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M.A. in Journalism - Capstone

Unbuilding: How Deconstruction is Saving the Planet by Giving Building Materials a Second Life

Dave Bennink found his calling almost by accident. As a young college student seeking an environmental internship in Bellingham, Washington, he landed at a local organization with an unusual idea: to open a 'used Home Depot.' They would sell salvaged building materials at an affordable cost, helping homeowners and builders on a budget while keeping good materials out of the landfill.

Their mission quickly expanded from just selling to also salvaging the materials themselves, by taking apart unwanted buildings through 'deconstruction' or careful disassembly.

That summer job has turned into a life-long mission for Bennink, now 51, who consults across the country to help other building reuse efforts get off the ground.

"I hit on something that helps people, planet, and profit," said Bennink. "No one loses except for the landfill. And we don't care about the landfill."

In the last few decades, recycling of everyday trash – paper, cans, plastic bottles – and composting of organics have become commonplace as Americans have grown conscious of the importance of reducing food and packaging waste to combat climate change.

But while communities implement recycling and composting initiatives as core components of their 'Zero Waste' strategies, they almost always overlook the single largest contributor to the nation's waste stream – the debris created from the construction and demolition of buildings, roads, and bridges.

In 2018, more than 600 million tons of construction and demolition debris, or 'C&D' waste, was generated in the United States, more than twice the volume of municipal solid waste created by American households and businesses. Ninety percent of this amount came from demolition.

Even though an estimated 80-95% of this concrete, asphalt, steel, wood, drywall, glass and brick can be reused, repurposed or recycled, a quarter of it – or 145 million tons in 2018 – ends up in landfills.

The biggest contributor to C&D waste is concrete and asphalt from road work, most of which is recycled. However, almost 80% of the brick, tile, wood, drywall and shingles from building construction and demolition is landfilled. Thirty million tons of wood alone – often sturdy, irreplaceable old-growth lumber – is being trashed every year. The portion that doesn't end up in the dump is mostly burned for fuel or ground into mulch.

In addition to the copious volume of debris generated, our modern demolition practices cause an enormous loss of valuable resources and the squandering of the 'embodied energy' of the demolished building and its components.

The debris from the demolition of just one 1,600 square foot house amounts to 40 tons, not even counting any concrete rubble from the foundation, basement floor, or driveway, which can add another 87 tons to the pile, according to the Environmental Protection Agency. The estimated embodied energy of a house this size is roughly equivalent to 87 barrels of oil or 4,000 gallons of gasoline, all lost when the house is demolished.

What Dave tapped into 30 years ago is now a budding ‘build reuse’ movement, made up of environmentalists, architects, historic preservationists, city planners, green builders, and entrepreneurs who hope to change this status quo.

Deconstruction – the eco-alternative to mechanical demolition – is the key to a new ‘circular economy’ for the built environment, unlocking the wealth of materials literally inside the walls of our buildings, and making them available for continued use.

Instead of considering the lifecycle of individual buildings, the focus moves to the lifecycle of the materials themselves.

Up to a quarter of the materials in traditional housing stock can be reused and another 70% can be recycled into new products, according to the Delta Institute, a nonprofit that supports environmental and economic initiatives in the Midwest. Taking buildings apart carefully to recover these materials provides a cascade of benefits, both environmental and economic.

The building and construction sector accounted for 39% of global carbon emissions in 2018, with 11% of that from the manufacture of building materials, according to the 2019 Global Status Report for Buildings and Construction Sector from the United Nations Environment Programme (UNEP).

The ‘embodied carbon’ of buildings includes the emissions from all stages of the building cycle – beginning with harvesting of raw materials, through the manufacture, transport, installation, maintenance and ultimately disposal of building materials, with the majority of a building’s total embodied carbon released at the beginning of the building’s life.

Deconstruction and reuse is essential to stemming this loss of embodied energy.

Deconstruction, which is more labor intensive than mechanical demolition, is also a job creator.

“Deconstruction and reuse generate as many as 20 times more jobs than demolition and waste,” said Bennink. “The landfill is not a good place to generate work.”

Over the years, Bennink estimates that he’s saved over 100 million pounds of building materials from the landfill through building deconstruction and material reuse, helping to protect the environment while creating jobs and providing affordable materials to consumers.

Deconstruction is not a new practice. In fact, until the 20th century, disassembly and salvage of everything down to the timber framing and nails was the norm, according to Allison Arlotta, a historic preservationist and former board member of Build Reuse, a national nonprofit advocating for better policies for demolition waste. Building materials were sold, traded, and reused in new buildings.

Technological advances in the two World Wars helped create the modern demolition industry, as the invention of the bulldozer and similar heavy machinery changed the landscape in more ways than one. Mechanical demolition by bulldozer and wrecking ball was fast and easy, and became widespread by the 1940s. At the same time, America’s post-war population explosion contributed to the growth of sprawling suburbs full of single-family houses.

After decades of prosperity and changing tastes, a return to inner-city living in the last few decades created a nationwide trend of ‘teardowns’ of older pre-war homes – ironically often built with higher quality lumber – to make way for new ‘McMansions’ and modern multifamily buildings in established neighborhoods. Cities with declining populations have faced another dilemma – blocks of unsafe, abandoned housing stock. The result has been ever increasing volumes of construction and demolition waste every year, according to the EPA.

Both the ‘teardown’ phenomenon and municipal blight-removal programs for abandoned housing have fed the growth of the deconstruction and build reuse movement – as historic preservationists, neighborhood advocates and environmentalists have watched in dismay at the rampant demolition and waste of historic housing stock and its embodied resources, sometimes in the name of ‘energy-efficient’ new construction.

Deconstruction has become a way to mitigate the loss of this old housing stock. For preservationists, seeing an historic building transformed into a productive use through material reuse helps ease the loss.

And yet, despite the proven economic, environmental and even emotional benefits, deconstruction is struggling to take off. It’s just easier, faster and often cheaper to knock buildings down.

Deconstruction faces less obvious challenges, too. For one thing, recovered building materials are bulky and heavy and require abundant storage space. Also, demand and supply for reclaimed materials are not always in the same place.

Lynn Edmundson, one of the many beneficiaries of Dave Bennink’s expertise, is the founder and executive director of Historic Houston, a nonprofit organization in Houston that salvages and resells materials from older buildings. Historic Houston has relocated scores of houses to prevent their demolition, and now features deconstruction at the center of its business model.

“You’re basically in the storage business until someone wants to buy whatever it is you have,” Edmundson said.

Furthermore, modern construction methods and buildings codes don’t account for the structural reuse of old wood, which is not ‘dimensioned’ to current standards or may have issues with insect damage or wood rot.

To overcome such challenges, build reuse strategies have included developing the resale market for salvaged and recycled building materials, using deconstruction in job training programs, and even designing new buildings for future disassembly.

One example of a build reuse innovation is ReCapturit, an online marketplace recently launched by one green-minded entrepreneur, Larry LaMotte in Washington state, to connect buyers and sellers of reclaimed materials.

Other efforts have included workforce training programs for people, such as youth or formerly incarcerated people, to gain entry to the construction industry through deconstruction experience.

Some states and cities have raised landfill ‘tipping’ or disposal fees as a deterrent, or offered incentives, such as lower permit fees, to deconstruct. But all of these worthy efforts feel like plugging the dike as long as municipalities focus most of their “reduce, reuse, and recycle” attentions on municipal solid waste alone.

Even those cities and states that have adopted C&D recycling requirements still send literal tons of good materials to the landfill. Build reuse advocates have started pushing for mandatory deconstruction as a way to change this.

Historic Houston evolved out of the local preservation community in Houston two decades ago.

“I run three businesses. I run a nonprofit, I run an architectural salvage warehouse that’s a retail outlet, and I run a deconstruction crew. Any one of those three things is a full time job, so all three together is three full time jobs, is what I feel like,” said Lynn Edmundson.

Edmundson has tinkered with the business model of Historic Houston over the years to keep the nonprofit afloat and today runs a members-only warehouse for salvage materials, with one work crew that does nothing but whole-house deconstruction. The crew is booked months in advance.

She won't even bother with 'skim jobs' or interior remodels that salvage interior finishes only. According to Edmundson, the lumber in the walls is where the gold is.

"The more valuable older historic building material is what you get at the end of the deconstruction," Edmundson said. "The value significantly drops off in the '60s and the '70s. What's really sad is the houses that are bulldozed most frequently are the ones that are from the '20s and '30s. It's heartbreaking."

She averages 15-18 residential whole-house deconstructions a year – mostly large homes built before World War II, although her crew will deconstruct houses of any age. A typical two-story house takes her crew about a month to take down. Smaller houses can be done in two weeks.

Edmundson charges a deconstruction fee to the homeowners, who are rewarded with a charitable tax deduction for donating the materials. In January 2020, Historic Houston deconstructed an entire mansion that had just been purchased for almost \$10 million.

"I think his charitable gift was over \$600,000," said Edmundson.

Even though she has so far managed to make it work, in her view, deconstruction doesn't really make sense from a purely business standpoint.

"The selling of the materials doesn't make enough money to make it profitable for a retail business," she said. "If there was a push from the municipality in terms of an ordinance that houses of a certain age had to be deconstructed, now you'd have a demand for those services."

She points to the City of Portland, Oregon, as an example she hopes more cities follow. "Now there's a supply there that is being mandated by the city."

In 2016, the City of Portland took the bold step of making deconstruction mandatory for removal of all houses built before 1916. The city was responding to a dramatic increase in residential demolitions – the number doubled between 2009 and 2014 to over 300 homes a year, alarming many residents of Portland's older neighborhoods.

"We were seeing a lot of demolitions out in the neighborhood," said Shawn Wood, Construction Waste Specialist for the City of Portland. "Folks were starting to raise their hand and raise their heads and raise their signs."

In response, the city launched a deconstruction and reuse program to mitigate the negative impacts of demolition. The first step was incentives, through small deconstruction grants in 2015.

"We were giving people money to deconstruct but we were getting information back from them – so, how long it took, how much it cost, how many labor hours, that type of stuff. But then it was also a proving ground for elements that are today found in our deconstruction ordinance."

These elements include informational signage on site and tracking of all materials salvaged.

The second phase of the deconstruction initiative was more radical – making deconstruction mandatory. Because the city wanted to start slowly, to allow the trained deconstruction workforce time to grow and to ensure that the sudden supply of reclaimed materials didn't overwhelm the market, the original mandate, adopted in 2016, applied only to houses built before 1916.

While often considered 'obsolete' by modern day builders and homebuyers, houses of this age were built with lumber superior in durability and strength to the farmed lumber and composites used now, and thus their reclaimed materials hold more value.

"Our old growth forests are in our houses," Wood said.

Pre-war houses are also easier to disassemble than more recent construction, which typically contain glues that literally make them harder to take apart.

Just as important to the selection of 1916 for the year-built threshold was city permit data showing that pre-1916 houses made up one-third of those demolished every year, a manageable number of projects to start with.

Once in place, the program was so successful that deconstruction costs went down as more contractors entered the field. The increased competition even pushed the local build reuse nonprofit out of deconstruction work.

By 2019, the percentage of deconstructions in Portland rose to 42%, to include even houses not covered by the ordinance. "That starts to speak to the lower cost and folks just choosing voluntarily to deconstruct," said Wood.

That same year, when staff went back to City Council to extend the ordinance to all houses built before 1940 – a move that captures two-thirds of residential demolitions – the vote was unanimous.

As of February 2021, 330 houses had been deconstructed since the program launched in 2016 – reclaiming 3.3 million pounds, mostly wood, for reuse. Wood equates this to 7.6 metric tons of carbon emissions per house, or 542 cars taken off the road for a year.

Wood credits the phased approach for the program's success.

The program was not without pushback from developers, who argued that deconstruction is more expensive and time-intensive than mechanical demolition, with added costs passed on to buyers. But Wood said the expense has actually equaled out as demolition costs have increased since 2016. Furthermore, donation of the reclaimed materials to nonprofits can provide a substantial charitable gift tax benefit to owners.

Even if this were not the case, Wood said, "mechanical demolition doesn't really capture the true costs of taking down a building – the loss of embodied carbon, the hazardous materials that can go into the soil or into the air, lead, asbestos. Deconstruction starts to address those true costs."

In 2020, the City of Palo Alto in California went even further than Portland by making deconstruction mandatory for all buildings, both commercial and residential, after finding that 44% of its landfill waste was coming from construction and demolition despite an already high recycling rate for construction projects. By requiring deconstruction, as well as a 'salvage survey' and separation of materials on site, the city hopes to divert 95% of all building materials from the waste stream by 2030.

San Antonio, home of the Alamo, is on the verge of becoming the next city to require deconstruction of buildings. A 2020 report commissioned by the city estimated that residential demolitions over the previous decade – roughly 450 per year – sent almost 170 tons of debris into the city's waste stream, squandering an estimated \$1.4 million worth of salvageable material every year.

The report's authors put it bluntly. "A linear economy that prioritizes demolition over deconstruction proves to be one of the most wasteful policies that San Antonio has on the books."

Stephanie Phillips, a historic preservation professional with the City of San Antonio, heads the city's deconstruction initiative, which is proposing a multi-pronged, phased ordinance that fuses the city's

climate action goals of sustainability, waste diversion, affordable housing preservation and disaster recovery with its strong heritage conservation ethic.

“Historic preservation *is* waste prevention,” according to Phillips.

Key elements of the deconstruction proposal include a city-owned reuse warehouse to address the weak local salvage market; training for demolition contractors on how to recognize and recover salvagable materials; increased demolition permit fees; expedited permit review for projects using deconstruction; changes to the building code to allow reuse; and the launch of a digital marketplace as a sort of ‘Craigslist of building materials.’

For historic preservationists, deconstruction still means the loss of a cherished building, so Phillips sells the recovery of materials as a different kind of preservation win.

“Like an organ donor, a building may have reached the end of its life, but its salvage materials can extend the lives of dozens of other historic structures,” Phillips said.

The loss of older homes in established neighborhoods can shake up a community.

“Let's make sure that we're doing justice to these buildings and these materials and these communities,” Phillips said, by “taking this down in a responsible manner, and using those materials in a positive way, ideally within that same community.”

As a deconstruction and reuse evangelist, Dave Bennink has now consulted in 44 states and four Canadian provinces. He figures he has helped over 100 build reuse projects in one way or another. Even though mechanical demolition may be relatively cheap and fast, it doesn't really make sense if you think about it.

“Demolition is a person demolishing their own building and then going to the store the next day and buying everything all over” to build their new building, Bennink said.

Bennink calculates that the average American will create over 120,000 pounds of trash during a lifetime, which coincidentally is about the same weight as the typical building he deconstructs.

“So when we save one building, we're saving a lifetime's worth of waste. But on the flip side, if you were to demolish your building, you have just thrown away your entire lifetime's worth of waste, your whole allotment for your entire life. You just use it up, all in one day.”

“I just try to convince people that throwing the most sustainable materials in the world away and throwing it in the garbage dump is a really bad idea.”