



Case 11 New potential for the Circular Economy: Tomorrow's Cities Will Be Built From Crops

Key Statement:

Arup believes the construction industry is ripe for circular economies.

The argument¹

Today, pineapple, potatoes, mushrooms, corn, oranges, and bananas are staples of the produce aisle. Tomorrow, they might be the backbones of our cities, according to a new report from Arup. In *The Urban Bio Loop*, the engineering firm advocates turning organic waste into construction materials as a way to use resources more effectively and develop a circular economy. Unlike a conventional linear economy—which is based on a “take, make, waste” model—the circular economy is a continual feedback loop that aims to recycle as much as possible, throw away as little as possible, and use as few raw resources as possible. The idea has been explored on a small scale—with edible packaging, for instance—and companies like Google and Ideo are exploring how the practice could be applied more broadly. Arup believes that the construction industry, which accounts for an estimated 39% of U.S. CO₂ emissions, is well-suited for circular thinking.



Crops as Raw Material²





Crops as Raw Material³

“It is well known that the so-called ‘business as usual’ scenario does not represent a viable option for a sustainable future and that different development models have to be identified for our society to continue growing and prospering in the future,” Arup writes in its report. “The construction industry must reflect this urgency of change—probably more than others. In fact, it is still permeated by a number of detrimental factors such as the use of high impact materials, non-reversible building solutions, low-efficiency processes and manufacturing.”

In the United States, construction waste accounts for over 534 million tons of debris—more than twice the amount of municipal solid waste. An estimated 90% is from the demolition of old buildings and 10% is from new-building construction. Pair that with another staggering statistic: 60 million tons of food—about half of all produce—is thrown away annually. Applying circular thinking could mean less produce in landfills if it’s used to make building materials, and making building materials that are recyclable to divert construction waste from dumps. Meanwhile, some materials could be grown like crops, eliminating excess waste entirely. More sustainable cities start with rethinking what buildings are made from. Here’s how crops could construct the city of the future.



Application of the Raw Material

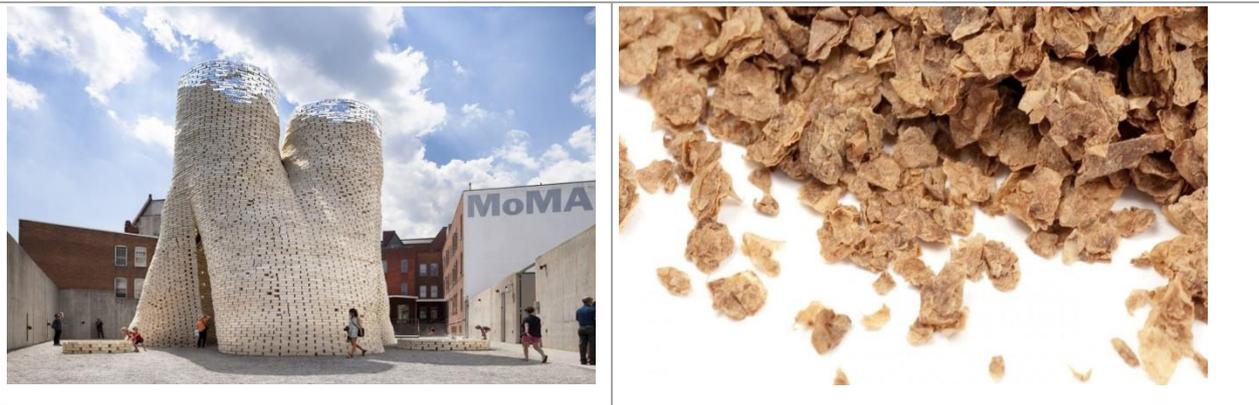
Skyscrapers Made From Mushrooms

In 2014, MoMA PS1 commissioned an experimental tower made from 10,000 mushroom bricks. Ecovative, the start-up that grew the materials, says they can be tailored to different densities and substitute particle board and Styrofoam (for insulation).

Walls Made From Corn And Wheat

The German company Wood K Plus is experimenting with a building material made from residual waste from corn cobs, which are strong, provide good insulation, and are inexpensive. The boards

could be used for lightweight internal walls, doors, and furniture. Enviroboard is able to make walls, both internal and external, from compressed wheat.



Application of the Raw Material

Carpets Made From Bananas

Using fibres from banana plants, the Dutch company Leoxx makes biodegradable textiles and carpets.

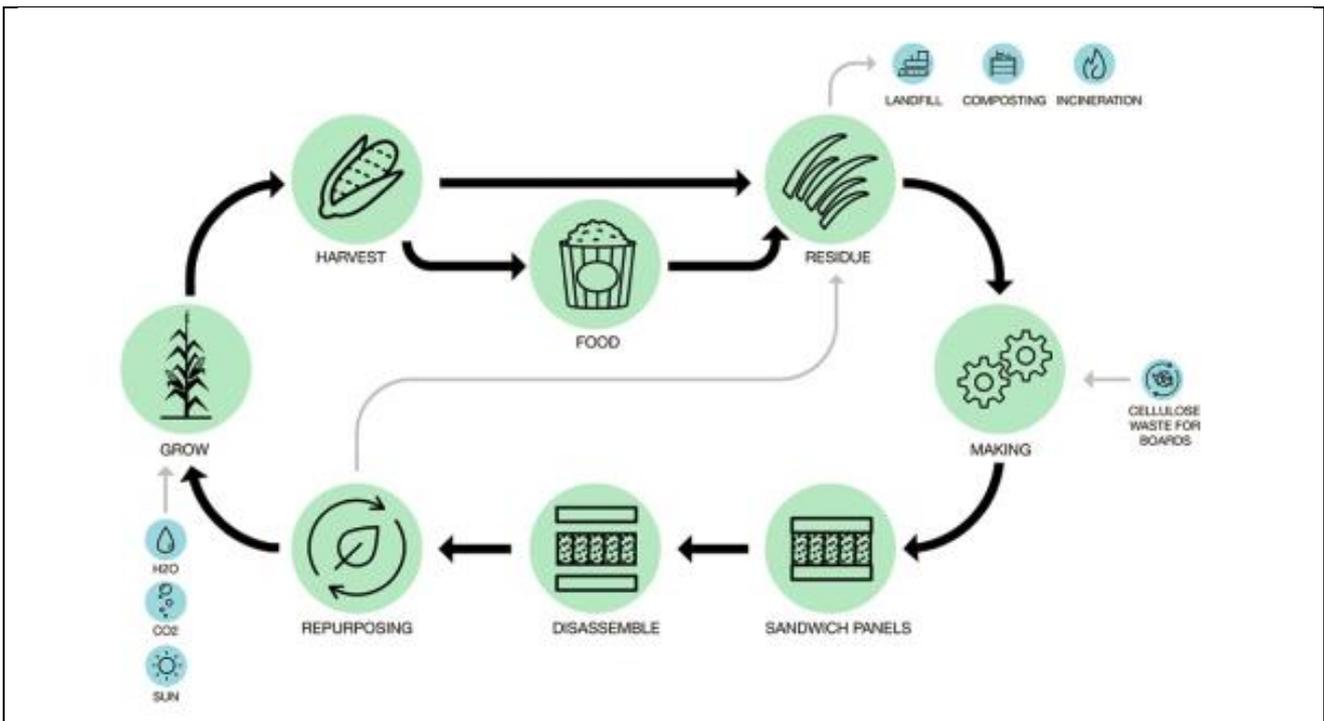
Floors Made From Sunflowers And Ceilings Made From Peanut Shells

Bright yellow sunflowers are beautiful, but they could also be used as a building material. To reduce deforestation, the Thai company Kokoboard makes composites from waste materials from crops like sunflowers. Adding heat, water, and pressure to sunflowers is enough to make a non-toxic, high-strength board that can be used for floors, ceilings, and internal walls.

By binding peanut shells with a formaldehyde-free adhesive and applying pressure, Kokoboard is able to make flame-retardant, moisture-resistant particle board.

Acoustic Panels Made From Seeds, Stalks, And Leaves

Seeds, stalks, and leaves can become flexible acoustic panels and decorative finishes for walls and furniture. The German company Organiods puts blends this plant material with eco-friendly binders and puts the mix into press moulds. A low-flammability, low-cost material.



Insulation Made From Potatoes.

Cork is typically made from tree bark, but the Dutch company Materia can make a substitute from potato peels. Fire resistant, and water repellent, the material is lightweight and can be used for acoustic and thermal insulation.

Bricks Made From Rice.

While organic matter can sometimes replace conventional materials entirely, it can also help us use less of them, too. Watershed Materials was looking for a way to cut back how much concrete goes into cinder blocks and found that replacing some of the filler with rice offered a solution.

Textiles Made From Pineapples And Citrus Peels.

Leather is an incredibly resource intensive and polluting product, from growing livestock to tanning. Ananas Anam, a British start-up, has been able to produce a supple leather substitute from pineapples, which could be used to upholster furniture. Orange Fibre, a start-up in Italy, weaves sustainable fabrics from cellulose fibres derived from citrus peels. While its silky textiles are now targeted to the fashion industry, it's not a stretch to see these become part of the interior design orbit.

Credentials

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References

¹ **Source:** Budds, D. 2017. Corn Walls And Rice Bricks: Tomorrow's Cities Will Be Built From Crops, in: Flipboard.com. 23 October. <https://flipboard.com/@flipboard/-corn-walls-and-rice-bricks-tomorrows-ci/f-c0a7882487%2Ffastcodesign.com>. Visit arup.com to read the full Urban Bio Loop report

² [Photo: GXN/courtesy Arup]

³ [Photo: GXN/courtesy Arup]