New Apps Encourage Climate Positive Design

The web-based app Pathfinder, at left, was the brainchild of landscape architect Pamela Conrad, who created the tool to measure the climate impacts of her work after discovering that no such tool existed. At right, an explanation of climate positive design, which seeks to sequester more carbon dioxide than it embodies or emits. Credits: Courtesy of CMG Landscape Architecture.

A COUPLE OF years ago, landscape architect Pamela Conrad got curious about the climate impact of her work. How much carbon dioxide did her chosen materials release into the atmosphere? How much carbon was seques-tered, or captured, by any given project's mix of trees, shrubs, grasses, and other plants? What factors could she adjust to improve the net outcome? Conrad, a principal at the San Francisco firm CMG Landscape Architecture, decided to investigate.

"I went online and I just assumed there was going to be some magical tool that I could download, and it would just tell me," she says. "I kind of expected to find it that afternoon."

That didn't happen. She did find helpful tools and data intended to help gauge and improve the emissions impact of the *built* environment, but what she was looking for didn't seem to exist: a tool to help landscape architects understand, in a holistic way, the climate impacts of their work.

Beyond her personal curiosity, this struck Conrad as a surprising absence. "We haven't been measuring anything outside the building," she says. That meant crucial conversations with policy makers and clients weren't happening, because "we haven't had the data." Because landscape architecture can not only reduce emissions but also make tangible contributions to carbon sequestration, this field is perfectly positioned to offer "climate positive design," as Conrad calls it: design that sequesters more carbon dioxide than it emits.

Conrad set out to make the tool she couldn't find, with the support of a research grant from the Landscape Architecture Foundation. She worked with environmental consultants and tech developers to create a beta version of the free, web-based app now known as Pathfinder. The app, which formally launched in September 2019, has been used by 300 firms and counting. It is intentionally simple and accessible. Users enter

various details of a project, large or small, from a backyard garden to a city plaza. The interface asks for information about materials (e.g., sand, crushed stone), plant types (e.g., trees, lawn), and other details.

On the back end, the app draws on data from sources including the U.S. Forest Service and the Athena Impact Estimator software created by the Athena Sustainable Materials Institute (ASMI) for building materials. It provides a kind of carbon profile for each project and offers suggestions to improve it, such as substituting a no-mow meadow for a lawn, or a wood deck for paving. The suggestions are intended to reduce the time it will take for each project to become carbon neutral, and then carbon positive.

In the course of designing Pathfinder, Conrad tapped into a vein of similar efforts in other corners of the architecture and construction sectors that are contributing fresh insight to broader discussions of policy, planning, and land use. ASMI, a nonprofit collaborative, has been a pioneer on this front: since 2002 it has provided a variety of software tools that help designers measure the building, construction, and material impacts of their projects and materials.
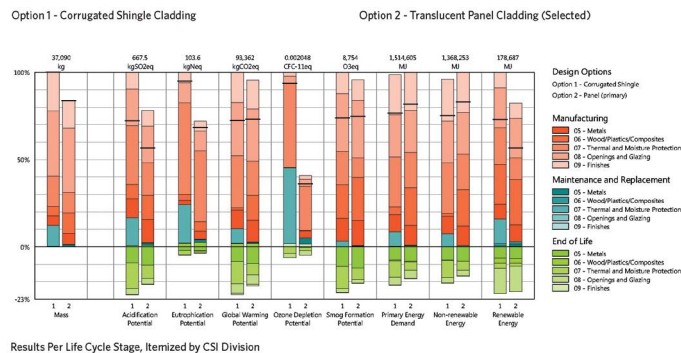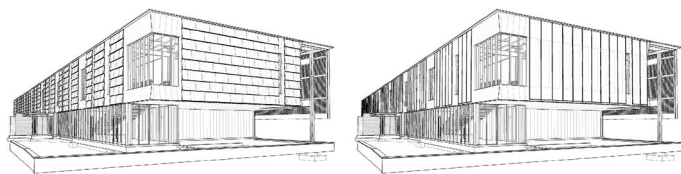
Interest in this sort of resource is surging. Stephanie Carlisle, a principal at Philadelphia architecture firm KieranTimberlake, caused a stir earlier this year with a lengthy call-to-arms essay on the contribution of architects to climate change in *Fast Company*. New construction contributes massively to carbon emissions, she wrote: "Although it's become mainstream to discuss energy efficiency and advocate for minimizing those impacts, architects, engineers, and planners have yet to truly reckon with the magnitude and consequences of everyday design decisions."

Carlisle says she has been heartened by the enthusiastic response to the essay. As it happens, KieranTimberlake introduced its own carbon measurement tool, Tally, a few years ago. Tally was designed to be folded into workflow processes, as a plug-in to a 3D modeling software commonly used in the industry called Revit. This means, Carlisle explains, that a designer can substitute and change material and other options

A designer can substitute and change material and other options on a work in progress, then run a report on its potential carbon impact: "It tells designers where to spend their energy."

Tally™ can be used to compare design options.

Option 1 - Corrugated Shingle Cladding

Option 2 - Translucent Panel Cladding (Selected)

Tally allows architects to compare the climate impacts of various materials. Credit: Courtesy of KieranTimberlake.

Results Per Life Cycle Stage, Itemized by CSI Division

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on a work in progress, then run a report on its potential carbon impact. "It tells designers where to spend their energy," she says. Some 200 firms now use Tally, and its sales rose about 150 percent last year.

Tally, Pathfinder, and other similar tools fit into a broader trend of architects and landscape architects responding to climate change. "These [projects] are great pieces of the puzzle," says Billy Fleming, Wilks Family Director for the Ian L. McHarg Center at the University of Pennsylvania and a coeditor of the recently published *Design with Nature Now*, a collaboration between the university and the Lincoln Institute of Land Policy. "The core of [the challenge] is absolutely about social, technical, and political systems that have to be reorganized around an international mobilization and response to climate change. So these efforts should be treated as the beginning of a conversation—not the end of it."

Indeed, both Carlisle and Conrad emphasize that these tools are just a means to an end. Such tools are "directly empowering architects and engineers," Carlisle says, but they can also help establish common benchmarks that make it easier for communication around carbon standards to "make its way into policy and code." That's starting to happen—Carlisle cites Marin County's recent introduction of carbon standards for construction materials, and Conrad notes that San Francisco is embarking on a sustainable neighborhoods framework that factors in carbon sequestration standards—but they say there's still not enough awareness of the possible positive impacts of design outside the design professions, or perhaps even within them. "We need way more investment in R&D, and in tools," Carlisle says.

Conrad extends the point: as much as she intends Pathfinder to offer "really quick, accessible answers" with practical impacts on real projects, she also wants it to serve as an educational experience that builds awareness. "Landscape architects are the primary target," she says. "But I see [potential use for] a lot of

"We think you can cut emissions [on a given project] in half, and increase sequestration by two or three times, just by having the right information in front of you."

other players in the space, like policy makers using it to set standards." While it's easy for an individual to use Pathfinder to plan a backyard renovation, large-scale landowners can use it to gauge the impact of setting aside portions of development for trees and other elements that build climate resilience.

A simple slider interface shows the user that, for example, a combination of 400 large trees and 1,100 medium-sized ones can sequester 2.3 million kilograms of carbon. "Once we're able to measure what we're doing and collect that data and get that feedback," Conrad continues, "then we can start understanding what we're doing and evolve our practices."

Conrad has been spreading the word about Pathfinder through conferences and webinars, and has been taking suggestions that will guide updates in 2020. Late last year, she helped organize the Climate Positive Design Challenge, aimed at landscape architects, which established specific targets for projects large and small to achieve carbon-positive status: five years for parks, for instance, or 20 years for streetscapes or plazas. Pathfinder is meant to play a central role in helping designers meet that challenge.

"We could potentially take a gigaton of carbon dioxide out of the atmosphere over the next 30 years," Conrad says. "We think you can cut emissions [on a given project] in half, and increase sequestration by two or three times, just by having the right information in front of you." ⬚

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