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## Deconstruction Ordinances Facing Challenges

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More cities are adopting deconstruction ordinances that require older homes to be taken down for salvageable parts, but they face challenges in trying to expand their efforts.

As the green building movement evolves beyond energy efficiency into new areas of sustainability, one promising effort focuses on finding new life for used building materials, though advocates say they are struggling with how to expand this niche market.

"Just in the past year or two, the conversation around deconstruction and reuse has really catapulted," said Shawn Wood, a construction waste specialist for the City of Portland, Ore., which he believes is the first municipality in the country to adopt an ordinance requiring certain homes to be deconstructed, rather than demolished.

Deconstruction ordinances can help reduce waste, but more demand for salvaged materials is needed to really drive the market, he said. Interest is ticking up among municipal leaders and even Google as the construction industry tries to reduce its carbon footprint.

More cities are considering deconstruction ordinances like Portland's that require older homes to be taken down for salvageable parts. Architects and academics are exploring ways to design buildings that can be easily disassembled and reused. And some foundations are funding efforts to build a "circular economy," in which waste is reused rather than thrown away.

But there are challenges to scaling up the effort for large commercial projects. For one thing, using salvaged materials isn't necessarily a money saver if the materials have to be refurbished and stored. And older materials don't necessarily adhere to new building codes and certifications, raising potential liability issues. In addition, structures built, say, in the 1960s or later include more composite materials that are difficult to take apart and reuse.

"There isn't a salvage economy in the U.S. for commercial buildings," said Jason F. McLennan, the chief executive of McLennan Design and the creator of the Living Building Challenge, an exacting sustainability certification.

"There is a small underground one for residential projects," he said, adding that he built his own house primarily from salvaged materials. "You have the Habitat for Humanity ReStores around the country, the independent salvage yards and eBay and stuff online, but the market tends to be more residential in nature."

Nevertheless, the enthusiasm for reuse is growing.

Mr. Wood regularly fields calls from jurisdictions around the country trying to figure out how to better manage construction debris, he said. Among the cities that already have deconstruction ordinances are Milwaukee; Palo Alto, Calif.; and San Jose, Calif. Pittsburgh and San Antonio are also pursuing deconstruction initiatives.

The obstacles are considerable, but the Kendeda Building for Innovative Sustainable Design, at the Georgia Institute of Technology in Atlanta, offers an example of what's possible.

It was designed to meet the Living Building Challenge, which requires, among many other standards, the incorporation of salvaged materials -- specifically, one salvaged item for every 500 square meters of design.

Jimmy Mitchell, a sustainability engineer at Skanska USA, the construction manager for the project, said he wanted to do more than simply bring in some repurposed furniture or fixtures. He felt an obligation to aim for "massive salvage."

So he asked the Lifecycle Building Center, an Atlanta store that sells donated materials for reuse, to source as many used two-by-fours as it could get. The boards would be incorporated into the building's wooden floor decks, alternated between new two-by-sixes, which would hold up the weight. The two-by-fours would function as spacers, creating an aesthetically pleasing pattern.

Lifecycle, where Mr. Mitchell is a board member, came through with 25,000 linear feet of two-by-fours, all salvaged from television and movie sets from Georgia's thriving film industry. That was enough, when nailed together with the new boards, to form 125 floor panels of the 498 required.

The design team also drew other used materials from campus buildings undergoing renovations. Thick pine boards from one became stair treads, and slate roof tiles from another were refashioned into bathroom wall tiling.

The building, funded by the Kendeda Fund, opened in the fall of 2019. It achieved certification in April after a 12-month evaluation of its operations.

"We weren't trying to meet the minimum for salvage -- we wanted to find big examples," Mr. Mitchell said. "I wanted to see that the weight of the salvage was heavier than the weight of the stuff we sent to the landfill. We accomplished that."

Mr. Wood, the Portland waste specialist, said he was hopeful that more private sector players would step up and incorporate salvaged materials into their new buildings. "I'm seeing that, but not at a large enough scale yet to really propel things," he said.

Portland's ordinance applies to all single-family houses built in 1940 or earlier. Mr. Wood said the city decided to limit the ordinance to those mostly wood-framed structures because they are easier to deconstruct than later builds that use adhesives and engineered lumber.

City officials have discussed extending the ordinance to commercial buildings (as Palo Alto, Calif., did), but writing a law that captures the many variations and materials in those structures is more challenging, Mr. Wood said.

"And then the market for that material, like large commercial windows and doors, is still limited," he said. "Not that you couldn't do it. It's another nut that needs to be cracked."

Google is taking a whack at it. The company recently funded a report identifying some of the barriers to scaling commercial deconstruction and recommending strategies for expanding the reuse sector. With offices in more than 150 cities globally, Google has a corporate interest in reuse.

"Recognizing the outsized proportion of waste resulting from typical commercial demolition has motivated us to explore deconstruction and reuse of materials from commercial buildings that were not originally

built with component disassembly in mind," the company said in the report. "Our desire is to advance and refine our deconstruction efforts, but to use our scale to learn, innovate and share with everyone."

The private sector can help ramp up reuse, but so can large college campuses like Georgia Tech, said Shan Arora, director of the Kendeda Building. Campuses are an ideal setup for recirculating materials because the administration knows which buildings are coming down, can plan to salvage and store materials, and can arrange for their reuse in future projects, he said.

"I use the term 'embodied tax dollars,'" Mr. Arora said. "These materials are fully paid for by taxpayers, and now we're just going to throw them away? To me, it's unconscionable."

Municipalities and state governments can also help drive the market for salvaged materials if they make a commitment to incorporate salvage into new projects, he said.

Another necessary piece of the puzzle is raising the visibility of reuse stores and advocacy groups, said Shannon Goodman, the executive director of the Lifecycle Building Center. She and other industry colleagues are trying to fund a study that would quantify the economic and environmental effects of the reuse industry, and show what their greater potential could be with the right strategic investments.

"We know these organizations across the United States fight so hard to reclaim more material and get it reused, but we don't have something that shows the whole picture," Ms. Goodman said.

The whole approach to building construction will have to change if the industry is to truly become circular, said Felix Heisel, an assistant professor of architecture at Cornell and director of the Circular Construction Lab. His students are studying how to design, build and manage buildings so that components can be easily moved from one building to the next. Each built environment would effectively become a material depot for future projects.

Such a shift will require greater innovation in materials, detailed documentation of materials and a new mind-set among all stakeholders, Mr. Heisel said.

"What is being built right now is almost impossible to take apart, in ways that support high-quality recycling and reuse," he said. "The use cycles of buildings are getting shorter and shorter. So every building at some point will either be remodeled or taken down. We should be planning for the disassembly and reutilization of all in advance."