ECONOMIC GAIN THROUGH ENVIRONMENTAL INNOVATION
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Study Imagines Ecoroofs Spanning 500 City Blocks

By Linda Baker: Sustainable Industries Journal Northwest

What would happen if Portland's Central Industrial Eastside, currently a 500-block stretch of mostly impervious concrete, were blanketed with sedums, wildflowers, native grasses, and other vegetation characteristic of green roofing systems?

That's the question behind an ambitious ecoroof research project timed to coincide with the second annual international Greening Rooftops for Sustainable Communities conference taking place June 2-4 in Portland.

A team of green building enthusiasts is now exploring what the barren rooftops of Portland's Central Eastside Industrial District would look like if every building were adorned with ecoroofs.

(Sustainable Industries Journal, June 2004, continued.)

The project is a collaboration between the Portland Office of Sustainable Development (OSD), Bureau of Environmental Services (BES), KPFF Engineers, Quantec, Portland State University (PSU) and Sera Architects.

“We already know that ecoroofs provide benefits to specific buildings,” said KPFF engineer Tom Puttman, who is modeling the project’s effect on stormwater detention. “Now we want to step away from the building level to look at the impact on an entire urban district. We’re asking: what does it mean to advocate for green roofs as city policy...as part of the city’s infrastructure?”

A leader in the promotion of ecoroofs, Portland is one of the few municipalities nationwide that offers financial incentives to developers who layer selected soils and plants over a drainage mat and conventional roofing membrane. Over the past few years, Portland ecoroofs have sprouted everywhere: on garages, food co-ops, in the Brewery Blocks, atop the Multnomah County Building, and, most recently, on the PSU Broadway Building (at 18,201 square feet, it will be the city’s biggest ecoroof to date). But as with any emerging green technology, advocates still face financial, technological and political hurdles in their effort to mainstream the product.

Enter the Central Industrial Eastside study, which aims to fill in some important gaps. Not only is it the first analysis of its kind to target an entire urban district, the project is also one of the first to tackle the aggregate benefits associated with green roofs: reduced energy consumption, stormwater detention and mitigation of the urban “heat island” effect. The latter refers to the increase in temperature that results when vegetation is replaced with concrete.

“This kind of integrated analysis hasn’t really been done before,” said Anthony Roy, an OSD project manager and coordinator of the Eastside project. The research also has a temporal element. Team members are taking measurements at 15-year intervals, until 2050, to model the changes as conventional roofs in the Central Eastside gradually turn green. “We’re presenting a vision for the area and the city.” Roy said while there are currently no plans to actually implement the research and install ecoroofs throughout the industrial district, Roy added, it is “an opportunity to use that area as a test site to create a vision for the city.”

To understand the study's key assumption -- that ecoroofs are part of “the greater good” – it’s important to think about the ecological system ecoroofs are supposed to simulate. When rainwater falls in a natural environment, it’s absorbed by soil and organic matter before it gradually evaporates or filters into streams. But when rainwater falls on a conventional rooftop, it sheets into pipes that explode into streams and rivers, causing erosion and threatening fish and other aquatic organisms. Also, almost very time it rains in Portland and Seattle, combined sewage overflows contaminate waterways with tons of untreated sewage.

Restoring natural cycles -- especially the water cycle -- is what an ecoroof is all about. “You’re reforesting the built environment,” said Patrick Carey, a Seattle architect who heads up the Northwest EcoBuilding Guild's Green Roof Project, which has installed 16 green roofs on residential carports, garages and studios. “There’s something so symbolic about that. Green roofs make a statement about ecology that no other building feature can.”

But there’s one major problem. Although the environmental benefits of ecoroofs over conventional roofs are widely accepted, translating those advantages into financial incentives or cost offsets still poses a problem for advocates trying to take green building policy to the next level. Ultimately, Wordsworthian odes to nature -- or what some might call the ecoroof “cool” factor -- are not the best way to sell developers or financially strapped government agencies on the idea of green roofs as urban infrastructure, especially since green roof systems run $15 to $18 per square foot, compared with $6 to $10 for a conventional roofing system.

(Sustainable Industries Journal, June 2004, continued.)

“Green roofs are pretty new and we don’t know how much they perform,” said City of Seattle sustainable building coordinator Lucia Athens, explaining why Seattle has no plans to institute economic incentives for ecoroofs. “The city would have to have a real clear understanding of how they work before we would offer incentives.”

In Portland, by contrast, builders can now increase their floor area ratio (FAR) when they include an ecoroof on 60 percent of the roof’s surface. The City's Clean River Incentive and Discount Program, which is scheduled to go into effect in July 2006, will also reduce stormwater utility fees for commercial and residential properties topped with ecoroofs.

Even with incentives, including a $50,000 demonstration project grant from the Willamette Stormwater Control Program and a $75,000 nonpoint source pollution control grant from the Oregon Department of Environmental Quality, it took two years before the Multnomah County Board of Commissioners would approve the ecoroof atop the agency's Central Eastside headquarters.

“What sold the board was showing them the life-cycle costs, not the environmental benefits,” said project manager Alan Profitt.

The analysis, conducted by Allen Lee, a project director at Quantec, showed the county’s green roof would last up to three times longer than a conventional roof. “For this area, the economics are really driven by the avoidance of having to replace a roof,” Lee said.

A recently installed ecoroof atop the Multnomah County Building demonstrates how a typical building on Portland's Eastside can be transformed.

(Sustainable Industries Journal, June 2004, continued.)

As a prelude to identifying other cost benefits, Lee is modeling the energy consumption impacts for the Central Industrial Eastside study. Initial results, he said, show a 1 percent reduction in energy use per building topped with an ecoroof. That incremental difference may add up after factoring in all the buildings in the Eastside District, he added.

As part of the project's integrated approach, Lee also plans to run a series of analyses calibrated to account for the changes in ambient temperature that occur as green roofs take over the neighborhood. This urban heat island data will come from PSU Engineering professor David Sailor.

"One of the strengths of this project is that my results are part of a feedback cycle," said Sailor, who is developing a mitigation impact screening tool (MIST) that urban planners and government officials can use to estimate the impacts of heat island mitigation.

"If [the ecoroofs] can reduce energy consumption, we can also reduce waste heat from air conditioners, further reducing the air temperature."

Of the three areas targeted by the Eastside study, the stormwater piece has the most documented benefits. Numerous studies in the United States and Europe have shown that as much as 70 percent of rainwater is retained on an ecoroof. In Germany, homeowners who install ecoroofs receive an exemption from "rain taxes" -- taxes collected for the amount of impervious surface cover on the property that generates runoff and contributes to the local storm sewer. It's food for thought in Portland, which is spending $1 billion on a federally mandated "Big Pipe" system to correct the problem of combined sewage overflows. Seattle is also facing expensive infrastructure upgrades.

"Will we have to put another pipe in 10 years?" asked Puttman. "Maybe the green decentralized approach is better than the centralized engineering approach."

Like Lee and Sailor, Puttman said that one of the challenges associated with the Central Industrial Eastside project is that the available engineering models don't always work for green roofs. In the case of stormwater runoff, said Puttman, models tend to focus on worst-case scenarios -- peak flows, for example -- instead of focusing on components relevant to green roofs, such as soil saturation. But information and technology sharing is another goal of the largely voluntary collaboration (though BES kicked in $20,000 for the legacy project, most of the team members are working pro bono).

"If we get interesting results, we'll get more demonstration projects and attract more committed people," said Lee.

As for the "cool" factor in the Industrial Eastside study, that's where the visuals from Sera Architects fit in. "We have a 3-D model of the Central Eastside," said principal John Echlin. "We're going to fly around it and illustrate the different degrees of green roof until all impervious surfaces undergo a complete metamorphosis."

Results from the ecoroof project will be available in late June 2004 at OSD's web site: *www.sustainableportland.org.*