

# LIVING ARCHITECTURE MONITOR®

A GREEN ROOFS FOR HEALTHY CITIES PUBLICATION

VOLUME 19 / ISSUE 4 / WINTER 2017

## THE BUSINESS CASE ISSUE

- Citizen Transforms Denver's Rooftops with Green Roof Ballot Initiative
- San Francisco Crunches Numbers on Benefits of Better Roofs Ordinance
- Design Guru Herbert Dreiseitl Revisits Potsdamer Platz – Integrated Design at its Finest
- Green Roof Cost and Benefit Analysis for Denver at Building and City-Wide Scales
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ISSUE 4  
WINTER 2017

# INSIDE

## FROM THE FOUNDER /

1 THE BUSINESS CASE IS CLEAR!: NOW IS THE TIME TO INVEST IN RESURFACING OUR CITIES

## STRATA /

2 LANDSCAPE DECLARATION A CALL TO ACTION  
NRDC FOCUSES ON NEW YORK AND IMPROVING UPTAKE OF PRIVATE GREEN INFRASTRUCTURE  
LIVING ARCHITECTURE DOCTOR

## INTERVIEWS /

3 ON THE ROOF WITH.... CITIZEN ACTIVIST BRENDON REITHEIMER GREENS DENVER ROOFTOPS:  
Interview by Steven W. Peck

## PLANT PROFILE /

6 MIGHTY SEDUMS- GREEN ROOF WORK HORSES: by Dr. Brad Rowe

## ECONOMICS & FINANCE /

8 A COST BENEFIT STUDIES OF GREEN ROOFS IN DENVER: BUILDING AND AGGREGATE SCALES:  
by Rohan Lilauwala

11 NEW PACE FINANCING IS RAISING THE PROSPECTS FOR GREEN ROOFS: by Eric J. Alini

## AWARDS OF EXCELLENCE 2017 /

14 PROFILES OF OUTSTANDING PEOPLE: by Blaine Stand

## CASE STUDY /

16 BERLIN'S POTSDAMER PLATZ 18 YEARS LATER: A SPECIAL TOUR OF INTEGRATED DESIGN EXCELLENCE:  
Interview of Herbert Dreiseitl by Steven W. Peck

22 GREEN ROOFS FOR RENT?...A TALE OF TWO ROOFTOPS: by Matt Barmore

## POLICY /

24 LIVING ARCHITECTURE PERFORMANCE LIBRARY: CASE STUDY #2: INSIDE SAN FRANCISCO'S MANDATORY  
GREEN ROOF OR SOLAR REQUIREMENT: by Jeff Joslin and Emma Tamlin

27 HOW SMART CITIES TECHNOLOGIES COULD SAVE CITIES BILLIONS:  
by Rachel Lempp and Greg Kats

## STANDARDS /

30 ANSI FIRE STANDARDS UPDATED: by Michael Ennis

## JOURNAL OF LIVING ARCHITECTURE /

30 CATALYZING DESIGN-SCIENCE FEEDBACK LOOP IN GREEN ROOF OPTIMIZATION FOR HOT CLIMATES:  
J. Hart et al

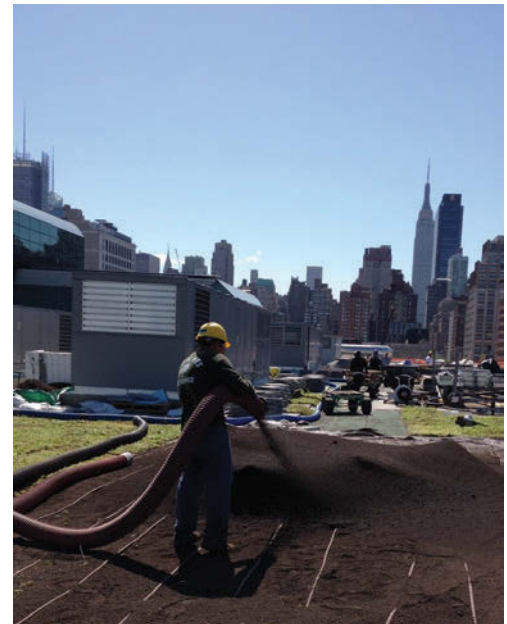
30 PHOTOVOLTAIC ARRAY INFLUENCES THE GROWTH OF GREEN ROOF PLANTS: J. Boussetot et al

## GRHC UPDATE /

34 UPCOMING EVENTS & BUYERS GUIDE

## ON SPEC /

35 THE ACADEMIC FOOTPRINT OF LIVING ARCHITECTURE: by Virginia Russell



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## MISSION

Green Roofs for Healthy Cities mission is to develop and protect the market by increasing the awareness of the economic, social and environmental benefits of green roofs, green walls, and other forms of living architecture through education, advocacy, professional development and celebrations of excellence.

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# THE BUSINESS CASE IS CLEAR! NOW IS THE TIME TO INVEST IN RESURFACING OUR CITIES

The news this year has largely been dominated by extreme weather events, from multiple record breaking hurricanes which tore apart island communities leaving people homeless and without food or water, to enormous forest fires in the pacific north west which destroyed homes and lives. The bad news is that many scientists fear that ‘mother nature’ is just getting started: that this is but a taste of things to come! As we approach critical tipping points in global temperatures, we run the very real risk of unleashing vast amounts of greenhouse gases trapped in the permafrost, called the methane bubble. In one global expulsion of methane, more greenhouses gases may be released than all of industrialization combined. Temperature increases are also undermining the health of ecosystems like the boreal forest, which sequester enormous amounts of green house gases. In our oceans, coral reefs cannot survive increasing water temperatures and are dying. Reefs provide homes for 25% of all marine species, support the livelihood of half a billion people and protect shorelines.

There is good news this year as well. The renewable energy sector, particularly wind and solar is growing very rapidly, and the business case for renewables is solid, with dropping costs. There is a rapid move towards the electrification of vehicles, with China’s policies fueling global demand.

A growing awareness of, and investment in, our capacity to adapt to

climate change impact also holds promise for the future. The historic Denver vote in favor of mandatory green roof or solar installations on new and existing roofs over 25, 000 sf of floor space is a testament to citizen activism, and the strong business case for resurfacing our cities. This month’s “On the Roof With” interview is with Brandon Reitheimer, the citizen in Denver who is leading the charge to resurface his community, which has the third worst urban heat island in the U.S. At Green Roofs for Healthy Cities, we have strongly supported this effort including developing a cost-benefit scenario for the green roof component of the I-300 ballot initiative, which makes the business case for implementation (See page 8). We found a net present value of \$1.85 billion over 40 years resulting from the installation and maintenance of 57.5 million square feet of green roofs.

Our analysis is supported further by a major study lead by Greg Kats, President, Capital E on the costs and benefits of investing billions of dollars of resurfacing three cities: Washington DC, Philadelphia and El Paso. Kats and his team looked at widespread solar PV, green roof, reflective pavement and roofs and urban tree implementation. The business case is clear. They found Net Present Values ranging from \$537 million in El Paso to more than \$3.5 billion in Philadelphia over a forty year period (page 27). The economics of preparing for climate change impacts in our cities by investing in these proven

approaches is compelling.

The recent introduction of a new financing program by Counterpointe Sustainable Real Estate, through PACE (Property Assessed Clean Energy) financing, may be a real game changer. In his article on page 11, Counterpointe CEO Eric J. Alini, states that like the rapid growth in the roof top solar industry “PACE financing may have the same transformative effect on green roofs.”

The speed at which we adapt to climate change and reduce greenhouse gas emissions, is very much key to the quality of our common future. Green roofs and walls have an increasingly important role to play in maintaining the resiliency and livability of our cities.

This year very important steps have been taken that promise to greatly accelerate adoption. Thank you for your contribution to our industry and for demonstrating that we are a critical element in the future resurfacing of our cities.

Sincerely yours,



Steven W. Peck,  
GRP, Honorary ASLA  
Founder and President

STRATA



## LIVING ARCHITECTURE DOCTOR

What's wrong with this picture and what can be done about it?  
This is an almost 10-year old, extensive modular green roof in  
Denver. Please send your responses to: [editor@greenroofs.org](mailto:editor@greenroofs.org).



### NEW PUBLICATION: THE NEW LANDSCAPE DECLARATION: A CALL TO ACTION FOR THE TWENTY-FIRST CENTURY

By Landscape Architecture Foundation. What is the role of landscape  
architecture? Featuring essays from James Corner, Gina Ford, Kate Orff,  
Martha Schwartz, Kongjian Yu, and more.

The Natural Resources Defense Council and the Stern Center for Sustainable Business released a major study entitled "Catalyzing Green Infrastructure on Private Property: Recommendations for a Green, Equitable and Sustainable New York City", which contains recommendations for NYC departments on how to ramp up green roof implementation including: guaranteed payments for pre-development costs, bundling green roofs with solar power support initiatives, direct financial benefits to property owners, and hiring a third party to administer a revitalized program. [www.nrdc.org/sites/default/files/catalyzing-green-infrastructure-on-private-property.pdf](http://www.nrdc.org/sites/default/files/catalyzing-green-infrastructure-on-private-property.pdf).

PACE (Property Assessed Clean Energy) Financing for green roofs was announced by Counterpoint SRE in August. The commercial lender will provide long term, off balance sheet financing for the design, installation and maintenance of green roofs in this new program which is available in 33 states. See [www.counterpointSRE.com](http://www.counterpointSRE.com) (See article p. 11)

In mid October, 2017 Green Roofs for Healthy Cities and the Green Infrastructure Foundation released "Making Informed Decisions: A Green Roof Cost-Benefit Study for Denver". The study found that a 'Yes' vote for the Denver Green Roof Ballot Initiative would result in 57.5 million square feet of green roofs, generate \$1.85 billion in savings by 2058 and approximately 25,000 job-years in employment over a 15 year period. Go to: [www.livingarchitecturemonitor.com/denver](http://www.livingarchitecturemonitor.com/denver)

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# ON THE ROOF WITH... BRANDON RIETHEIMER, FOUNDER OF DENVER GREEN ROOF INITIATIVE

INTERVIEW BY STEVEN PECK, GRP, HONORARY ASLA

Frustrated with the lack of local progress on climate change in Denver, Colorado, Brandon Rietheimer decided to get involved. He began searching the internet for something that would accelerate progress and found green roofs and Toronto's Green Roof By-Law. After months of approaching politicians and Denver city staff about establishing a similar program, he got nowhere.



BRANDON RIETHEIMER AND  
KATHERINE ROBBINS OF THE  
DENVER GREEN ROOF INITIATIVE

That's when he, and more than 60 citizen volunteers made history by collecting thousands of signatures to put a mandatory green roof or solar requirement for new and existing buildings on the ballot for the November 2017 election. Despite being outspent by a factor of 12:1 by the opponents of the initiative, I-300 passed with more than 54% in support. If it is fully implemented, I-300 will transform Denver's rooftops in the decades to come, helping to reduce their terrible urban heat island effect, reduce greenhouse gas emissions and spur urban agricultural opportunities. Brandon's success gives hope to many. At a time when many hard-won federal environmental victories are being rolled back, his achievement is a testament to the power of citizen-led activism.

**SWP:** Hi Brandon. Congratulations! Why did you decide to get involved, rather than stay on the sidelines? You aren't in the green roof or solar business so what motivated you?

**BR:** Thanks. I was highly motivated from Bernie Sanders' message of "get active at the local level". When Trump was elected president I knew that that message was more important than ever before for our environment. To me climate change is the biggest issue that we face.

**SWP:** Why did you choose to advocate for green roofs and solar panels, rather than say parks or recycling?

**BR:** I began researching ways that I could affect policy in Denver and I stumbled across green roofs. The more

research I did on them, the more I understood the enormous amounts of benefits they offered. With Denver growing as rapidly as it is, it only made sense that we mitigated that footprint with green infrastructure.

**SWP:** What made you decide to launch the ballot initiative, which seems like a long shot way to change the status quo?

**BR:** I tried to get active in local environmental groups but felt that they weren't taking aggressive action. I spoke to the city to try and incentivize or mandate this policy but they didn't take me seriously. Climate change can't wait and I knew that a ballot initiative was a way for a citizen to make changes to policy and get something done immediately.

**SWP:** I know you were worried about collecting 7,000 signatures in time! How many volunteers were involved in collecting signatures and is this really a first?

**BR:** We collected almost 8,000 signatures through the help of 60 volunteers. We didn't pay one single person. We have been told this is the first ballot initiative to pass without paying a paid petitioner. I think it truly shows the times that we live in.

**SWP:** What does the mandatory requirement ask of building owners and developers?

**BR:** This would require any building over 25,000 square feet of floor space to dedicate a portion of their roof, 20 to 60 per cent, to green roofs or solar. This does apply to existing buildings or for normal roof replacement. It creates a technical advisory board so that it will always remain current. It also creates technical standards to ensure rooftops are being built properly.

**SWP:** Many existing buildings may not be able to hold the extra weight, what happens with them?

**BR:** Because no other city has mandated this on existing buildings, we wanted to make sure that if a building is unable to handle the load that they can seek an exemption.

**SWP:** Are there developers in Denver that support this initiative?

**BR:** Our biggest supporter from the development community is Zeppelin Development. They are already incorporating green roofs into their design without a mandate.

**SWP:** Did the cost-benefit study produced by Green Roofs for Healthy Cities and the Green Infrastructure Foundation help to secure the yes vote?

**BR:** The study provided played a pivotal role in helping us

# CLIMATE CHANGE CAN'T WAIT AND I KNEW THAT A BALLOT INITIATIVE WAS A WAY FOR A CITIZEN TO MAKE CHANGES TO POLICY AND GET SOMETHING DONE IMMEDIATELY.

- BRANDON RIETHEIMER

showcase the facts and benefits, winning the vote of some nay-sayers. The report will have an even bigger role in the stages to come.

**SWP:** What is next? I read that council can overturn the election results!

**BR:** To overturn this, city council would need a 2/3 vote and we do not foresee that happening. The mayor himself has said that the people have spoken and they will begin the implementation process. We have heard rumors that our

opposition may challenge us in court saying that this is too restrictive on design. There remains much more to do to secure this initial victory.

## FIND OUT MORE

*Denver Green Roof Initiative*  
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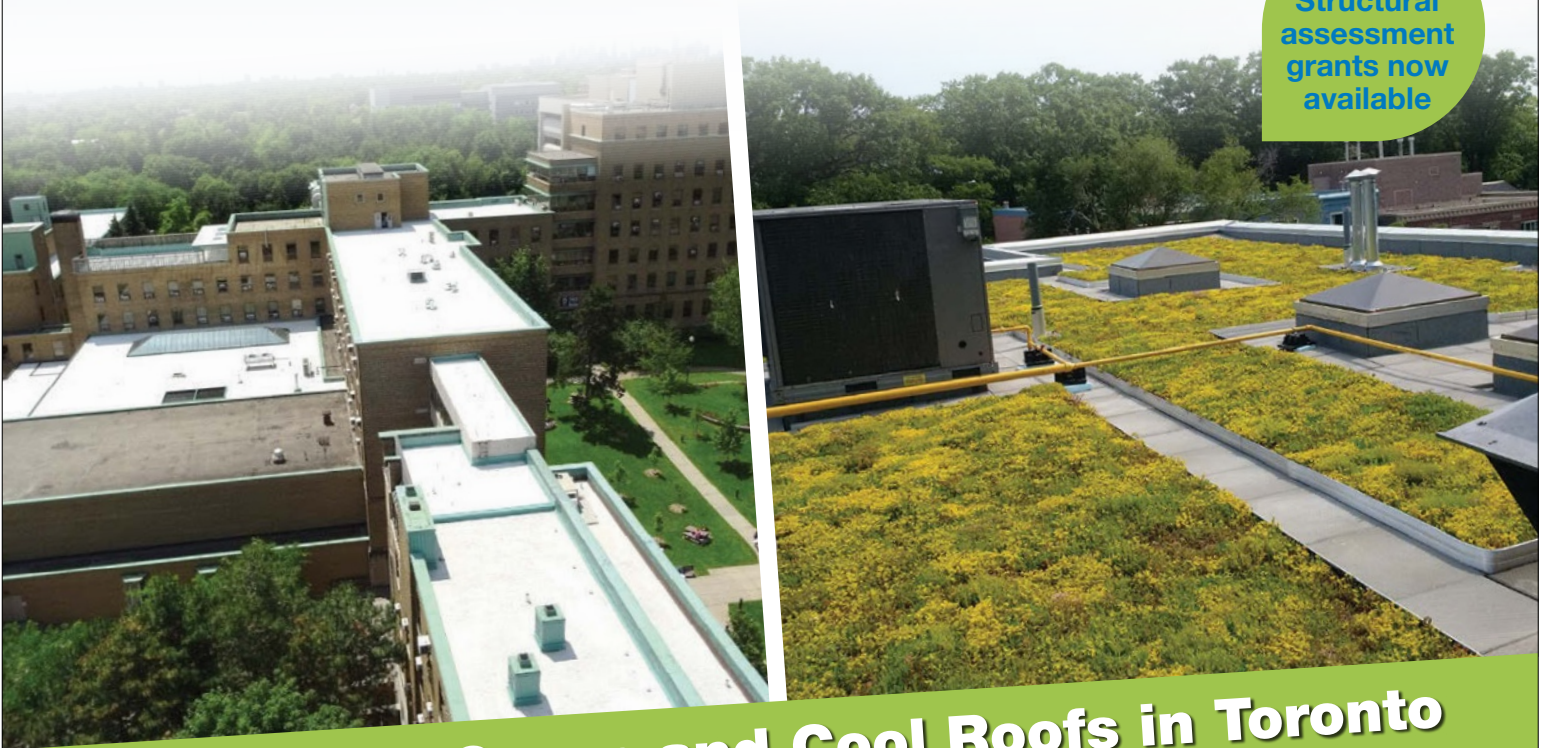
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# SEDUM: THE WORKHORSE OF GREEN ROOF PLANTS

BY DR. BRADLEY ROWE, MICHIGAN STATE UNIVERSITY, EAST LANSING

Since the theme of this issue of the Living Architecture Monitor is making the business case for green roofs, I chose to write about the genera of plants that are probably growing on more green roofs and has more to do with driving the economic engine of extensive green roofs than any other. That is the much maligned or much loved *Sedum* spp.

The genus *sedum* (family Crassulaceae) are a large group of succulents that are primarily native to the northern hemisphere, but also extend into Africa and South America.

Most are found in Eurasia, but *S. pulchellum* and *S. ternatum* are both native to the eastern United States. The genus name is derived from the Latin word *sedeo* meaning 'to sit' in reference to the growing habit of many of the sedums (they sit and sprawl over rocks). Thus the common name, stonecrop. They are typically found in their natural habitat growing on rocky or stony areas and do well on dry well drained gravelly soils with limited fertility, on sunny slopes, and exhibit great drought tolerance, especially once established. Most are herbaceous perennials and easily propagate themselves from seed or cuttings. Prostrate stems growing along the ground often root forming new plants. Flowers range from red to pink to yellow to white and are known to attract butterflies. In fact, the San Bruno elfin (*Callophrys mossii bayensis*), a U.S. federally listed endangered species that inhabits rocky cliffs along the coast of California relies on *S. spathulifolium* for food.

*Sedum* is a popular choice for extensive green roofs due to its tolerance for drought, shallow substrate adaptability, and ability to limit transpiration and store water. Many have

been identified as exhibiting some form of Crassulacean Acid Metabolism (CAM). CAM plants limit transpirational water loss by keeping their stomata closed during the day. They take up CO<sub>2</sub> during the night, store it as an organic acid, and then use it the following day as the source for the normal photosynthetic carbon reduction cycle.

Even though *sedum* are widely used on green roofs, there is much confusion surrounding the genus. Depending on what taxonomic expert you want to listen to, there is a lot of disagreement on the classification of many of the 'sedum' species used in commerce. Many that are commonly used were formerly classified in the genus *sedum*, but are now segregated into other genera such as *Dudleya*, *Hylotelephium*, *Phedimus*, and *Rhodiola*. A few examples include *Hylotelephium spectabile* (*S. spectabile*), *Hylotelephium telephioides* (*S. telephioides*), *Phedimus hybridus* (*S. hybridus*), *Phedimus kamtschaticus* (*S. kamtschaticum*), *Phedimus middendorffianus* (*S. middendorffianum*), *Phedimu spurium* (*S. spurium*), *Phedimus takesimensis* (*S. takesimensis*), *Rhodiola rosea* (*S. rosea*), and *Rhodiola pachyclados* (*S. pachyclados*).

Regardless of what taxonomists say, I don't believe that the industry is going to start referring to *Sedum kamtschaticum* as *Phedimus kamtschaticus*. An example is the common florist's



mum or Chrysanthemum. Not too long ago it was reclassified into the genus Dendranthema. I don't recall anyone ever referring to it as Dendranthema and the International Botanical Congress eventually changed the name back to Chrysanthemum. Will a similar history evolve with sedum?

The practice of changing plant names and the fact that many are difficult to tell apart leads to confusion. For example, I have seen what appears to be the same plant labeled as *S. kamtschaticum*, *S. kamtschaticum* var. *ellacombeanum*, *S. ellacombeanum*, *S. kamtschaticum* var. *floriferum*, *S. floriferum*, and *S. mid-dendorffianum*. Supposedly, *S. kamtschaticum* var. *ellacombeanum* grows slightly larger than the straight species. Also,

the cultivar *S. kamtschaticum* 'Weihenstephaner Gold' is considered to be a cultivar of *S. kamtschaticum* by some and as a cultivar of *S. floriferum* by others. Still others consider it a variety (var. *floriferum*) of the straight species *S. kamtschaticum* and thus a synonym in name. Anyone else confused?

Furthermore, depending on the source of the plant material, I have seen what appears to be the same plant labeled differently. Likewise, I have seen what appears to be two different species labeled as the same plant. Identifying these species correctly has always been confusing to me so I assume that others must be experiencing the same thing. Regardless of what you call them, if an assortment of species are used, they all behave

similarly and the green roof seems to work out just fine. Sedum do well on green roofs since the environmental conditions usually mimic their native habitats. They are also a major player in driving the implementation of green roofs.

*Brad Rowe has been conducting green roof research at MSU since 2000. Research topics include plant selection, growing substrates, carbon sequestration, stormwater runoff, energy conservation, and roof vegetable production. He was the founding chair of the GRHC Research Committee and received the GRHC Research Award of Excellence in 2008. Brad also teaches a course on green roofs and walls at MSU.*



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# COST-BENEFIT ANALYSIS HELPS DENVER VOTE “YES” TO MANDATORY GREEN ROOF REQUIREMENT

BY ROHAN LILAUWALA, GRP

In the lead up to the vote on Denver’s I-300 Citizen-Led Ballot Initiative to make green roofs or solar panels mandatory for new and existing buildings with over 25,000 square feet of floor space, the opposition had a 12-to-1 fundraising advantage. Inaccurate information about the costs of the initiative was being distributed to citizens through radio ads and a mass mail out.

**R**obust cost-benefit analyses have helped to support green roof policies in places like San Francisco, Washington, D.C., and Toronto, as well as implementation by building owners like the General Services Administration and Walmart. In the absence of any real cost-benefit analysis in Denver, Green Roofs for Healthy Cities and the Green Infrastructure Foundation, with the help of Kirstin Weeks of Arup, Andy Creath of Green Roofs of Colorado, Jeff Joslin from the City of San Francisco and Brandon Rietheimer of the Denver Green Roof Initiative, conducted a cost-benefit analysis. The team used Denver-specific data combined with national averages on the costs and benefits of green roof implementation to conduct a cost-benefit analysis for a three-storey office building, as well as for widespread implementation across Denver. The report was released on October 13, 2017 and profiled at the Denver Green Roof Symposium held on November 2, 2017.

The analysis on the extensive green roof on an office building

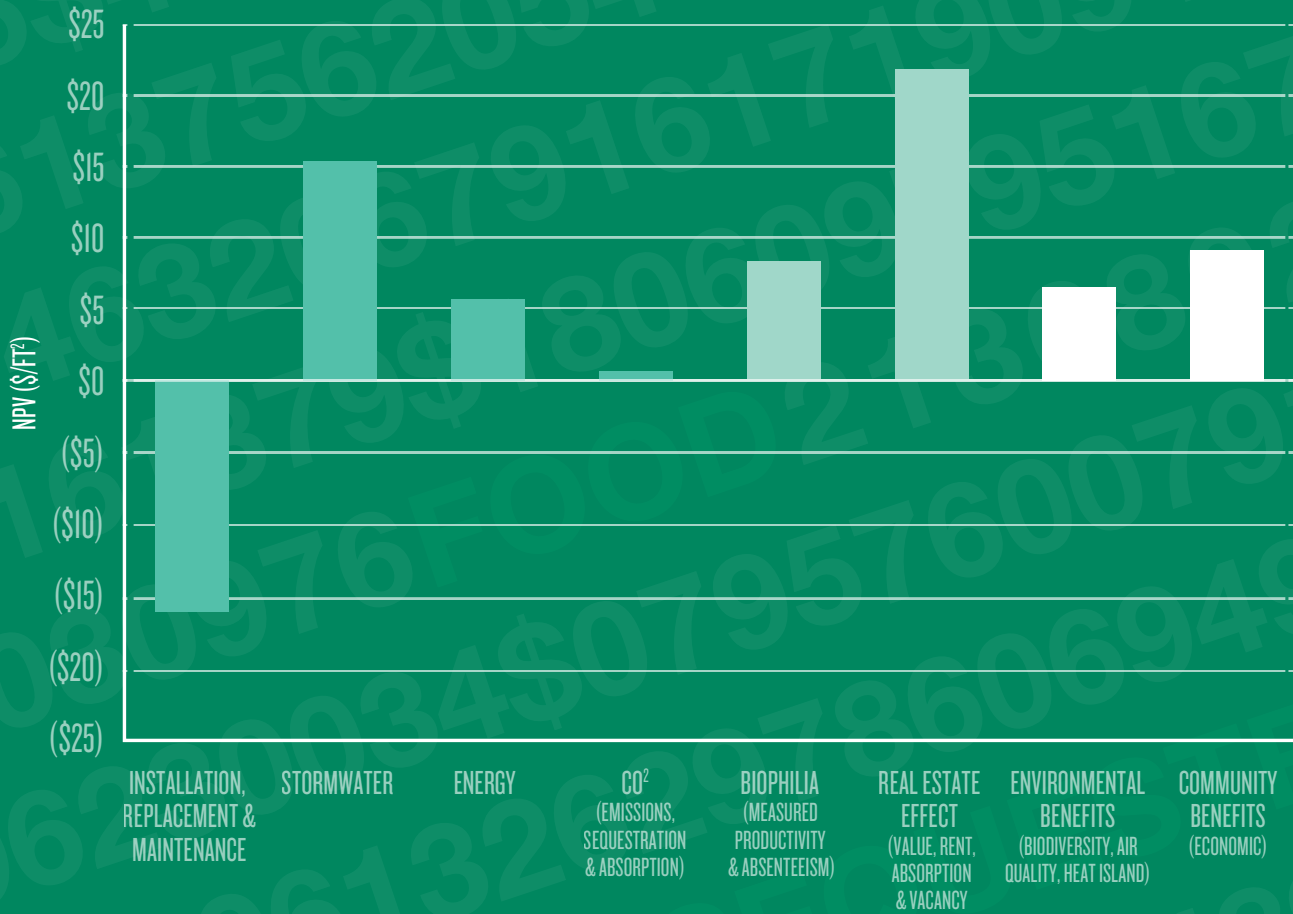
found that over 25 years, benefits in the areas of stormwater management (Present Value of \$15.1/sq. ft.), energy (\$5.7/sq. ft.), biophilia (\$8.5/sq. ft.), and real estate/economics (\$21.9/sq. ft.) more than offset the installation and maintenance cost premium for building owners and/or tenants (\$21.1/sq. ft.). (See chart right).

Affordability was not an issue for many types of buildings because the life-cycle economic benefits outweigh the additional costs. In affordable housing projects specifically, there is evidence of reduced vandalism and greater community cohesion, particularly when residents can access the roof to use it as amenity space. Colorado is also one of 33 states where financing under the PACE (Property Assessed Clean Energy) program is possible, allowing building owners and developers to obtain off-balance sheet financing for installation and maintenance costs applied to a building’s tax assessment. This



# NET PRESENT VALUE OVER 25 YEARS, PER SQUARE FOOT OF AN EXTENSIVE GREEN ROOF ON AN EXAMPLE NEW OFFICE BUILDING IN DENVER BY BENEFIT CATEGORY.

Source: Making Informed Decision: A Cost-Benefit Analysis of Green Roofs in Denver



program can eliminate the disincentive for developers to invest upfront in green roofs when many of the benefits accrue to the ultimate owners of the building in years to come.

The city-wide cost benefit analysis used conservative assumptions including high costs of installation and low applicability to existing building stock. The analysis showed that after 15 years of I-300's implementation, Denver would build an estimated 57.5 million square feet of green roofs, at a total installation and maintenance cost of \$1.34 billion (PV). These roofs would generate a number of public and private benefits, including 25,000 job-years of employment, \$445 million in local food produced, \$573 million in increased roof lifespan, and \$171 million in savings from a reduced urban heat island effect (Denver has the third worst heat island in the US). Looking into the future, as these roofs built in the first 15 years continue to accrue benefits but costs are limited to

maintenance, their Net Present Value is a staggering \$1.85 billion.

The I-300 initiative was passed by a majority of Denver voters on November 7. This was undoubtedly thanks to the determination of the Denver Green Roof Initiative volunteers, as well as the engagement of Denver's citizens. At the same time, this cost-benefit report provided a strong argument for implementing green roofs in Denver, and serves as a foundation

for future analysis. More work needs to be done to fine tune the requirements and provide additional information about the public and private benefits of green roofs.

To read the full cost-benefit report, visit [www.livingarchitecturemonitor.com/Denver](http://www.livingarchitecturemonitor.com/Denver)  
*Rohan Lilawala is Program Manager at the Green Infrastructure Foundation and Senior Researcher at Green Roofs for Healthy Cities. [rlilawala@greenroofs.org](mailto:rlilawala@greenroofs.org)*



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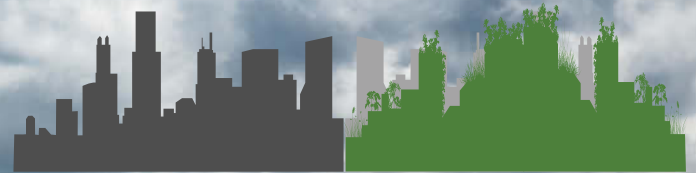
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# NEW FINANCING PROGRAM IS RAISING THE PROSPECTS FOR GREEN ROOFS

BY ERIC J. ALINI

In the past, the higher upfront costs of green roofs over conventional roofing often stopped projects before they started. But no longer. Green roofs can now effectively compete with conventional roofing through a new type of financing that covers the cost of eligible energy efficiency, sustainability and resiliency projects.

Through a public-private partnership, Property Assessed Clean Energy (PACE) incentivizes owners to make energy efficiency upgrades by providing 100% financing that is long term, fixed rate and preserves the property owner's capital. Owners may even elect to defer the first payments by including capitalized interest in the financing - allowing rental income to stabilize before repayment begins and aligning the ongoing utility savings with repayment costs for the improvements. Prepaid service and warranty contracts may be included, lowering maintenance costs as well. By including irrigation, elevators, stairs and related roofing work in the financing, green roofs can now be installed with no upfront capital and have become economically attractive.

Since 1736, when Benjamin Franklin proposed the idea of property tax to pay for the Philadelphia fire department, tax assessment financing has funded public service projects - from new sidewalks to schools. Today, PACE is the nation's

first voluntary property tax assessment applied to individual buildings. It's an innovative way to pay for reducing the environmental footprint of America's building stock by helping owners reduce their upfront costs through property tax assessment financing. For projects that typically can't calculate energy savings or offer payback periods that are too long for conservative investors, PACE transforms the standard return on investment (ROI) model and provides a unique set of positive economic incentives that make environmental upgrades such as green roofs very attractive.

The PACE financing mechanism begins when funds are transferred from a capital provider to a government agency. Funding is then secured through a tax assessment placed on the building and repaid through the property tax bill. As a result, the repayment of the financing is treated as a tax on the property rather than a loan expense, greatly improving a project's economics.

# PACE GREEN ROOF CASE STUDY

- Project Cost: \$350,000-Green Roof design, engineering and installation, irrigation, horticultural design and installation
- Related Costs: \$150,000-Stairway to roof, permits & inspections, Prepaid service contract, Roofing structural and membrane work
- Total Costs to be financed: \$500,000
- Terms: 25 years at 7% fixed rate interest, no balloon
- Estimated annual assessment added to property tax bill: \$49,500 -\$4,125 pro rated monthly cost
- Pass-through to tenants depends upon lease; stormwater management and energy savings varies with each individual property

Source: Green Roof Program, [www.counterpointesre.com](http://www.counterpointesre.com)



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# "THE REPAYMENT OF THE FINANCING IS TREATED AS A TAX ON THE PROPERTY RATHER THAN A LOAN EXPENSE, GREATLY IMPROVING A PROJECT'S ECONOMICS."

- ERIC J. ALINI

## SPLIT INCENTIVE

PACE is the long-awaited solution to the commercial building sector's greatest barrier to environmental best practices: the split incentive. Split incentive relates to commercial real estate lease language obligating a tenant to pay for utility costs and a landlord to pay for building upgrades. Building owners, carrying all the costs of the upgrade and passing all the energy savings to the tenants, may never see a positive return on the investment. So it's not surprising that Lawrence Berkley National Lab's 2013 "Remaining Market Potential of the U.S. Energy Services Company Industry" found commercial buildings lag behind all other building segments with a pitiful 10% adoption rate of energy efficiency technologies. PACE solves the great split-incentive dilemma by converting project financing to property tax assessment financing. This triggers an accounting transformation with considerable benefits. Under most commercial leases, tenants pay the utility bills and the property tax, placing them with de facto responsibility for repaying the cost of projects while benefiting from lower utility bills- closing the split-incentive gap.

Now commercial building owners can access low-cost, private sector capital to pay for 100% of eligible projects, finance the cost of the project over time to ensure that the annual payments are less than the annual utility savings, and avoid split-incentive. On top of that, debt liability may not be impacted if the financing receives off-balance sheet treatment. The building is improved without any capital expenditure and operating expenses are reduced.

## THE PPA MOMENT FOR GREEN ROOFS

Could PACE be the special ingredient that makes green roofs commonplace? There is precedent. Before Power Purchase Agreements (PPA) were introduced to the solar industry, rooftop solar was a luxury consumer product. The advent of the PPA made solar energy an economically attractive option for building owners. PACE financing may have the same transformative power on the green roof industry.

As markets learn to use PACE at a meaningful scale, its impact will be felt across industries. Already, the earliest signs of disruption can be seen. Contractors who quickly learned the basics of PACE are starting to grab market share by offering a solution that sets them apart.

PACE is still in its infancy, having only developed the public sector infrastructure necessary to handle the cash streams over the last 3 to 5 years. Its potential is clear with early signs of exponential growth. Rocky Mountain Institute promotes it - Lawrence Berkeley National Labs validates it - and Scientific American magazine calls it a top 20 "world changing" idea. Red and blues states across the country are passing legislation to enable it, making PACE financing the fastest growing financial tool in the U.S. As PACE goes mainstream, vendors who align with this tool will emerge as new industry leaders and products once thought to be luxuries will become the new standard. Green roofs should be one of those standards emerging as the new norm for America's buildings.

---

*Eric J. Alini, Chief Executive Officer, Counterpointe Sustainable Real Estate Mr. Alini is the founder and Managing Partner of Counterpointe Energy Partners, LLC. Mr. Alini is also the founder of Counterpointe Capital Management LLC (CCM), a tax lien asset manager and servicer. CCM has managed over \$240mm in tax lien assets over the past 3.5 years.*



## 2017 AWARD WINNERS (Left to Right)

- Janet MacKinnon, AE Design
- Arjun Viray, Portland State University
- Cathy Chung, Omni Ecosystems
- Bruce Dvorak, Texas A&M University
- Oren Mizrahi, Connect Landscape Architecture
- Tony Sanchez, Recover Green Roofs
- Lynda Wightman, Hunter Industries
- Mark Sindell, GGLO
- Rafael del Castillo, Bertschi School
- Chris Hellstern, KMD Architects
- Jeff Joslin, City of San Francisco
- Nancy Rottle, University of Washington
- Leann Andrews, University of Washington

## CONGRATULATIONS 2017 AWARDS OF EXCELLENCE WINNERS

Every year, Green Roofs for Healthy Cities organizes the Green Roof and Wall Awards of Excellence for excellence in design, research, and policy to be presented at the annual CitiesAlive conference. In the Fall issue, we profiled 2017's outstanding design projects. Here we present the individual awards, celebrating achievements in research, advertising, policy achievements, and corporate excellence.

## CATEGORY - ADVERTISING AWARD

## AWARD WINNER - SIKA SARNAFIL

Sika manufactures thermoplastic (PVC), single-ply, commercial roofing and waterproofing membranes. With more than 40 years of roofing and waterproofing experience in locations all over the world, on buildings of all types and in many diverse climates, Sika Sarnafil membranes have passed the most stringent European test standards for root resistance.

## CATEGORY - RESEARCH POSTER AWARD

## AWARD WINNER - ARJUN VIRAY AND OLYSSA STARRY – CURRENT AND POTENTIAL USES OF GREEN ROOFS ON HOSPITALS

Every year, CitiesAlive hosts a poster session on the trade show floor, in which students research green infrastructure topics and present their work to conference attendees. The winner this year is Current and Potential Uses of Green Roofs on Hospitals from Arjun Viray and Olyssa Starry, PhD of Portland State University. This poster examines the ways in which green roofs currently benefit healthcare facilities.

## CATEGORY - JLIV AWARD

## AWARD WINNER - LEANN ANDREWS &amp; NANCY ROTTLE – DEPLOYING LIVING WALLS AS KINETIC FACADES

To honor the groundbreaking green infrastructure research that is being published in the peer reviewed Journal of Living Architecture (JLIV). The winner this year is Deploying Living Walls as Kinetic Facades by Leann Andrews, PLA and Nancy Rottle, PLA, FASLA of the University of Washington. This paper explores ideas for integrating moveable exterior living walls with the facades of high-rise buildings to enhance urban ecosystems while contributing opportunities for personal interaction with the natural world.

## CATEGORY - RESEARCH AWARD

## AWARD WINNER - BRUCE DVORAK, TEXAS A&amp;M UNIVERSITY

Bruce Dvorak, PLA, ASLA is an Associate Professor in the Department of Landscape Architecture & Urban Planning at Texas A&M University. In 2009, Professor Dvorak established the Interdisciplinary Green Roof Research Group at Texas A&M to investigate green roofs and living walls in central Texas. Bruce is a member of the Green Roofs for Healthy Cities Research Committee and an editorial board member of the Journal of Living Architecture and is working with green roofs and walls to observe plant viability and monitoring of the micro-climates on rooftops in central Texas.

## CATEGORY - CIVIC AWARD

## AWARD WINNER - JEFF JOSLIN, DIRECTOR OF CURRENT PLANNING, SAN FRANCISCO PLANNING DEPARTMENT AND THE CITY OF SAN FRANCISCO

Jeff Joslin is the Director of Current Planning with the city of San Francisco, and one of the key drivers behind the adoption of San Francisco's green roof mandate. When San Francisco's Better Roof Ordinance became effective January 1st, 2017, the City By The Bay became the first U.S. city to mandate solar and living roofs on most new construction. This new ordinance provides flexibility for the building designer, owner, and developer to maximize benefits.

## CATEGORY - CORPORATE LEADERSHIP AWARD

## AWARD WINNER - LYNDA WIGHTMAN, HUNTER INDUSTRIES

Lynda Wightman is the Industry Relations' Manager with Hunter Industries assisting with the company's worldwide specification efforts; education opportunities; allied association representation (strength being focused on water conservation and sustainable landscapes, specification and sports turf). Her education background is in Ornamental Horticulture, Landscaping and Irrigation. She is involved in various industry associations including ASIC, STMA, NALP, ASLA, Irrigation Foundation, IA, NIAAA, NRPA, ASBA, MNLA, and many regional chapters of these associations. She is a strong supporter of students.



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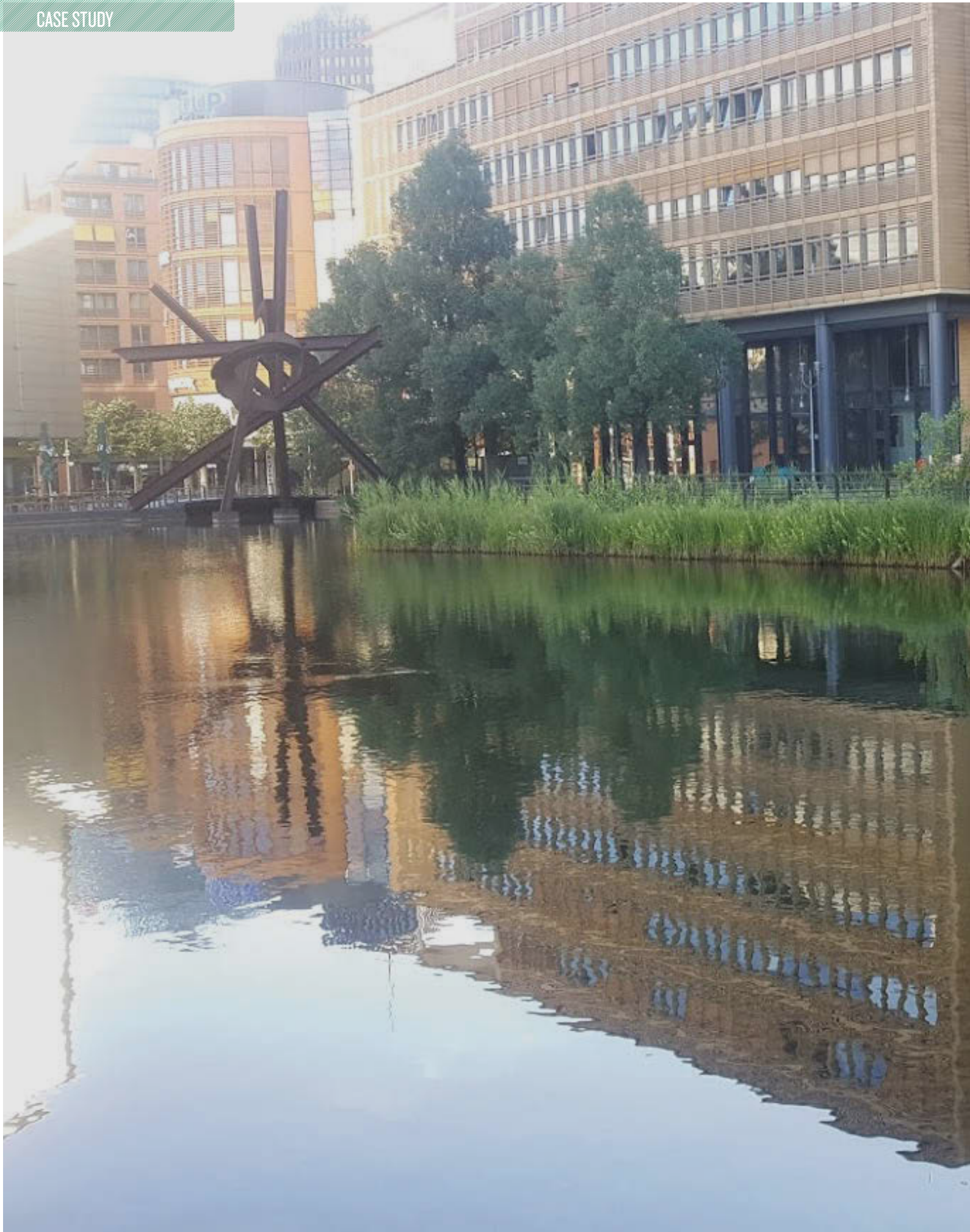
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## CASE STUDY:

# POTSDAMER PLATZ – REVISITING INTEGRATED GREEN INFRASTRUCTURE PERFECTION IN BERLIN, GERMANY

BY STEVEN W. PECK, GRP, HONORARY ASLA

After WWII, the downtown of Berlin was destroyed by air raids and artillery - covered with building debris, unexploded bombs and rubble. Out of these ashes emerged, almost 60 years later, an outstanding 60 acres of commercial development featuring 19 buildings, which to this day exemplifies the best in integrated green infrastructure and stormwater design and development.

It's early morning and the mists from the 1.2 hectare lake, the centerpiece of Potsdamer Platz are still swirling about, as Herbert Dreiseitl, Executive Director of Ramboll Living Cities Lab and lead designer of the project escorts a few colleagues on a rare tour of this enormous place. We are in Berlin attending the 10th Annual World Green Infrastructure Congress and we rise early to see this project with its lead designer – a special treat.

“The lake is designed to rise and fall from 12 to 30 centimetres to adjust to varying levels of stormwater flows”, said Herbert as we stand by the mirrored surface of the lake. “The buildings on the site also have over 12,000 square meters of extensive green roofs, and there are





**HERBERT DREISEITL, LEAD DESIGNER  
OF POTSDAMER PLATZ, BERLIN.**

Photo courtesy of S. Peck



strict policies on the maintenance programs for each of them to help control water quality.”

The lake is surrounded on several sides by living machines (cleansing biotopes) that filter out pollutants in the water. We are in downtown Berlin and there are small birds and dragonflies flying about the site. “I had to fight to have plants in the lake, to help clean the water, and to keep copper flashing off the roofs,” said Herbert. “The ‘starchitects’ on the project just wanted a reflecting pool for mirroring the facades of their buildings but I won Renzo’s support.” Italian architect Renzo Piano (California Academy of Sciences) was responsible for the overall masterplan design of the site.

The lake has the second highest water quality in Berlin. The water continuously circulates via underground pumps every three days in the hot summer throughout the entire system, which contributes to maintaining its incredible quality. The water also passes over structures that oxygenate it, and that create a soothing ripple effect on its surface. As we walk around the lake, I am amazed when I see several large pike swimming in the clear waters. The fish are removed each year, but they somehow keep coming back.

The green roofs and the lake help to reduce the urban heat island effect, which averages about two degrees C in Berlin. The lake provides a popular and valuable amenity space to the workers in the offices of firms such as Sony, Daimler-Benz and PricewaterhouseCoopers. The lake, which is about 3 meters at its deepest, also invites people to swim, although this is not a formally sanctioned use.

“These water features cost only \$9 million U.S. in 1999, but this investment drove up the value of all of the

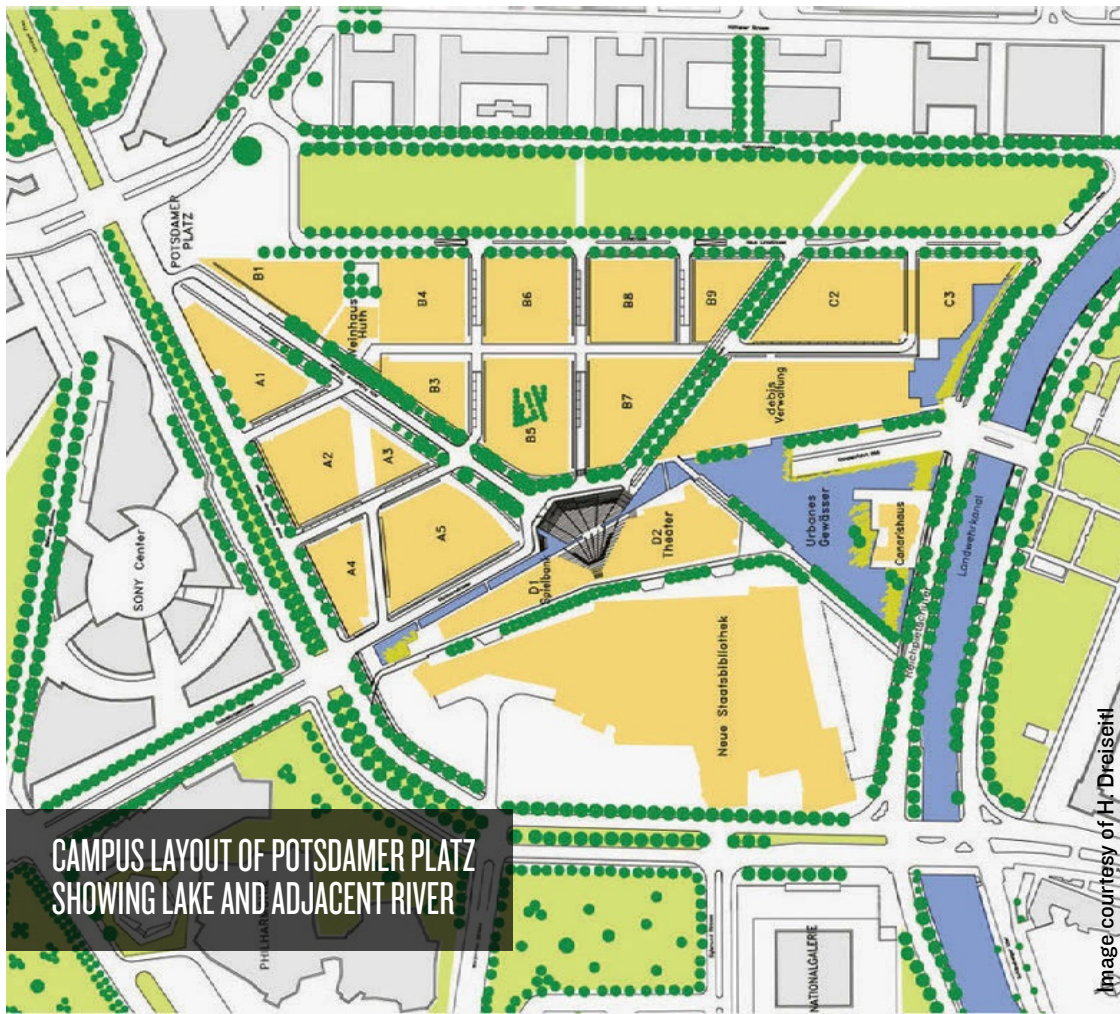




"THESE WATER FEATURES COST ONLY \$9 MILLION U.S. IN 1999, BUT THIS INVESTMENT DROVE UP THE VALUE OF ALL OF THE REAL ESTATE DEVELOPMENT SURROUNDING THE PROPERTY."

- HERBERT DREISEITL



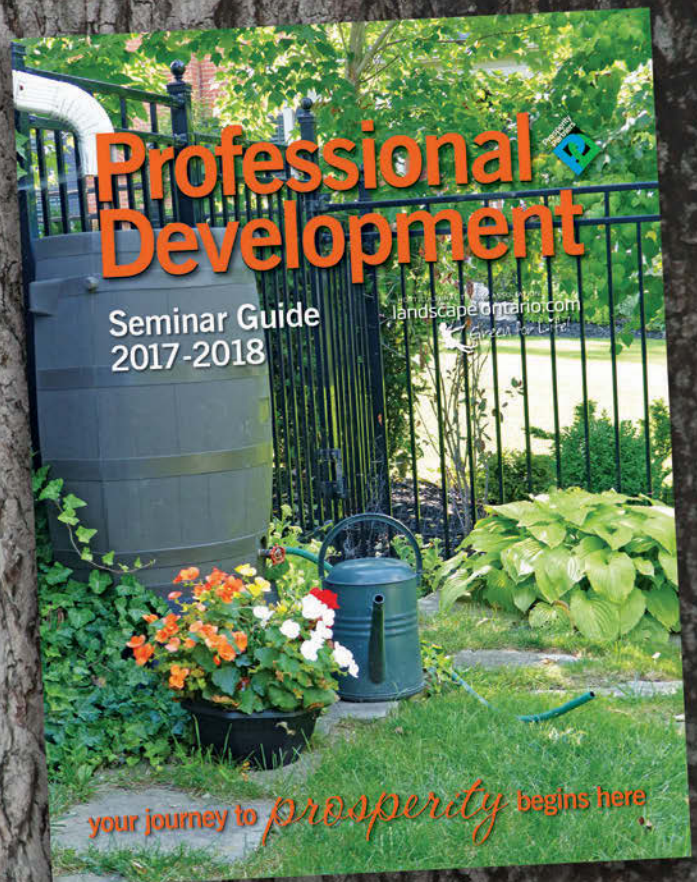


real estate development surrounding the property,” said Herbert, when I asked him about the costs and benefits. “The place is so popular that there are always people here, and they even hold the German Film Festival on this site.”

Potsdamer Platz, now in its 18th year, exemplifies the tremendous value of using stormwater in our cities for amenity space, and how the integration of stormwater management with green infrastructure can provide significant overlapping benefits in city re-building. Instead of driving stormwater out of the city as fast as possible, we need to capture and use this water to create beautiful, functional and healthy urban environments.

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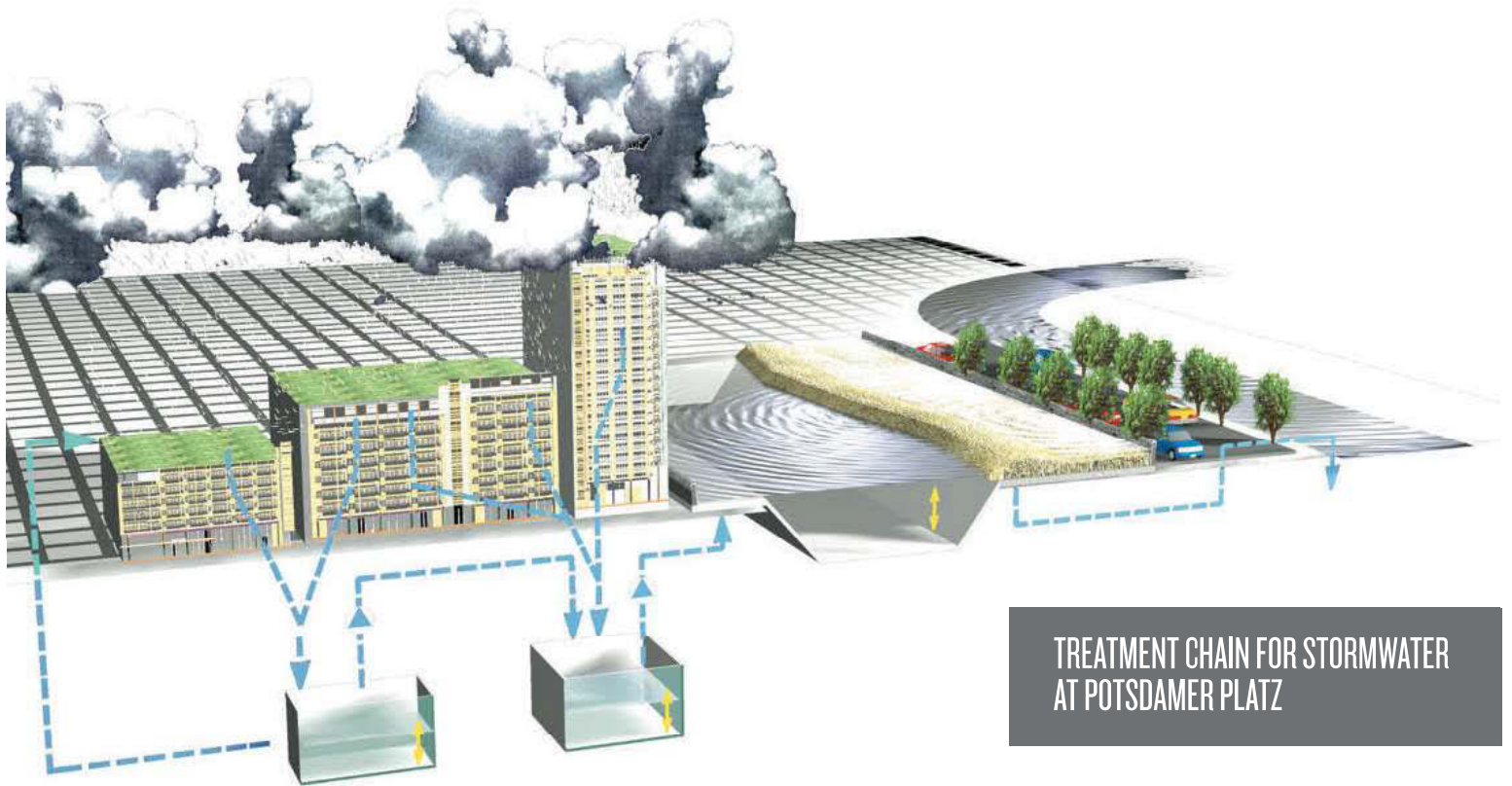
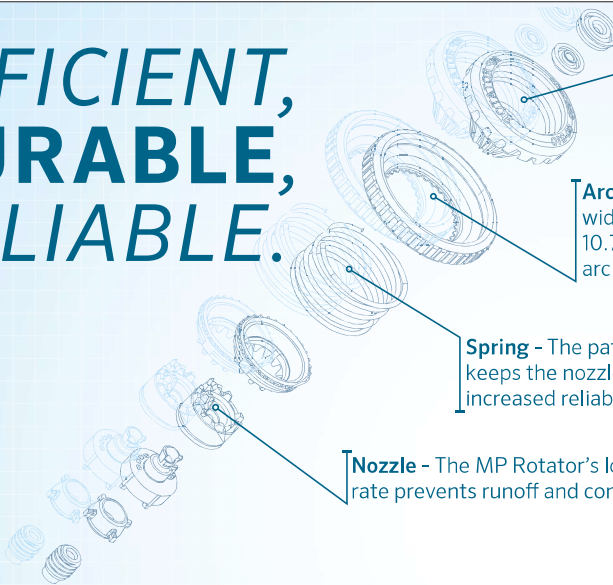


Image courtesy of H. Dreiseitl

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A PORTION OF THE ATLANTA CITY HALL GREEN ROOF, DURING CONSTRUCTION

Photo courtesy of M. Barmore

# GREEN ROOFS - FOR RENT? A TALE OF TWO ROOFTOPS

BY MATT BARMORE, GRP

Green roofs can not only do great things for the environment, they can bring direct financial benefit to building owners. When intentionally designed to serve as gathering spaces, green roofs are attractive, unique venues that can both serve the community, and serve as a profit center for the building owner. Here are two recent examples.


## ATLANTA CITY HALL

A National Register of Historic Places designee, the Atlanta City Hall is situated in the center of old downtown Atlanta. Opened for public service in 1930, the building exemplifies the Late Gothic Revival architectural style popular in its day. The Atlanta City Hall green roof was originally constructed in 2003, then deconstructed and completely rebuilt to a new design in the Fall 2017. It sits adjacent to the government center's popular coffee shop and lunch stop, Café 55 – named for the building's address of 55 Trinity Ave SW – and directly above the Mayor's Office & Porch. Filled with plants that will bloom in the bright Georgia sunshine from early April through October, the green roof color palette ranges from pinkish-purple echinacea purpurea to the variant greens of Little Bluestem and Karl Foerster grasses to the starry blue flowers of amsonia hubrichtii to the sunny yellow-gold of rudbeckia goldstrum, and more.

During the morning and afternoon, the new green roof is designed to serve as a colorful, relaxing gathering spot for meals, meetings, and conversation, with benches, tables, and chairs available to café patrons. Inherent to the design, however, is a broad center area paved with a pedestal-and-roof-paver system, for use as event space beyond the building's working hours. This area narrows toward the edge of the roof, creating a focal point for weddings,

speeches, and other intended gatherings. The City of Atlanta worked closely with their green roof designers and installers for several months prior to the job start, to ensure that their vision of a flexible space, useful both for daytime City Hall staff and evening/weekend public rental, was met. While the roof was completed only recently and has not yet had its first seasonal bloom, the City Hall green roof reopened in October and is ready for rent!





PINNACLE TOWER GREEN  
ROOF IN NASHVILLE HOSTS  
GATHERINGS LIKE WEDDINGS  
AND GENERATES REVENUE

Photo courtesy of M. Barmore

## PINNACLE TOWER

The green roof at Pinnacle Tower overlooks the historic Cumberland River – flowing lazily just a block away – while sitting at the edge of the bustling downtown business, cultural, and country music “honky-tonk” hub of Lower Broadway Street in Nashville, TN. From Pinnacle’s green roof, Nashville landmarks are in clear view, including Nissan Stadium, The Country Music Hall of Fame, Music City Center, and the famous “Batman building,” the nearby AT&T Building. This green roof was designed with a wide, concrete-paver gathering space, bordered by varied-height planters which are in turn surrounded by an intensive green roof featuring multiple A-frame trellises planted with flowering, climbing plants. A large wooden trellis at the south end serves as the focal point for weddings and events. The green roof then extends more narrowly along the sides of

the building, with multiple tabletop seating and gathering spaces serving the tower’s busy daytime function as a prime professional space in downtown Nashville. So popular is the green roof as a community space that weddings are booked nearly a year in advance, and multiple weddings and events are scheduled within the same day.

Enhancing urban environments and providing unique, attractive community gather-

ing space while also serving as revenue for the building owner is another way that green roofs bring benefits to our cities. By spotlighting these benefits, green roof designers, manufacturers, and proponents can make a solid financial case for green roofs to building owners.

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*Matthew Barmore, GRP, is the Vice President, Greenrise, and Chair, Corporate Members Committee, GRHC.*



# BUILDING SAN FRANCISCO'S BETTER ROOFS ORDINANCE

BY JEFF JOSLIN, DIRECTOR, CURRENT PLANNING, SAN FRANCISCO  
AND EMMA TAMLIN, GREEN ROOFS FOR HEALTHY CITIES

The Living Architecture Policy Library (LAPL) examines the process behind developing policies that are focused on green roofs and/or walls. This is the second case study in the LAPL which is designed as a resource for decision makers to develop effective green roof and wall policies.

**O**n January 1st, 2017, San Francisco became the first US city to require solar or green (living) roofs on most new construction. The San Francisco Better Roofs Ordinance requires between 15 and 30 per cent of roof space on most new construction to incorporate solar, green roofs, or a combination of both. The ordinance was approved on September 15, 2016 and October 17, 2016 by the Planning Commission and Board of Supervisors respectively. Although the initiative was proposed and approved in a matter of months, the effort to encourage more living roofs in the Bay Area was the culmination of four years of consistent effort.

In 2013, San Francisco hosted the national green roof conference, CitiesAlive, which was co-sponsored by the Planning Department and the San Francisco Public Utilities Commission (SFPUC). The conference was specifically courted by the City in order to initiate consideration of new green infrastructure policy and programs.

In preparation for the 2013 conference, SPUR (San Francisco Bay Area Planning and Urban Research Association) formed the Green Roof Task Force, which produced the “Greener and Better Roofs Roadmap”. The report recognized that – in addition to being a prime location for renewable

energy resources – roofs can host ‘green’ or ‘living roofs’ which provide a multitude of benefits. These include reducing stormwater entering the sewers, reducing energy consumption, augmenting roof life, improving city views, enhancing biodiversity and habitat, sequestering carbon, capturing air pollution, and connecting citizens with nature. The SPUR Roadmap recommended next steps for green roof progress in San Francisco, including the introduction of legislation.

Following the conference, the Planning Department formed a Living Roof Team to continue research on San Francisco specific rooftops.

The team led tours of existing rooftops throughout the city, conducted interviews of designers, analyzed other cities’ policy efforts, and researched environmental attributes that contribute to successful living roofs in the Bay Area’s specific microclimate and bioregion. The team continued to work with various stakeholders and city agencies to further define priorities, roles, and best next steps for disseminating living roofs in San Francisco.

The culmination of this information was crafted into a Living Roof Manual, Living Roof webpage, and a Living Roof map of San Francisco. This ongoing work since 2013 led to further work with San



**"SHOULD THE CURRENT RATE OF DEVELOPMENT CONTINUE, IT'S ESTIMATED THAT SAN FRANCISCO COULD SEE AS MUCH AS 1.5 MILLION SQUARE FEET OF NEW LIVING ROOFS BEING NEWLY ESTABLISHED EACH YEAR."**

- JEFF JOSLIN

Francisco Department of the Environment to advance a holistic Better Roof Ordinance.

A detailed cost-benefit study was also conducted that tested various likely building uses and scales, and demonstrated the cost efficacy at both the project and the city scale. City scale benefits were determined to include:

- \$15 - 100 million of tax revenues in the first five years from improved property and biophilic value;
- 60,000 – 385,000 tonnes of carbon emissions avoided or sequestered over 15 years, a critical period for reducing the anticipated impacts of climate change, equaling:
- the sequestration of 3,600-24,000 acres of forest
- the energy used by 400-2700 homes
- 800-5400 cars off the road

Should the current rate of development continue, it's estimated that San Francisco could see as much as 1.5 million square feet of living roofs being newly established each year.

#### POLICY NAME

San Francisco Better Roofs Ordinance

#### POLICY DESCRIPTION

The Better Roofs Ordinance requires between 15 and 30 per cent of roof space on most new construction to incorporate solar, living roofs, or a combination of both. The living roof option allows developers to replace required solar (15 per cent) with living roof at a rate of 2 sq.ft of living roof for every 1 sq.ft of solar.

#### DATE PROPOSED, APPROVED & IMPLEMENTED

Proposed Summer/Fall 2016

Approved Planning Commission: September 15th, 2016

Approved at Board of Supervisors: October 17th, 2016

Effective January 1, 2017

#### CITY DETAILS

Population: 864,816 (2015)

Plant Hardiness Zone: 10B

Climate: Mediterranean climate, mild temperatures, little rainfall

Average rainfall: 23.64 inches/year

Average temperature: 57 degrees F

#### POLICY DRIVERS

- Efficient and best use of space in an dense urban city
- A more green and sustainable city
- Connecting people to nature & creating habitat
- Improved stormwater management
- Air quality improvements
- Biodiversity/biophilia increases
- Job creation opportunities

#### ANTICIPATED CHALLENGES

- The policy negatively impacting the cost of affordable housing
- Drought/lack of water creating an issue for planting
- Competing rooftop uses (urban agriculture, open space, etc.)
- Buildings becoming shaded in the future

#### SOLUTIONS

- Developed a Cost Benefit Analysis to show the affordable options for different green roofs compared to normal and white roofs
- The Living Roof Manual provides recommendations for plants that are drought tolerant
- Continued coordination with sister agencies

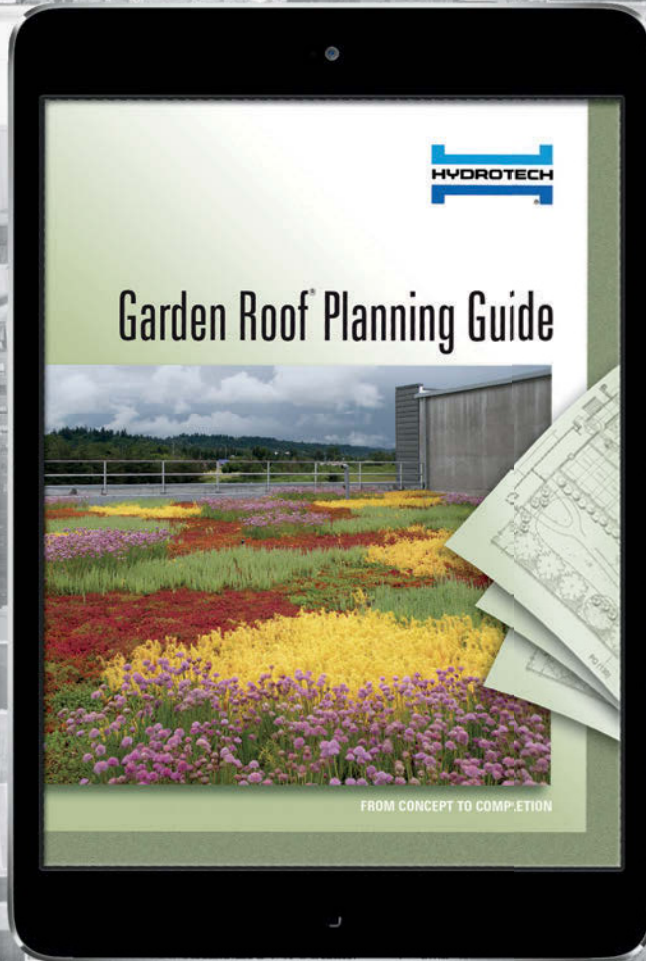
#### MONITORING IMPACTS

- Track impacts using a permit tracking site
- Update living roof data base as projects are approved
- Track square feet of living roofs and square feet of solar roofs
- Data will be used to calculate stormwater runoff mitigation and air pollutants impacts
- Size and location of living roof are important when determining impacts
  - Ex. A large living roof located near a freeway will have substantial air pollutant benefits

#### IMPLEMENTATION TOOLS AND RESOURCES

Please visit [sf-planning.org/san-francisco-better-roofs](http://sf-planning.org/san-francisco-better-roofs) for links to the ARUP Cost Benefit Analysis, Living Roof Manual, and the SPUR Report: Greener & Better Roofs.





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# HOW SMART SURFACE TECHNOLOGIES COULD SAVE CITIES BILLIONS

BY RACHEL LEMPP AND GREG KATS

A new study released in December 2017 shows that city-wide adoption of smart surface technologies could save cities billions of dollars over 40 years. *Achieving Urban Resilience*, authored by Greg Kats and Keith Glassbrook of Capital E, quantifies the large-scale environmental, economic, and health benefits of smart surface technologies in three US cities: Washington DC, Philadelphia, and El Paso.

The strategies examined include cool roofs, green roofs, solar PV, reflective pavements, and urban trees. Many cities have initiatives and programs in place to promote the adoption of such technologies, but such programs are fragmented and limited and should be implemented more rigorously. “Delaying this transition would impose large financial and social costs, particularly on places of lower economic opportunity [and on] the elderly and children. We have the roadmap—now we must follow it,” said Dan Tangherlini, former DC city administrator and former administrator of the US General Service Administration.

Many of the benefits of smart surfaces have never before been quantified, making this report unique and highly impactful. The current systematic mismanagement of the sun and rain costs cities billions in health, energy, stormwater and other costs, and these costs will continue to rise as climate change raises worldwide temperatures. The costs and benefits of city-wide adoption of smart surfaces has a net present value \$1.8 billion dollars for the District, \$3.6 billion for Philadelphia and \$500 million for El Paso over 40 years. When avoided tourism loss is included, these numbers jump to \$4.9 and \$8.4 billion for the District and Philadelphia, respectively.

Rick Fedrezzi, current CEO of the International WELL Building Institute and Founding Chairman of the USGBC said of Kats’ report, “In his seminal work 14 years ago, Kats provided the first and most influential analysis on the cost and benefits of green buildings. That work has had a transformative impact in the U.S. and globally in greatly expanding recognition of the financial rational for building green and in accelerating adoption of green design. In *Achieving Urban Resilience*, Kats provides an enormously important step for US cities to understand and quantify the large range of health, livability and climate change benefits from adopting a range of cost-effective strategies now available to manage sun and rainfall. The work is so important because it is the first to rigorously document, quantify and explain these benefits and benefit pathways.”

Cities have substantially higher summer temperatures and worse air pollution than suburban or rural areas, a phenomenon known as the urban heat island effect. Paved areas, less greenery, and dark surfaces all contribute to higher urban temperatures, and these features of the built environment are even more common in low-income areas. This disparity in the built environment places a higher burden of medical costs, energy bills, and general discomfort for low-income residents (See diagram page 29).

Calculating costs is relatively straightforward, while calculating the value of benefits is more complex because of direct and indirect impacts, as well as compounding effects. Direct impacts occur at the individual building level, while indirect impacts occur at the city

CATEGORY	PRESENT VALUE OVER 40-YEAR ANALYSIS PERIOD (2015\$)		
	Washington, DC	Philadelphia	El Paso
COSTS	\$838,495,000	\$2,384,050,000	\$1,617,098,000
BENEFITS	\$2,648,400,000	\$5,958,661,000	\$2,154,979,000
NET PRESENT VALUE	\$1,809,905,000	\$3,574,611,000	\$537,881,000

level. An example of a compounding effect is the increased efficiency of solar PV located on a green roof because of lower rooftop temperatures. Additionally, many potentially significant benefits were not quantified due to lack of available data in the area, making the value of benefits reported a conservative one. The main categories of impacts quantified in this report include energy and greenhouse gases, financial incentives, stormwater, health, climate change and employment.

As buildings are cooled and shaded by green roofs, they require less energy for climate control. Rooftop PV also lowers energy bills at the individual building level. City-wide cooling efforts result in widespread lower temperatures, reducing energy costs. Rooftop PV also reduces demand during peak

energy periods, requiring fewer peaking energy plants to be built. Many cities also award financial incentives for installing the technologies analyzed in the report through renewable portfolio standards, renewable energy credits and other tax credits. Additionally, reduced greenhouse gas usage slows the onset of climate change.

Excess stormwater runoff can result in localized flooding, sewage overflows, and damage to local water bodies. Decreased total runoff from green roofs and urban trees relieves pressure on stormwater systems and protects local water bodies from pollution.

The health impacts of city-wide deployment are widespread and indirect. Reduction in the production of ozone and particulate matter by using renewable energy, lowering temperatures, and planting trees to filter air

can significantly improve air quality. Additionally, incidence of heat stress and related illnesses could decrease by lessening the occurrence of extreme heat events. Improving the health of a city's population saves money by reducing the number of unreimbursed hospital visits. Current work is being done to expand the report further, especially focusing on benefits to health as the percentage of GDP spent on healthcare climbs higher than the current 17% in the United States.

Finally, building and maintaining green infrastructure has the potential to create new employment opportunities. Labor intensity of green energy is higher than conventional energy sources. The World Bank estimates that wind, solar and energy efficiency retrofits create more than 3 times the number of jobs per investment than oil and natural gas.

Obviously, the benefits of city-wide smart surface deployment are broad and significant. This study can be used to drive cities in the United States toward comprehensive steps to enhance resilience and health as well as decarbonization backed by informed cost-benefit analysis at the city-wide scale for the first time. Outside of the US as developing countries modernize and improve cities with cost-benefit analyses in mind, green strategies have the potential to become the norm, not the exception when backed by comprehensive analyses like the Kats' report.

*Rachel Lempp is an intern with Capital E Investments and Greg Kats is the Managing Director of ARENA INVESTMENTS and the President of Capital E Investments. For more information visit: [www.cap-e.com](http://www.cap-e.com)*



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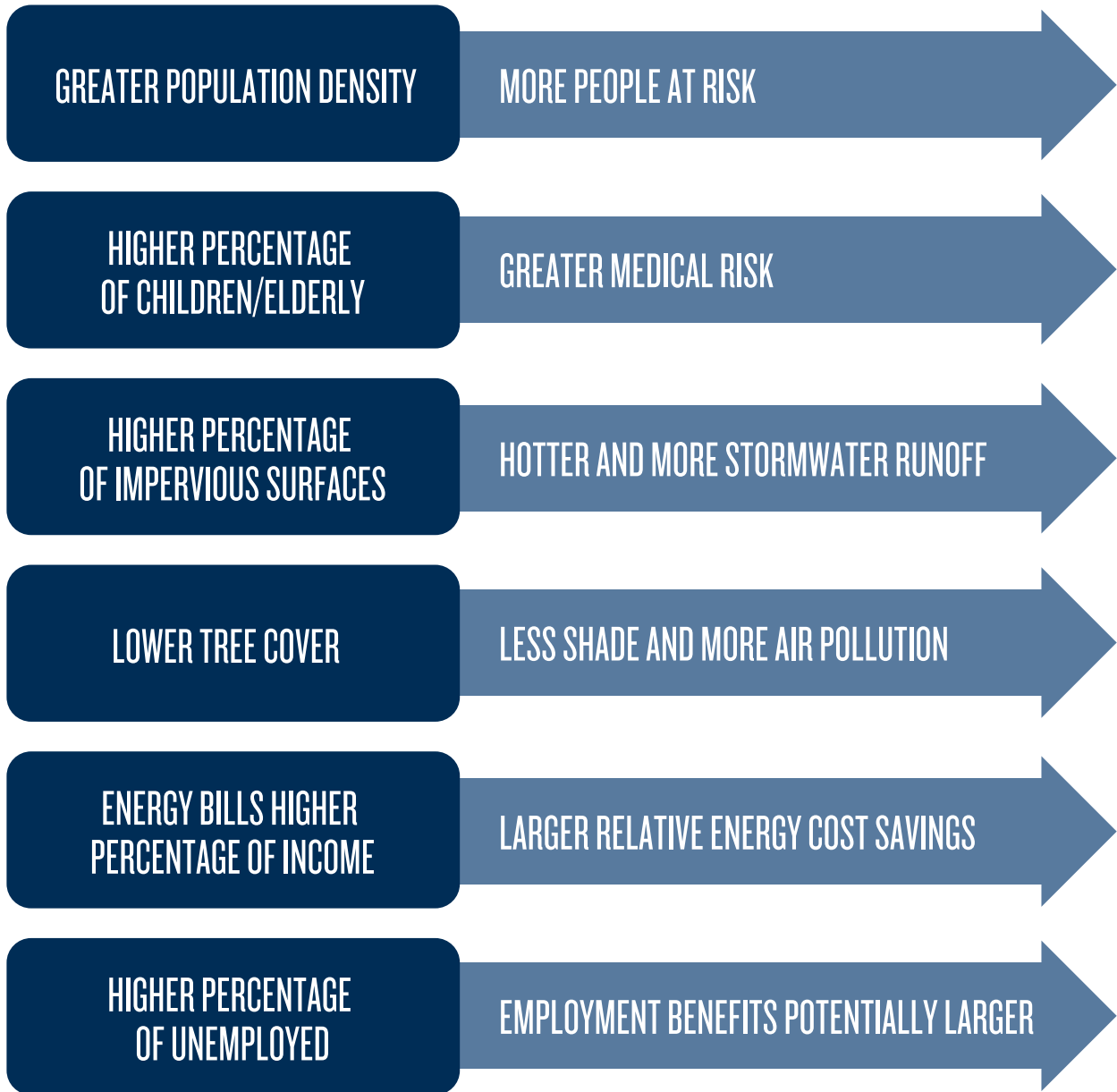


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**FIGURE 1: THERE ARE GREATER RISKS AND LARGER POTENTIAL BENEFITS IN LOW-INCOME AREAS.**



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# REVISED DESIGN STANDARD MINIMIZES FIRE RISKS

## SPRI UPDATES VF-1 FIRE DESIGN STANDARD FOR VEGETATIVE ROOFS

BY MICHAEL ENNIS

The steady advance of vegetative (green) roof designs within mainstream construction under the International Building Code requires regular updating of key design standards. As part of this industry wide effort, the American National Standards Institute (ANSI) re-approved the updated VF-1, “Fire Design Standard for Vegetative Roofs” as an American National Standard on May 11, 2017.

**G**reen Roofs for Healthy Cities and Single-Ply Roofing Industry Inc. (SPRI), the trade association representing commercial roofing system manufacturers and component suppliers, initially collaborated on VF-1. The standard was developed by SPRI in 2007 and first approved as an ANSI standard in 2010. The document was created to provide a design and installation reference for roofing professionals to help eliminate the risk of fire on vegetative roofs.

“Updates to the VF-1 Standard included collaboration between all industries and segments involved with vegetative roofing” says Brian Davis, chair of SPRI’s VF-1 Review task force.

“This, in turn, helped to create the best, most comprehensive document possible for the industry to reference and design with.”

Vegetative roof designs continue to evolve, with plant types, growing media, system complexity and usage, such as rooftop gardens. When updating the VF-1 Standard, SPRI needed to consider changes relating to external fire design and fire spread based on the American Society for Testing and Materials (ASTM) E108 – 17, “Standard Test Methods for Fire Tests of Roof Coverings.”

“Some of the key changes included new definitions and clarifying or removing some of the previous explanations and classifications, as well as additions to the VF-1 commentary section,” says Davis. “Some of the most important changes revolved around firebreaks, fire barriers, border zones, and area dividers, to name a few.”

The updated standard describes and provides more in-depth definitions of the three main categories of vegetative roofs—

extensive, intensive, and semi-intensive. The standard also adds the spread of fire requirements that include combustible features that are part of the vegetative roof design, but not part of the building structure. Roof planters are one example.

The section on “Spread of Fire, Protection for Large Area Roofs” is more robust, with specific references to FM Global recommendations (FM Global Loss Prevention Data Sheet 1-35—Green Roof Systems), which also coincides with the International Building Code “General Building Height and Area Limitations.” The new document also refers to German Landscape Research, Development and Construction Society (FLL) requirements. This includes FLL’s definition of a “hard roof” and its assertion that a vegetative “hard roof” can be considered equivalent to an ASTM E108 Class A Fire Classified roof assembly under certain conditions.

Vegetative roof technology has also been the subject of greater research efforts over the last seven years, as shown by the 14 references included in the new document, compared to only four references in the 2010 version. The 2017 version of ANSI/SPRI VF-1 provides clearer criteria for minimizing the risk of fire on green roofs through prudent design and mandatory maintenance requirements. The updated VF-1 standard is available for a free download at [www.spri.org](http://www.spri.org)

---

*Mike Ennis, RRC, joined the Single-ply Roofing Industry (SPRI) trade association in 1993. He has chaired various SPRI committees and task forces, and served as president from 2004 to 2006. He became the group’s technical director in 2007. Ennis can be reached at [info@spri.org](mailto:info@spri.org).*



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Volume 4 issue 3 pgs 1-8 2017

### CATALYZING DESIGN-SCIENCE FEEDBACK LOOP IN GREEN ROOF OPTIMIZATION FOR HOT CLIMATES

John Hart Asher<sup>1</sup>, Michelle Bertelsen<sup>1</sup>, Mark Simmons<sup>1</sup>

#### ABSTRACT

Synthetic ecosystems such as rain gardens, green roofs, engineered wetlands and urban meadows are becoming increasingly popular for their intrinsic environmental and ecological benefits as well as for their aesthetic value. But, as in many emerging technologies, communication between the academic institutions generating basic and applied science and the design disciplines is not as efficient as it could be, and strengthening this link will improve the performance of these systems. The case study serves to illustrate the process of linking research, design and implementation. Scientific research, performed by the authors and found in the literature, is used to inform design, and design challenges are used to suggest avenues of research. The research itself is briefly outlined where appropriate, but the focus of this paper is the process of linking science and design in a feedback loop.

Volume 4 issue 3 pgs 9-18 2017

### PHOTOVOLTAIC ARRAY INFLUENCES THE GROWTH OF GREEN ROOF PLANTS

JENNIFER BOUSSELOT<sup>1</sup>, THOMAS SLABE<sup>2</sup>, JAMES KLETT<sup>3</sup>, RONDA KOSKI<sup>4</sup>

#### ABSTRACT

A multi-faceted research project was conducted on a modular green roof in semi-arid, high elevation Denver, Colorado U.S.A. A photovoltaic (PV) array ran along the southeastern edge of the research area and visibly influenced the plant growth, cover and biomass. Plants grown near the PV prospered compared to plants in the exposed area. Average summer temperatures in the modules under the PV array were cooler with less temperature variation compared to the modules located in the exposed areas of the green roof. Shading structures integrated on green roofs may produce effects that resemble natural ecotones tending towards greater plant coverage and biomass, and therefore greater green roof resilience.

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The last of a series of successful Green Roof and Wall Symposia in 2017 is on December 11, 2017 in Pittsburgh. To register please visit [www.greenroofs.org](http://www.greenroofs.org). GRHC is planning a new year of Local Market Symposia events. This year, you can choose the cities we visit by sponsoring or exhibiting at one or more of the events. We are planning a Symposium in Houston on March 14, 2018. If you have a city you would like to see us bring a symposia to, contact Blaine Stand at [bstand@greenroofs.org](mailto:bstand@greenroofs.org) to add it to our list of prospective cities.

Visit [greenroofs.org/local-market-symposia](http://greenroofs.org/local-market-symposia) for more information.

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# THE ACADEMIC FOOTPRINT ON LIVING ARCHITECTURE

BY VIRGINIA RUSSELL, FASLA, GRP, PROFESSOR, UNIVERSITY OF CINCINNATI

This story ends with once upon a time... As an academic practitioner, my contribution to living architecture is expressed in my scholarship, teaching, and service. Most academics are investigating aspects of stormwater management, air quality, or the other co-benefits associated with green roofs and living walls, but my scholarship is tied to the development of pedagogy for living architecture. Teaching is my opportunity to share my passion for living architecture with young

Community service projects and leadership in allied organizations are my creative outlets for advocating for living architecture. But my contribution through teaching is the most tangible. Three times a year, in any given semester, (yes, including summers), I teach at least 60 students in landscape architecture, architecture, city planning, urban design, environmental studies, engineering, and horticulture all about living architecture. That adds up to about 180 students per year, who will all participate in a co-op placement at least once before they graduate.

The University of Cincinnati has the world's oldest cooperative education program, which prepares and places students for semester-long work experiences in their fields of study. Undergraduates will go out on co-op as many as five times before they graduate. This means that the living architecture knowledge imparted through my lectures, studios, field trips, and community service projects is disseminating at a rapid pace. At least 60 students are placed into at least 60 different multi-disciplinary firms all over the world every semester, or hundreds of offices each year.

My students will often be the only people in those firms who know anything about living architecture. Whatever they teach the firm is whatever I taught them.

My footprint in this industry - and that of many other academics - is much larger than some might imagine. But my influence doesn't end there. With each of our community service projects,

we work with communities and activists to bring living architecture to life. My students are what I call The Thin Edge. As an educator, I can get access to and co-operation from agencies and citizen groups that I could not reach as a consultant. In turn, we educate, inspire, and motivate citizens and policymakers. Because our work makes living architecture exciting and feasible, we create new projects for the industry.

We all want this industry to grow. In our different ways, we each support GRHC and its mission. There are a variety of ways that you can engage and support the future citizens (and specifiers) of the world in that mission: provide scholarships for tuition; finance travel expenses to attend the CitiesAlive conference; sponsor community service studios, donate products for teaching and research - there are many areas of need. Make your involvement a long-term commitment. Build a relationship with a network of opportunity such as the Student Chapters of the American Society of Landscape Architects. Everyone wins in these mutually supportive scenarios. According to the US Bureau of Labor Statistics, as of 2016 there were a total of 457,000 employed landscape architects, architects, and civil engineers in the US. Wouldn't it be wonderful if we could educate all of them about living architecture? Once upon a time ... all of them were students.

---

*Virginia L. Russell, FASLA, GRP Former Chair of the GRHC Research Committee.*



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