all kinds it supports, Brewer says.

Through DWL, surrounding communities and landowners have offered strong support for restoration efforts. The key is knowledge, according to Brewer. DWL knows the area's natural history and the swamp's varied ecosystems. And, DWL has been a part of the local community for decades, so people know what DWL—and Wild Earth Allies—hope to accomplish.

Which brings us back to the IBPES report. The findings are grim, but they are also eye opening, according to Watson. "The report also tells us that it is not too late to make a difference, but only if we start now at every level from local to global," he notes. "Through 'transformative change,' nature can still be conserved, restored and used sustainably."

But it's time to shed bad habits, adds Audrey Azoulay, director general of UNESCO, which is a co-producer of the report. "This [reminds] each of us of the obvious truth: The present generations have the responsibility to bequeath to future generations a planet that is not irreversibly damaged by human activity," Azoulay notes. "Our local, indigenous and scientific knowledge are proving that we have solutions and so, no more excuses. We must live on earth differently." **GB**

Positive thinking

Despite the current dire circumstances, the world ecology resource [Nature+Positive](#) forecasts what can happen to Earth's ecosystem if rewilding and other sustainability efforts kick in by 2030.

SOURCE: [NaturePositive.org](#)

SEEDS OF KNOWLEDGE

THIS FLOWER-HAPPY COUPLE IS BRINGING PLANT LIFE BACK TO SAN FRANCISCO.



Creating a buzz.
San Francisco residents Shalaco and Phoenix McGee have spent a decade adding color to city landscape while spreading knowledge of green gardening.
COURTESY OF SPINBLOOM

PEOPLE CALL SHALACO AND PHOENIX MCGEE “GUERRILLA GARDENERS.” They get a thrill from “flower bombing” San Francisco neighborhoods, “spreading the gospel of the seeds.”

Sometimes they do it while they’re walking through a random neighborhood, looking for neglected patches of land, where they can use parmesan cheese shakers to distribute native wildflower seeds. Sometimes the seeding is done while they’re on one-wheeled electric skateboards. Other times, they’re dressed as bumblebees.

For them, it’s simply a matter of “democratising nature.” They want people to identify, understand and appreciate what’s around them.

It all started as a way to support pollinators, which are crucial to the production of about one-third of all crops eaten by humans, according to Phoenix. In recent years, pollinators such as bees have been in decline, partially due to climate change, and partly due to human ignorance. Wildflowers offset that situation by providing habitats for local wildlife; they also improve soil health. Native plants also require less water, which is a definite plus during times of drought.

Of course, it all really started during the couple’s first date. Shalaco, who owns a video production studio, and Phoenix, a sustainable landscape gardener, transplanted an abandoned aloe tree into a neighbor’s backyard. The two discovered they shared a love of plants. Ten years later, the fruits of their labors are all over the city. “We do it year-round,” Phoenix says. “The seeds will grow

when the time is right. And sooner or later, you will run into your plants.”

Shalaco refers to that moment as “being like a magic trick.” But they don’t take the credit—that belongs to Mother Nature. “It’s just a nice way to make a forgotten space full of flowers,” he says.

They truly love what they do, and it’s contagious. People in other cities have caught on. Videos made of the couple doing their thing appeared on TikTok a few years ago. They now have 250,000 followers, more than 5 million likes, and 40 million-plus views. Instagram, YouTube, Twitter and Facebook users have since joined the party. “Viewers love our passion,” Shalaco says. “Some of them say that they’re not really into trees, but they love how passionate we are.”

The couple is flattered to be in such a big spotlight, and they welcome the fact that so many other people now want to take up parmesan shakers and colorize their neighborhoods. But they caution people to do research before they start. Go to a local garden shop, check city ordinances, read up on the proper types of plants to grow in an area—whatever seeds go out need to be for native, non-invasive vegetation.

“Anyone can do this,” Phoenix says. “It doesn’t matter your situation—if you rent, or living in a dark house, or only have concrete—there are always ways that you can grow plants where you live.”

People can also get more information from the couple’s website, [@SFinBloom](#), or Phoenix’s business site, [Green Earth Gardeners](#).



POWER SHIFT



Generation gap? Although similar, millennials and Generation Z have different views and priorities about the economy, sustainability, home purchases and more.

When it comes to generational influence, there's a massive transition underway—with millennials and Gen Z calling the shots.

BY SARA GUTTERMAN

Prepare for a changing of the guard. Baby boomers are currently the wealthiest and most influential generation. Weighing in at 70.2 million strong, boomers hold 53 percent of all U.S. household wealth and comprise a majority of S&P 500 CEOs, chief justices, and state governors. They have worked longer than the generations before them, but they are now retiring in droves.

Generation Xers are poised to inherit the boomers' wealth and leadership positions, but an uncontested ascension isn't guaranteed. Xers do presently have the highest level of cultural influence, dominating top positions at large news corporations and media outlets, and they're at the peak of their careers. But millennials and some enterprising Generation Zs are in hot pursuit.

As millennials and Gen Zs emerge, they're changing the rules of engagement. In the face of divisive politics, existential environmental threats, global pandemics, and social justice challenges, younger

generations are calling out a broken status quo, demanding an urgent reckoning, bold leadership, and a radically better future.

Born from crisis, the passion, purpose, optimism, and outrage of these generations is creating endemic structural change. The generations that grew up with active shooter drills in schools, fake news, and catastrophic climate events have had enough.

Exhausted with how negative and divided our country has become, these younger individuals are flipping the script on the current national dialogue.

And they're motivated to act: According to Green Builder Media's COGNITION Smart Data, more than 80 percent of these budding leaders believe that they can—and must—step up to make a difference in the world. Will their undaunted optimism yield a radical reimagination of our culture?

GENERATIONAL CONTEXT

Each generation is shaped by its own unique historical context, including events, wars, recessions, elections, social movements and cultural experiences, creating a shared perspective about the world.

As younger generations move into positions of power, they are influencing society, shaping it to conform to their world view, which makes it particularly important to understand the nuanced purchase drivers, penchants, and behavioral patterns of millennials and Zs so that we can know what to expect for the future.

While the two generations have similarities, they're actually quite different, with divergent preferences and expectations based on the events that took place during their formative years.

MILLENNIALS: THE DRIVING FORCE

Millennials (born between 1982 and 2000) have been top of mind for builders, developers, and manufacturers alike for years, and with good reason: 88 million strong, this group boasts a total spending power of more than \$2.5 trillion.

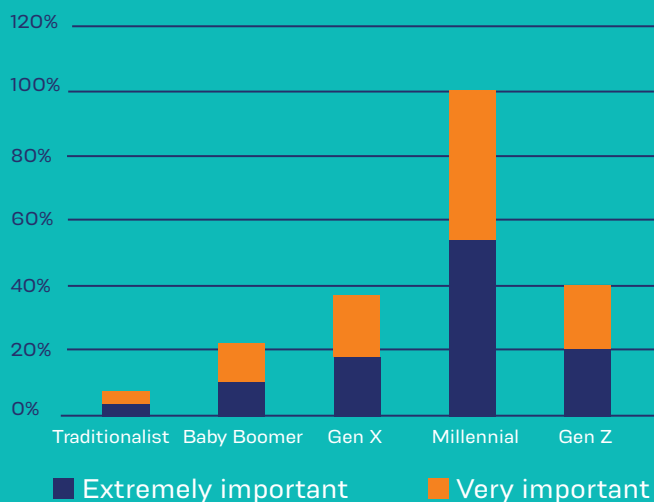
Values based and mission driven, millennials place purpose over paycheck, care deeply about the environment, and incorporate sustainability into their decision making.

According to a recent survey conducted by COGNITION Smart Data, Green Builder Media's market intelligence division, 87 percent of millennial respondents are worried about climate change, 93 percent believe that companies should take a stand on environmental issues, and 78 percent prefer purchasing products from sustainable brands.

Fifty-six percent of COGNITION survey respondents believe that humanity is doomed due to climate change. In fact, these millennials claim that failure to mitigate and adapt to climate change is their top global risk of highest concern, more so than economic or social instability, COVID, terrorism, or gun violence.

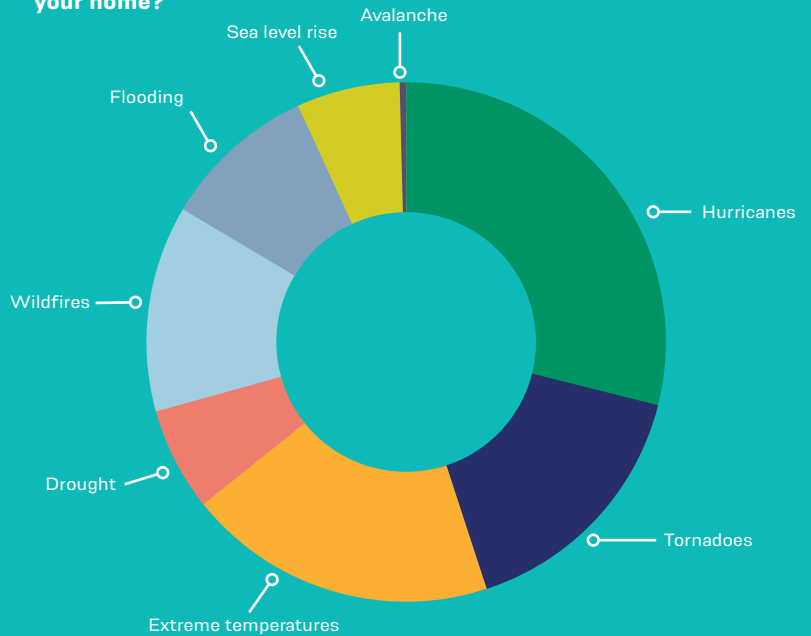
Out of all the generations, millennials report the highest level of interest in resiliency, perhaps because they're directly experiencing negative impacts from climate-based events like superstorms, tornadoes, wildfires, flooding, and extreme heat.

How important is resiliency when making decisions about buying a home and products for your home?



SOURCE: GREEN BUILDER MEDIA

Which impact of climate change poses the greatest threat to your home?



SOURCE: GREEN BUILDER MEDIA

GEN ZS ON THE RISE

Generally speaking, Gen Zs are individuals born between 2001 and 2019. Weighing in at approximately 78 million, they command a combined spending power of nearly \$360 billion—a number that will grow substantially over time as their net worth increases. The oldest Gen Zs are graduating college and starting to think about buying homes.

Millennials and Gen Zs resemble each other in certain respects—for example, both generations value work-life balance and remote working. However, the events that defined their childhoods resulted in divergent global outlooks.

Millennials were raised during a time of relative economic growth and prosperity, whereas Gen Zs' childhoods were marked by two crippling recessions and a global pandemic. As a result, Zs tend to be more debt-adverse and budget-conscious than their older peers.

Perhaps because of the general instability of their childhood years, Gen Zs indicate that they experience stress and anxiety on a daily basis. They believe that mental health should be openly addressed in the workplace, and they're looking for jobs that offer benefits like mental health days, therapy, and access to medication.

Gen Zs are the most diverse generation in American history. While millennials embrace and celebrate diversity, equality is a guiding principle for many Zs. Expect this generation to become even more vocal about their passions and concerns over the coming years as they continue to mature.

Gen Z is considered to be a highly sensible generation. They value realism, safety and security, and solving real problems.

When it comes to purchase decisions, Gen Zs—who never knew a world without the Internet—rely heavily on YouTube. According to a survey conducted by YPulse, 64 percent of Gen Zs access the majority of their media content on YouTube—it's the first place they go to get information about something they don't know (whereas millennials tend to go to Google).



Additionally, YPulse found that Zs are more likely to follow the purchase recommendations of social media influencers than millennials (60 percent versus 42 percent).

Another essential difference between the two generations: Millennials grew up spending time in-person with their friends, whereas Zs have had more remote engagement due to the forced separation caused by Covid. Zs are inclined to rely on remote learning, gaming, social media, and the metaverse as communication and socialization tools. Because of this, Zs are more inclined to spend time and work alone than their millennial counterparts.

MILLENNIALS

Used more limited technology as children

Felt a stronger economy when young

Less globally connected at younger age

College-going, debt accumulating

Wore branded clothing

Less focused on social justice

GENERATION Z

Used more advanced, on-the-go technology

Felt great recession when young

More globally connected at younger age

College maybe, debt aware

What brands?

More focused on social justice

SOURCE: GREEN BUILDER MEDIA

GEN ZS AND HOUSING

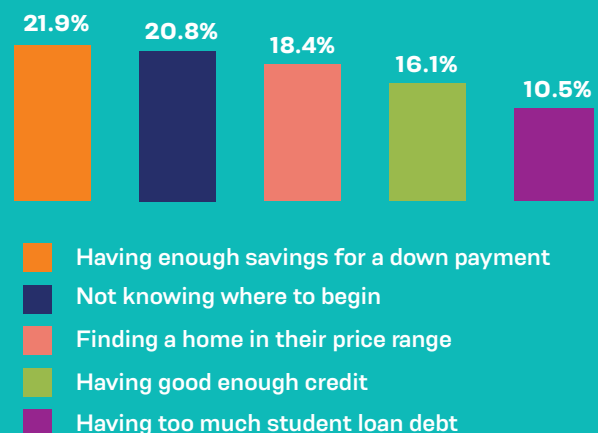
The American Dream is alive and well in line with the Gen Z generation. COGNITION data reveals that 86 percent already have set their sights on homeownership. And, with the recognition that paying higher prices for a home is a better prospect than paying ever-increasing rents, these individuals indicate that they want to purchase homes quickly.

According to Rocket Homes Research, nearly 45 percent of Gen Zs want to purchase a home within a speedy 5 years.

Older Gen Zs who are purchasing homes are generally entering the market in small or mid-sized, affordable markets.

While long on desire, Gen Zs still face a rocky road in the home buying process. The biggest challenge that this generation is facing is unrealistic expectations about home prices: on average Gen Zs have an expectation that they'll pay around \$223,000 for a home, whereas the median national home price has reached a bloated \$425,000.

GEN ZS TOP 5 ANTICIPATED OBSTACLES FOR HOME BUYING



SOURCE: ROCKET HOMES RESEARCH



As with general purchase drivers and behavioral patterns, millennials and Gen Zs have similarities and differences with respect to their housing preferences.

According to a recent survey conducted by COGNITION Smart Data, both audience segments incorporate sustainability into their purchasing decisions and report that Environmental, Corporate, and Governance (ESG) is the most influential factor when making decisions about purchasing products for their homes. Millennials indicated that the environmental elements of ESG were the most important to them, whereas the social aspect was most important to Zs, with diversity, equity, and inclusion ranking top on their list of social concerns.

Because of their budget-conscious nature, Zs are more likely to consider long-term value, not just upfront cost, when purchasing a home since they understand that a more energy-efficient home will be more affordable over time.

COGNITION data reflects that millennials care deeply about healthy homes—in fact, they're the first generation to indicate that having a healthy home is now as important as location when making homebuying decisions. With that said, the data shows that Gen Zs place an even greater value on healthy homes than millennials, and that Zs have a broader definition of what

healthy home means.

While healthy homes used to be the purview mainly of indoor air quality (including mechanical systems like HVAC, ventilation fans, and energy recovery ventilators [ERVs] and non-toxic materials), the concept of a healthy home has expanded over the past two years to incorporate healthy cooking, sustainable lifestyle choices, and stress relief. Younger homeowners and buyers are rethinking their lifestyle choices, including habits, diets, and exercise regimens to keep their families psychologically and emotionally healthy.

This translates into increased demand for home features like:

- Intimate spaces for calming activities like yoga and meditation
- Flex spaces to accommodate remote working and adult retreats
- Antimicrobial surfaces, self-cleaning toilets, and touchless products like faucets, bidets, and locks for enhanced sanitation
- Ergonomic furniture and workstations



While millennials generally prefer open floorplans with indoor and outdoor spaces that can be used for gathering with family and friends, Zs seem to prioritize sanctuary spaces, meditation rooms, private gardens, and places where they can find peace and solitude.

A healthy home isn't the only thing that Zs prioritize—they are keenly interested in all-electric living. The recent COGNITION survey showed that 100 percent of Gen Z respondents wanted to live in an all-electric home (versus 61 percent of millennials) because they can reduce their environmental footprint, have a healthier home, and save money.

While millennials prioritize resiliency, smart home technology, and solar, Zs place more value on net zero energy, water, and carbon.

Another interesting reveal from the COGNITION survey: 100 percent of Zs want to live in a prefab home because they believe those units are healthier and have higher performance and better quality than conventional site-built homes.

The survey also revealed that the circular economy is top of mind for millennials and Gen Zs. When asked what they're doing to protect the planet, the most common response among millennials was recycling, composting, and reusing products to

give them a second life. Zs were more focused on ride sharing, alternative transportation, and riding their bikes. Interestingly, Zs still want homes with garages, but not necessarily for their own vehicles—rather, they want to use the space for bike shops, offices, gathering areas, and other unconventional uses.

LESSONS LEARNED

There are a few important implications for building professionals and manufacturers when considering this generation.

First, Gen Zs value individualism and independence. They have a strong sense of agency over their lives that comes from their deep-rooted values and attitudes.

Second, they value measured consumption. COVID- and inflation-related supply chain shortages, in conjunction with a mounting sense of urgency to solve climate change, has driven this generation to embrace nature-positive actions and decisions that blend affordability with sustainability.

Third, record-low levels of trust, a greater demand for transparency and accountability, and soaring fears around fake news and misinformation has aroused a sense of conscious consumerism within members of this generation.



LEAD OR BE LEFT BEHIND

At a time of profound challenges and new possibilities, Gen Zs are looking for transformative brand leadership and systemic change. They're demanding shifting paradigms—not just shifting preferences.

To effectively reach these customers, companies need to navigate and embrace the context and contradictions inherent in today's society, understanding the gap between brand promises and lived experiences.

Authentic leaders will take advantage of this moment to ask hard questions about transparency, accountability, and their company's role in our urgent social and environmental challenges, and they'll find a way to meet consumer demand for a transition from an outdated business model in which companies extract value by exploiting people and natural resources to a new paradigm whereby companies create value by enriching the lives and livelihoods of employees, communities, customers, partners, shareholders and the environment. 68



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Climate Revolution



Perhaps the most-defining feature of Gen Z is the group's high level of stress and anxiety due to climate change.

According to COGNITION insights, more than half of Gen Zs surveyed report feelings of sadness, anger, powerlessness, and helplessness when it comes to mitigating the impacts of climate change, and nearly 50 percent feel ignored when they try to express their climate anxiety.

COGNITION DATA SHOWS THAT:

- 60 percent want to see a restructuring of our economy with equality and climate change in mind
- 61 percent want to see climate action that is as urgent as COVID response
- 85 percent claim that they have greatly been affected by climate change
- 64 percent feel guilty about their negative impact on the environment
- 73 percent support using public protests to raise awareness about climate change and other important issues

In line with their personal values, Gen Zs are demanding unforeseen levels of climate engagement and accountability from their friends, colleagues, and the companies they work for and buy from.



VISION House Sussex: Right Place, Right Builder

A next-generation family home, VISION House Sussex, is taking shape in a Milwaukee-area community.



Structurally sound. Carpenters began framing the Sussex home in spring and setting roof trusses. The focus has since shifted to insulating and waterproofing the foundation.

COURTESY OF TIM O'BRIEN HOMES

www.greenbuildermedia.com

BY MARC HUMINILOWYCZ

It's early April in the Village of Sussex, located in the greater Milwaukee area of Wisconsin. Having dealt with the usual challenges of building during a Wisconsin winter, local builder Tim O'Brien Homes is framing a new kind of dwelling that will set a regional benchmark for energy efficiency, indoor air quality (IAQ) and occupant comfort.

The model home, named VISION House Sussex, will be one of five new builds in Vista Run, a mixed-use, master-planned development with 289 home sites and 60 acres reserved for community amenities such as walking trails and parkland. The project is a partnership between Tim O'Brien Homes and Green Builder Media. It will demonstrate to builders and consumers how to optimize performance, sustainability, health and wellness, intelligence and resiliency at an attainable price point.

Tim O'Brien Homes is no stranger to green building. The company has been crafting homes to a higher standard since 2007, continually improving sustainability and durability by focusing on best building science and design practices, renewable energy systems, and advanced technologies for optimal energy efficiency and home occupant comfort.

Company president Tim O'Brien says because builders within the Milwaukee area adhere to a building code that dates back to 2009, "not a lot of them are doing anything other than complying with that code." In contrast, Tim O'Brien Homes focuses on energy efficiency, IAQ and reducing utility costs.

"Looking at the science behind our homes, we continue to bring in the baseline of what we've been doing for many years," O'Brien says. "VISION House Sussex will be certified ENERGY STAR and EPA Indoor airPLUS. The project will give us the opportunity to show the market what can be achieved."

BUILT FOR WISCONSIN WEATHER

According to O'Brien, the VISION House Sussex will be perfectly suited to its geographic location. "We live and work in an environment with extreme temperatures," he says. "It can be a bitterly cold minus 10 degrees Fahrenheit here in the winter and a blistering hot 95 degrees F in the summer."

To address the climate extremes, the model home, like other Tim O'Brien houses, will focus on a super-tight building envelope for maximum comfort, including a thermal barrier, Energy Star-certified windows that insulate while reducing solar heat gain, and blower door testing.

One key component to ensure yearlong occupant comfort and energy efficiency will be the home's unique exterior wall construction, which includes high-performance blown-in batt insulation between the studs, 1 inch of rigid foam insulation on all exterior walls, and a "thermal blanket" of Tyvek house wrap. As an added bonus, this system allows for 2-by-4 instead of 2-by-6 framing. Without sacrificing structural integrity, the reduction saves on lumber costs while maximizing interior floor space.



"Looking at the science behind our homes, we continue to bring in the baseline of what we've been doing for many years."

—Tim O'Brien, president,
Tim O'Brien Homes

Elsewhere in the home, the foundation walls are clad on the outside with 2-inch rigid foam insulation with a water-proofing membrane, closed-cell foam in the box sills, and the attic contains blown insulation rated to a high R-value.

Because heavy, wind-driven rain is the area's biggest weather-related event, Tim O'Brien Homes focuses on the homes' durability. According to O'Brien, protection from the elements comes from the previously mentioned tight building envelope, installed by certified technicians. The company also works with leading building science firms such as Construc-



tion Instruction out of Colorado to perfect details and make sure that Tim O'Brien Homes keeps up with changes discovered through product testing.

"We're fortunate that we don't need to worry about outdoor air quality issues or major natural disasters like earthquakes, tornadoes, forest fires or hurricanes," O'Brien adds.

That said, one IAQ issue prevalent in the region is a high concentration of radon, a naturally occurring but harmful gas, in the soil. To address this, VISION House Sussex, like every Tim O'Brien home, will be built with an active sub-slab soil venting system to prevent radon from entering the home.

Scenic future. The Village of Sussex will soon be home to a mixed-use, master-planned development with 300 home sites and 60 acres reserved for community amenities such as walking trails and parkland.

Vista Run, where the VISION House Sussex is located, is one of the larger developments in the Village of Sussex. COURTESY OF TIM O'BRIEN HOMES



Air equality. The VISION House features balanced ventilation supplied by a RenewAir energy recovery ventilator.

COURTESY OF TIM O'BRIEN HOMES



Basement basics. Foundation walls are clad on the outside with 2-inch rigid foam insulation with a waterproofing membrane, cell foam in the box sills, and blown insulation rated to a high R-value in the attic.

COURTESY OF TIM O'BRIEN HOMES

Because the building envelope of Tim O'Brien homes is so tight, IAQ is key. The VISION House features balanced ventilation supplied by a RenewAir energy recovery ventilator (ERV), an appliance that continually replaces stale indoor air with fresh air from the outside. It also preheats the air coming into the home in the winter and removes heat in the cooling season. Other IAQ measures include a MERV 11 HVAC air filter and the use of low volatile organic compounds (VOC) paints. While ERVs have been standard in Tim O'Brien homes for almost 10 years, a key component of the VISION House will be a monitoring system that demonstrates its air quality in real time.

WATER-FRIENDLY AND RENEWABLE READY

The model home will also demonstrate the company's commitment to renewables. "In the planning of this development, we factored in the best orientation of the homes for optimizing solar energy down the road," O'Brien says. "Our model home will have solar panels, batteries, and a power inverter."

Water conservation is also imperative. "Even though we've got Lake Michigan right next door to us, we recognize that a big climate issue around the country, especially in the west and southwest, is water capacity and quality," O'Brien adds. "Any little thing we can do to protect this precious resource makes a difference."

As a result, the VISION House will be equipped with a Rheem water heater that optimizes the energy efficiency of water heating and distribution, Kohler low-flow water fixtures, and a leak detection and water management system.

CUSTOMER FOCUSED—WITH SOMETHING FOR EVERYONE

Tim O'Brien Homes has built a solid reputation over the years as the green choice for new home buyers in the greater Milwaukee area. O'Brien describes his company's typical clientele. "Our clients are first-time and second-time move-up," he explains. "These are mostly people from urban, high-density neighborhoods who originally rented, but are now looking for more space with fewer shared spaces."

Vista Run, where the VISION House Sussex is located, is one of the larger developments in the Village of Sussex. The mix of products in this community ranges from starter home condos in duplexes and fourplexes, to townhomes, to detached single-family homes. "The partnership allows us to bring in more product types and be able to provide housing to a large demographic in terms of price point," says O'Brien, whose company is one of several partnering with one developer in Vista Run. "This is especially important here in Waukesha County, where we have a lot of manufacturing. Employers are looking for a variety of housing stock that appeals to the diverse demographics and needs of their employees."

According to O'Brien, the acceptance by consumers of the homes his company builds (to be highlighted with the VISION House project) is all about total cost of ownership—the initial cost to build, own and operate them. "Our customers expect a durable home from us. They really don't understand the difference between a home built to local code and a high-performance home like ours, which is built to a higher level of standards,"



Radon restriction. Sussex homes will include a radon venting system to prevent radioactive gas from entering the home.

COURTESY OF TIM O'BRIEN HOMES

Multifaceted. Exterior walls to the VISION House Sussex home feature a combination of rigid foam insulation and oriented strand board, space-saving 2-by-4-inch framing, and a "thermal blanket" of Tyvek house wrap.

COURTESY OF TIM O'BRIEN HOMES

he explains. "When we talk to prospective homeowners about total cost of ownership, we put a higher emphasis on utility costs, as well as maintenance and replacement costs. People really get that. Because many of them have previously lived in homes that have been drafty, uncomfortable and expensive to maintain, this means a lot to them."

As winter transitions into spring in the greater Milwaukee and Madison areas, the foundation has been insulated and water-proofed. Carpenters have finished framing most of the second floor of the home and begun setting roof trusses. Rough mechanicals will follow shortly. The other four homes will begin construction about one month apart from each other.

Throughout the construction process, prospective home buyers are being kept up to date on every detail by way of weekly email

updates and photos. "It's an integral part of keeping homeowners on board throughout the building process," says Ryan Hillgartner, Tim O'Brien Homes' director of marketing. "Building science and technology are new to most people, so it's important for us to educate them not only about the 'how' but also 'why,' relating to the sustainability, durability and health of their new home."

Using market-available and cost-effective products, systems and technologies, the VISION House Sussex will spotlight next-generation green homes that are beautiful, comfortable and affordable says O'Brien. "It is my ambition to make a positive impact in the home building industry by continually improving our process to deliver customers a wonderful experience that reduces the level of stress in building a home," he says. "It is this innovative approach that defines our company's culture." **GB**

VISION House Sussex Sponsors:



Sustainable *Meets* Smart

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Shown in Ranch Panel style with optional Stockbridge window inserts.



LiftMaster MyQ Smart Garage® Video Keypad



LiftMaster Secure View™ Smart Opener

Windsor Door and LiftMaster teamed up to deliver an optimal garage solution for the VISION House Sussex - a demonstration model home by Tim O'Brien Homes and Green Builder Media as part of a Milwaukee master-planned development designed to showcase best practices in home sustainability, performance, health and resilience.

Featured Garage Innovations:

- **Windsor 715** – The insulated choice for America's leading builders. Windsor Model 715 is crafted with 25-gauge steel and built to perform, while assuring budget needs are met. Rough Tex backed insulation helps keep the elements out and guarantees smooth door operation.
- **LiftMaster Secure View™ Ultra-Quiet Belt Drive Smart Opener with Camera and Dual LED Lighting** – Control, secure and monitor the garage with the myQ app- anytime, from anywhere.
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W WINDSOR DOOR

FROM ENERGY HOG TO EFFICIENT MICRO FARM



A worthy reworking. Stace McGee's transformed Fort Collins, Colorado home underwent a lot of major changes, such as a new 7-kilowatt solar array, siding made from reclaimed wood, and a new-and-improved metal roof.

Utilizing lessons learned from a career in sustainable building, Stace McGee transformed a leaky out-of-date barn into a haven for his family.

BY MICHELE LERNER

Stace McGee found an idyllic place to raise his family: a micro farm in Fort Collins, Colorado with a creek running through it and a bike trail behind it. But the barn where he lives with his wife and their two teenage kids wasn't so charming when they bought it.

"The old pole barn was used as a home for 16 years, but it was illegal because it wasn't built to code," says McGee, co-founder and principal of Equiterra Regenerative

Design, a sustainable residential and commercial architecture firm headquartered in Albuquerque, New Mexico. "The plumbing and electrical systems were illegal, and there were lots of thermal bypass issues."

For example, the house had an air change per hour rate (ACH) of 11 when McGee bought it. "A building needs an ACH of 5 just to meet code requirements for habitable space," McGee says. "We got to just under 3 ACH after the remodel was complete."





The property, which cost \$1 million, includes a main home that the McGees rent to tenants; their renovated barn house; and 2.75 acres with space for chickens, extensive gardens, and a 40-foot hoop house that can be converted to a temporary greenhouse. About 70 percent of the food the McGees grow on their farm is donated to a local food bank, and the rest feeds their family and is shared with their neighbors. McGee estimates that the renovations on the barn house cost more than \$275,000, far less than is typical since he did much of the work himself.

SETTING PRIORITIES WITH A HERS RATER

McGee was eager to renovate his house to demonstrate that such a project could support local climate change initiatives. The City of Fort Collins has set a goal to reduce carbon emissions by 80 percent over 2005 levels by 2030 and to be carbon neutral by 2050.

“Existing residential buildings are the elephant in the room that is possibly holding our city back from meeting that goal,” says McGee. “Bringing existing housing up to the current code to meet the 2030 challenge is a big issue, because most homeowners don’t want to take on the burden.”

McGee hired Fort Collins-based Green Insights to perform a Home Energy Rating System (HERS) analysis, including a blower door test to define the leaks, test the ducts, and check the insulation and thermal envelope. The initial HERS rating was 115, well above the ideal total for achieving net zero energy use. After renovations, the HERS rating was 41.

“After inspecting the home, a HERS rater can assist a homeowner to define the options to improve energy efficiency and inform them about incentives opportunities,” says McGee.

For example, replacing the home’s outdated HVAC system will be repaid within five years because of utility savings and a rebate, not to mention the increased comfort of the new system, he notes.

“HERS rater Ryan Moore and I identified the most important elements to fix to reduce the energy use in the house,” says McGee. “We also wanted to save and reuse everything we could, such as roof insulation and wall



LEFT: Old double- and single-pane windows were replaced with new energy-efficient units.



The old metal siding on the back section of the barn was replaced with reclaimed wood.



The remodeled living room includes reclaimed walnut veneer from True Reclaimed Lumber in Wellington, Colorado.



New and reused insulation were placed between the studs of the house to provide better sealing.



Exterior walls were removed and ZIP System R-sheathing rigid wrap was installed during the renovation of the barn, which had numerous gaps and cracks that contributed to an excessive ACH of 11.



Leaky windows were replaced with energy-efficient units. Insulation from elsewhere in the house was reused wherever possible.



An overhang was added above the front door for aesthetics, and to keep snow and rain from the main entrance.

insulation. We took off the leaky metal roof and added 2 inches of rigid insulation and a half-inch of roof sheathing, and then put the metal roof back on.”

Ductwork that was previously in unconditioned space is now in conditioned space. McGee removed the exterior metal siding, added 1.5-inch-thick ZIP System R-sheathing rigid wrap, insulation between the studs, and reclaimed wood siding.

“We removed all the electric baseboard heat and packaged terminal air conditioning (PTAC) units and installed a Mitsubishi mini-split system with a Panasonic ERV system for balanced fresh air,” says McGee. “We also installed a 7-kilowatt photovoltaic (PV) system on the roof to offset a lot of the electricity we use.”

McGee plans to add a battery system and electric vehicle (EV) charging station in the garage during the next phase of renovations, along with another solar array.

In addition to energy-related improvements, including installing energy-efficient appliances, McGee refinished the floors, renovated the bathrooms and the kitchen, and added a new laundry room. The appraised value of the property rose from \$1.2 million to \$1.9 million in just four years, partly as a result of the renovations and curb appeal, along with market demand in Colorado, McGee says.

REBATES AND TAX CREDITS

McGee received about \$1,775 in local rebates for energy improvements such as moving the ducts into conditioned space, replacing the outdated HVAC system, and adding low-flow toilets and faucets. He was ineligible for some rebates because he did the work himself rather than hire a third-party contractor. He received approximately \$5,600 in rebates on the solar panels between the City of Fort Collins and federal programs.

If this project was done today, McGee would have been able to apply for the IRA 45L DOE Zero Energy Ready home rebate of \$5,000.

“I advise anyone considering this type of project to go first to the city utility to explore their rebates and incentives,” says McGee. “The solar installers also helped me figure out rebates. The utility company provided a free energy audit and recommended the HERS rater, too.”

The result of McGee’s commitment to reducing his carbon footprint and to supporting local climate change goals is a sustainable place to raise his family and become an essential part of his community. **GB**



Plumbing and electrical systems for the barn, which has been inhabited for 16 years, did not meet code and had to be replaced. The perimeter insulation also decreased 1.6 inches by using R-5 rigid.



The kitchen renovation included replacing all appliances with energy-efficient electric models.

Project Stats

BUILDER: Eric Harrington, [Blue Rooster Construction](#), Fort Collins, Colo.

ARCHITECT/DESIGNER: [Equiterra Regenerative Design](#), Albuquerque, N.M.

HERS RATER: [Green Insight](#), Fort Collins, Colo.

PHOTOS: [Patrick Coulie Architectural Photography](#), Albuquerque, N.M.

Key Components

RECLAIMED WALNUT SIDING AND EXTERIOR WYOMING SNOW FENCE: [True Reclaimed Lumber](#), Wellington, Colo.

HVAC: [Mitsubishi SEER 20 mini split](#)

ERV: [Panasonic](#)

RIGID WRAP INSULATION: [Huber Engineered Woods ZIP System R-Sheathing](#)

SOLAR: [Sandbox Solar](#)-installed [Solaria PowerXT 440R-PM](#) panels and an [Enphase microinverter](#)

APPLIANCES: [GE](#) in the kitchen and [Summit](#) in the bar

LOW-FLOW TOILETS AND FAUCETS: [Kohler](#)

HOUSING 2.0

ZERO FOR LOWER COST

Here are five faster, better—and cheaper innovations that will help you deliver **better performance at a lower cost.**

BY SAM RASHKIN

This is Sam Rashkin's latest in a series of articles based on his second book, "Housing 2.0: A Disruption Survival Guide." It is intended as a roadmap for high-performance builders to become the most successful in the industry.

Two key points about disruption: One, it happens. And not only does it happen, we're in the age of acceleration, where it happens with exponentially increasing frequency and magnitude. That's because data, software, and technology innovations are enabling vast opportunities to deliver better user experiences at lower cost.

The second point is critical: When disruption happens, the choices are to adapt or be left behind. The market is littered with lost jobs and failed businesses in the wake of innovation. I often talk about the large array of enterprises eliminated when the automobile disrupted the horse and buggy at the turn of the 20th century. A more recent example of accelerated disruption is how quickly the smart phone, introduced in 2007, has replaced dozens of technologies: landline, camera, cam recorder, radio, GPS, alarm clocks, wristwatch, timer, portable music players, eBook reader, calculator, watches, flashlights, newspapers, photo albums—the list goes on.

This disruption is depicted below for just one of these technologies: the camera. Today, film camera sales are negligible and digital camera sales have decreased more than 90 percent from their peak in 2010.

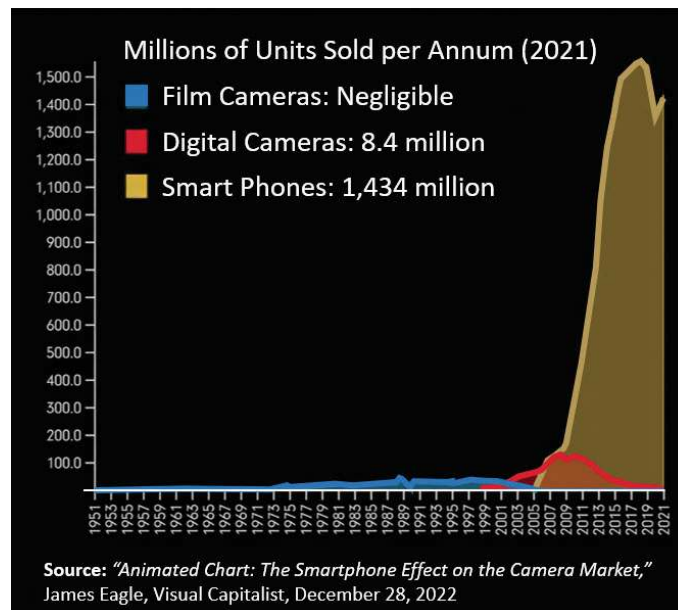


Figure 1: Due to its versatility, the smartphone has blown the rest of the camera market away during the past 15-plus years.

GREEN HOUSING AND DISRUPTION

This brings us to sustainable housing. Disruption is finally coming to the industry most resistant to change. I'll refer you to my book, "Housing 2.0," for a detailed discussion of the five crises imposing huge pain on the housing industry, and the four market-ready innovations to relieve that pain.

The resulting home of the future will blow away everything we're building today with a transformative user experience. Zero energy is an important part of this advanced dwelling. Without question, the "zero train" has left the station. Consider the following developments:

- The International Energy Conservation Code (IECC) has been rapidly increasing in rigor. The latest 2021 IECC is effectively a zero-energy enclosure code that exceeds the Department of Energy Zero Energy Ready Home (ZERH) current program requirements and serves as the baseline in the forthcoming 2024 program requirements.
- Seven states are planning or currently implementing zero energy or zero energy ready codes, including California, New Jersey, New Mexico, New York, Oregon, Puerto Rico and Washington.
- Eighteen states have adopted 100 percent clean energy or renewable energy policies that typically include zero energy buildings.
- Since 2020, there has been a 190 percent growth in total homes voluntarily certified to zero energy and zero energy ready programs in the U.S. and Canada. This includes a 440 percent growth in single-family homes, with more than 67,000 certified units in 2022.
- ZERHs are being offered for \$148 per square foot by a leading manufactured home company. This establishes zero energy in the lowest cost housing segment.
- For the next 10 years starting, in 2023, the 45L tax credit will provide builders \$5,000 for each single-family home and \$1,000 for each multi-family unit certified to ZERH.
- Sixty percent of global investors surveyed plan to adopt Environmental, Social and Governance (ESG) criteria. This is already influencing the largest publicly owned builders to engage in ESG reporting and leverage high-performance certifications to strengthen their environmental scores.
- And last, but not least, readers of this column know the heavy emphasis I place on optimizing user experience. Zero takes the homeowner experience to the next level, including ultra-low energy bills, enhanced comfort, low-maintenance, safety, health, and resilience. And as an industry, we need to be better at translating this value. This will be the subject of a future article.

These developments are a clear signal that it's time for all builders, architects, and housing programs to begin adapting and not get left behind by the zero train.

FIVE HIGH-PERFORMANCE HOME INNOVATIONS

The key to optimizing success with zero is to deliver better performance at a lower cost. To that end, there are five highly under-utilized innovations that offer impressive faster, better and cheaper benefits compared to business-as-usual options.

1. Unvented attics. The most vulnerable interface in the home enclosure is between the attic and ceiling below. This is because it is exposed to the most extreme temperature differential during summer, a constant stack effect pressure difference, extensive air barrier challenges (e.g., knee walls, dropped and raised ceiling, shafts, and wind baffles), and extensive air sealing challenges (e.g., penetrations, duct boots, access panels, and drywall to top plate). As a result, the attic/ceiling interface is the most important for controlling air, thermal, and moisture flow. However, a standard red line test tracing the air barrier across the entire enclosure reveals a missing top-side air barrier. (See Figure 2, above right.) This compromises efficiency, comfort and creates the worst location for HVAC equipment.



Figure 2: This redline air barrier test shows a missing air barrier at the top side of attic insulation in a vented attic.

Home performance can be substantially improved with unvented attics, most commonly with structural insulated panels (SIPs) as the roof structure, or spray-foam insulation installed at the roof rafters. The resulting benefits for unvented attic benefits include:

Faster	Reduced cycle time
Better	More conditioned space HVAC inside conditioned space Improved energy efficiency Enhanced comfort Greater resilience (fire, impact)
Cheaper	No attic vents No attic/ceiling air barriers Reduced air sealing Reduced rework Reduce cycle time

2. Precast concrete foundations. Compared to typical poured-in-place concrete foundations, precast concrete foundations are produced offsite in large panels and installed in the field. They use a ribbed configuration that significantly reduces the amount of concrete required. In addition, rigid foam insulation (e.g., typically R-10) is installed in the plant along the interior face, including the concrete ribs, for a complete thermal break assembly. The ribs are covered with a metal channel so interior drywall can be attached without a framed wall. And last, the assembled panels act like an effective bond-beam and do not require a concrete footing. Figure 3 (below) shows a comparison of pour-in-place and precast concrete foundations.

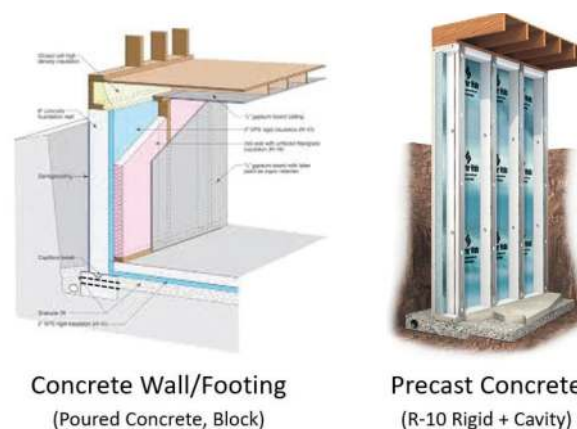


Figure 3: A comparison of pour-in-place and precast concrete foundations.

Meticulous field work is needed to ensure a perfectly level gravel bed for precast concrete panels. However, this will substantially improve accuracy for all construction above the foundation. The resulting benefits for precast concrete foundations include:

Faster	Reduced cycle time
Better	Greater strength with effective bond beam Greater moisture protection with 5,000 vs. 3,000 psi concrete and clear path to drain tile not blocked by footing More conditioned basement space with thinner walls More level above-grade construction 70 percent less concrete which is the biggest source of embodied carbon in homes
Cheaper	Reduced cycle time No framed wall required to fasten drywall

3. Structural insulated panels (SIPs). Traditional framing represents 150-plus-year-old enclosure technology, with only minor incremental innovations. Maybe it’s time for a change. SIPs are sandwich panels that are fabricated in a factory. Two skins, typically oriented strand board (OSB) or plywood, are pressed and glued to a foam panel, most commonly expanded polystyrene or extruded polystyrene (see Figure 4 below). These panels can typically be made as large as 24 feet by 9 feet.



150-Year-Old
Enclosure Technology



Advanced Enclosure
Technology

Figure 4: Traditional framing (left) is losing luster when compared to SIP construction (right).

The resulting benefits of SIPs compared to traditional framing include:

Faster	Significantly reduced cycle time: Large panels are assembled much faster than framing Inherent air tightness minimizes air sealing labor Less work with built-in air barriers Less work with no attic venting No need to cut drywall to framing on exterior walls with continuous interior sheathing Easier trim installation with superior dimensional accuracy
Better	Consistent industry-leading air-tightness Inherent quality insulation installation Minimized risk of defects Superior dimensional accuracy Greater inherent resilience to impact and fire Greater strength Greater resource efficiency with approximately 50 percent less wood Added conditioned space with thinner walls required to achieve same effective R-value compared to framed walls
Cheaper	Reduced cycle time Less inspection and oversight Less rework Less waste

4. Aerosol air sealing. Manual air sealing uses field labor working in diverse weather conditions to seal more than a half-mile of cracks and hundreds of penetrations in typical construction. All of this can be automated with a system that uses computer-controlled blowers to pressurize the house with an aerosol-based sealant mixture. The aerosol under pressure accelerates through any holes or cracks where the sealant is deposited until fully sealed. Results are monitored and measured in real time to ensure the air sealing target is reached. Figure 5 (below) shows a comparison between manual and aerosol air sealing.



Manual Air Sealing Digital Air Sealing

Figure 5: Manual air sealing (left) compared to aerosol air sealing (right) are common ways to ensure there is no air leakage during home construction.

The resulting benefits of aerosol air sealing compared to manual air sealing include:

Faster	Reduced cycle time with easier compliance achieving targeted air sealing and, in some cases, no final blower door test
Better	Greater precision hitting airtightness targets Optimized process with real-time results Reduced risk qualifying for high-performance certifications
Cheaper	Reduced cycle time Reduced rework In some cases, no final blower door test required

5. Plug-and-play ducts. Quality design and installation with conventional HVAC duct systems have been a serious problem. One study revealed 67 percent to 100 percent of systems tested had significant duct leakage and 50 percent to 93 percent of systems had incorrect air flow.

Maybe once again it is time for a change. In this case, it's a plug-and-play duct system that easily snaps together and is automatically airtight. It is substantially simpler than a conventional HVAC duct layout, using one small duct, approximately 2.5 inches in diameter, which is home-run from a manifold-type cap on the plenum to a supply grill in each room (see Figure 6, below).

Each small duct supplies approximately 25 cfm of flow. The number of supply ducts running to each room is determined by the total cfm required. For instance, a room requiring 70 cfm of conditioned air flow would have three of the ducts run to supply grills spaced around the room. The resulting benefits of a plug-and-play HVAC duct system compared to conventional duct systems include:

Faster	Reduced cycle time: No duct sealing required Simple one-size duct layout Snap-fit connection system App for easy system balancing
Better	Small ducts easily integrated in the conditioned space Enhanced comfort with more diffusers optimizing mixing More predictive air flow
Cheaper	Reduced cycle time Reduced rework to ensure air-tight duct system



Figure 6: A plug-and-play duct system easily snaps together and is automatically airtight.

RECOMMENDATION

Here's the problem. The impressive benefits of improved performance, cost savings, risk reduction, quality, and process associated with new innovations are rarely integrated into the bidding process. Thus, business-as-usual technologies have an unfair advantage on top of an incredibly change-resistant industry.

As discussed at the beginning of this article, the zero train has left the station. It's incumbent on all high-performance home builders and professionals to get to high-performance faster, better and cheaper. That begins by looking at the true cost of innovation, including all of the difficult-to-measure benefits. Hopefully this article is a good start. But help is on the way. I'll be introducing a number of true-cost bidding tools later in 2023 to help make more informed decisions. Stay tuned. **GB**

Sam Rashkin's two-decade career as a licensed architect includes serving on national steering committees for the U.S. Green Building Council (USGBC)'s LEED for Homes, Green Builder Media's Green Builder Guidelines, the Environmental Protection Agency (EPA)'s WaterSense label, and EPA's Indoor airPLUS label. He has partnered with Green Builder Media to develop the **Housing 2.0 program**, which empowers building professionals to design and construct higher-performance, healthier and more-sustainable homes at a fraction of the cost.

The Housing 2.0 program is sponsored by Jinko Solar, LP Building Solutions, Mitsubishi Electric, Panasonic Healthy Indoor Solutions, Schneider Electric, and Sunnova..

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A.I. and Green Building

WILL ARTIFICIAL INTELLIGENCE PLAY A ROLE IN GREEN BUILDING?

BY TERRY BEAUBOIS

The current controversy about new software tools that are using A.I. (artificial intelligence)—programs such as ChatGPT, Midjourney, Dall-E, Lensa.ai and others—is creating quite a stir in many segments of society, the professions, and especially in education. I've tried them out to evaluate how they might help green building for the building industry.

WHAT ARE A.I. PROGRAMS?

Today, programs that are currently being developed for wide use can be used from the convenience of your laptop for free (at the moment)—programs such as ChatGPT or Midjourney.

ChatGPT is the type of program that functions as users input words as sentences to ask a question or “give an assignment.”

ChatGPT responds with a text answer.

Midjourney represents another type of A.I. program. In Midjourney, the user enters a text description of what they would like to see, and the program creates four images for them to consider.

WHAT DOES ALL THIS MEAN FOR GREEN BUILDING?

It's early. Savvy homeowners and building owners are going to try out these tools for various reasons. They may approach you with the results of these A.I. products. It is my goal at this time to provide you with enough information so that you can at least say, “Oh, yes, I know about those tools.”

HERE'S EXACTLY WHAT I TYPED INTO CHATGPT:

I am a homeowner planning a new home. What questions should I ask a builder about my home being a green building project?

IN JUST A FEW MINUTES, CHATGPT RESPONDED:

(This is unedited, directly from ChatGPT, including the numbered format.)

As a homeowner, it is important to ask the right questions to ensure that your new home meets your expectations and is environmentally friendly. Here are some questions to ask the builder regarding a green building project:

1. What is the builder's experience with green building techniques and technologies?
2. What certifications, such as LEED or ENERGY STAR, does the builder have?
3. What is the builder's approach to sustainability and reducing the home's carbon footprint?
4. What materials will be used in construction and what steps will be taken to ensure they are eco-friendly and sustainable?
5. How will the home be designed to optimize energy efficiency, including the use of insulation, efficient HVAC systems, and low-e windows?
6. What steps will be taken to conserve water, such as low-flow fixtures and drought-tolerant landscaping?
7. What renewable energy sources will be incorporated, such as solar panels or geothermal systems?
8. How will waste be managed during the construction process and what steps will be taken to minimize the amount of waste generated?
9. What is the expected air quality and ventilation in the home, and how will it be maintained?
10. How will indoor air quality be monitored, and what steps will be taken to ensure it remains healthy and safe?

These are just a few questions you can ask a builder to ensure that your new home is a green building project. These questions will give you a clearer understanding of the builder's approach to sustainability and what steps will be taken to make your home as environmentally friendly as possible.

WHAT ABOUT A.I. FOR GRAPHICS AND ILLUSTRATIONS?

The illustrations produced by programs like Midjourney, at this point in time, can be used for some very loose creative design ideas to stimulate more creativity, but nothing I would show to a client as their architect for a project—unless they were looking for some dreamy, pre-concept ideas. As the reality of the 3D internet (the Metaverse) approaches, and as these tools and applications are developing, I can already see some very creative uses across the greater building industry.

Cosmopolitan magazine just published an issue with a cover generated by an A.I. program—and put the illustration world on edge by including the headline, “Meet the World’s First Artificially Intelligent Magazine cover,” and then lower on the cover they printed the chilling words, “and it only took 20 seconds to make.”

The illustration accompanying my article was generated by me in Midjourney. It took about 20 seconds to create from a sentence I typed into the program.

HOW POPULAR ARE THESE TOOLS?

All of the A.I. functions—text-to-text, text-to-images and image-to-images—are quite amazing. So amazing that, while many new computer programs take months or years to reach the milestone of 1 million users, ChatGPT reached that milestone 5 days after



Thinking ahead. Artificial intelligence (A.I.) programs such as ChatGPT are currently being developed for use as a question-and-answer tool that builders can use to meet homebuyers' needs.

it was announced. That's very popular.

Are these A.I. tools “ready for prime time” for use in green building? As far as being used by designers and builders of green buildings, yes and no. Not everything is ready right now, but maybe soon, so awareness of these tools can be important.

Improvement of A.I. tools like these clearly indicates that in the near future, they WILL become useful to us in the professions, and that future may not be very far away. I know of companies that are already showing interest in developing A.I.-enabled tools for use in the building industry.

WHAT DOES IT MEAN FOR THE GREATER BUILDING INDUSTRY?

ChatGPT is already great for anyone in the AEC looking to fine tune and supplement their own work at this time—from some contract verbiage (along with consulting your attorney), to specifications and client information. A writer who knows about a subject and knows what questions to ask can get some good information out of ChatGPT already. Then, by knowledgeably editing the ChatGPT text into a form of value to your business, you can benefit from the speed, completeness and content that it provided.

Try it out yourself at: <https://chat.openai.com/chat>. (This is moving at the speed of the internet, so one may experience delays or changes at this URL.)

IT'S JUST THE BEGINNING OF A.I. AND GREEN BUILDING

My time in Silicon Valley includes watching and testing developments that can help architects, builders and the building industry. Integrating the developments into my own work is an interesting part of remaining a viable professional. Over the years, I've beta-tested new products from Apple and Adobe and other companies for their use in the world of AEC and beyond: From the introduction of CD-ROMs to websites and the internet in the 1990s, and from virtual reality to A.I. in the 2000s and 2023.

I'll keep us up to date on A.I. and other developments that can specifically help us with green building, as things progress.^{GB}

Terry Beaubois is CEO of BKS: Building Knowledge Systems, in Palo Alto, California. He can be contacted at tbeaubois@gmail.com.

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**COMING NEXT ISSUE****2023 Eco-Leaders**

Green Builder's annual special edition features sustainably minded companies that are making progress on conducting Environmental Product Declarations and Cradle-to-Cradle Certification. These are ones that are rethinking business models, prioritizing resource use, incorporating digital technology, and more.

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Ron Jones
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As I prepare this report in early May, the snowfields still dominate the terrain in the high country. By the time the printed words appear in June, most of that winter cloak will have been shed, except in the shadowy areas and crevices on north facing slopes. If events occur in the usual timeframe, the forest road leading to Mariposa Meadows will reopen for traffic and we will make our way up there to learn how well our efforts have endured another winter at over 10,000 feet.

We enjoyed an exceptional snowpack this past season, reportedly more than 60 percent above normal—very good news for the streams and rivers that supply water to millions of parched users downstream. The county road crew has already begun the annual ritual of plowing with bulldozers the two to three feet of snow, even deeper in some places, that still rides on the surface. They pile it high on either side of the roadway in an effort to help it to dry out as completely as possible before pickups, camp trailers and other wheeled contraptions are allowed to traverse the path it cuts through the forests and grassy clearings.

The earliest tiny spring flowers will be in evidence for those willing to look closely, but it will be a few more weeks before the wild iris, lupine, larkspur, paintbrush and more than a dozen other species transform the rolling fields into a real-life impressionist's masterpiece.

With great anticipation we will explore the property again for familiar clues of activity and the inevitable surprises. We can expect that robins have already begun to construct nests atop our porchlights and mountain bluebirds may have returned to reclaim occupancy of the small wooden houses

we have mounted especially for them on the tall posts that mark where the pasture fence previously divided the meadow into two parts.

By that time, the stream will be surging with runoff from all around the drainage, bending the still leafless but budding willows in the direction of its confluence with the larger creek a few miles further down. The earliest tiny spring flowers will be in evidence for those willing to look closely, but it will be a few more weeks before the wild iris, lupine, larkspur, paintbrush and more than a dozen other species transform the rolling fields into a real-life impressionist's masterpiece. More bashful perhaps: The exquisite columbine and similar shade seeking varieties take longer to appear, and then only for those who will invest time in slow walks through the stands of spruce.

Next, we will carefully climb the steep, winding driveway and approach the small cluster of buildings that wait in the aspen forest. We're hopeful that our work has fared well. There will almost certainly be some lingering snow in places, including on the vast hospitality deck, and we can search them one by one for telltale tracks and droppings revealing the visits from moose, deer, and perhaps a bear or even a large cat. The aspens will not have opened their leaves yet but will be marked by the teeth of elk who barked them for winter nutrition.

The meadow grasses will reach pocket height before we realize it and the whole landscape will be awash with clouds of brilliantly colored butterflies (the inspiration for the name we chose), wasps, bees and a host of insects that have magically reappeared to feed the ravenous songbirds, swifts and swallows—all this taking place before we've scarcely found time to tend the irrigation gates and ditches.

We are builders, sure, but building must start with place. Our efforts there are just a small part of a much bigger conversion, one that repeats itself annually, eternally, and evolves alongside the music of the insistent flow of cold, clear water and at the indiscernible speed of trees. We are not the center of this; it is the center of us. If we deserve to be part of that, we will need to earn it. **GB**

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