Building European cities with wood would sequester and store half of cement industry's current carbon emissions

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This is the first time that the carbon storage potential of wooden building construction has been evaluated on the European level, in different scenarios," explains Ali Amiri, who is completing his doctorate at Aalto University. "We hope that our model could be used as roadmap to increase wooden construction in Europe."

The study is based on an extensive analysis of the literature. Drawing on 50 case studies, the researchers divided buildings into three groups according to how much wood they use—and, as a consequence, how much carbon dioxide they store.

The Aikalava pavilion was built to celebrate Finland's 100th birthday. Credit: Vesa Loikas

The group with the least amount of wood stored 100 kg of carbon dioxide per square meter, the middle group stored 200 kg, and the group with the greatest amount of wood stored 300 kg per square meter (CO₂ kg m²). The potential carbon storage capacity was not generally related to building or wood type, or even its size; rather, capacity is based on the number and volume of wood used as building components, from beams and columns to walls and finishings.

The researchers also looked at how Europe could achieve the tremendous cut by modeling a path for reaching the level of 55 million tons per year by 2040. If, say, in 2020, 10% of new residential buildings were made of wood each storing 100 CO₂ kg m², the share of wood-built buildings would need to grow steadily to 80% by 2040. At the same time the scenario demands a shift to wooden buildings that store even more carbon dioxide, with more buildings falling into the 200 CO₂ kg m²-storage group, and eventually the 300 CO₂ kg m²-storage group.

Energy efficiency is the most frequently used instrument for measuring the environmental impact of buildings. However, energy efficiency requires...
more insulation, efficient recovery of heat, and better windows. In fact, about half of the carbon footprint of zero-energy houses occurs before anyone has even lived in them.

When the energy used in housing comes increasingly from renewable sources, the significance of the construction phase of the building's total environmental impact grows even more.

"Certificates for green buildings used around the world, such as LEED and BREEAM, could better take the climate benefits of wood construction into account. So far, they are strongly focused on how energy is consumed during use," Amiri says.

In terms of wood products, a wooden building provides longer-term storage for carbon than pulp or paper. According to the study findings, a wooden building of 100 m$^2$ has the potential to store 10 to 30 tons of carbon dioxide. The upper range corresponds to an average motorist's carbon dioxide emissions over ten years.

"Wood construction is sustainable only if the wood comes from forests that are grown in a sustainable manner. Shifting from short-lived products, like paper, to products with a long life-cycle, like wooden construction materials, would help minimize the impact on European forests and the crucial carbon sinks they hold," says postdoctoral researcher Juudit Ottelin.