

Meeting of the Minds

The Annual

Selected blog posts

CityMinded.org

Volume 4



Three Ways to Bring Better
Broadband to Residents
Pg. 7

Creating a Smart, Resilient
Water Future
Pg. 19

Why Plans Fail
*The 5 Pieces of Neighborhood
Revitalization Infrastructure*
Pg. 15



Letter from the Editor

<i>Meeting of the Minds</i>
Founder Gordon Feller
Executive Director Jessie F. Hahn
Director of Communications Dave Hahn
Program Manager Caroline Firman
Event Planner Kristi Audette
Website CityMinded.org

Meeting of the Minds brings together urban sustainability and technology leaders to share knowledge and build lasting alliances. We foster person-to-person and city-to-city learning by spotlighting projects and practitioners working on urban solutions in these eight focus areas:

Environment Underlying themes: <i>Climate change, natural disaster</i>	Governance Underlying themes: <i>Urban policy, justice, services</i>
Technology Underlying themes: <i>Innovation, connectivity, IoT</i>	Economy Underlying themes: <i>Business, jobs, finance</i>
Resources Underlying themes: <i>Energy, water, food systems</i>	Society Underlying themes: <i>Health, culture, education</i>
Infrastructure Underlying themes: <i>Built environment, urban planning</i>	Mobility Underlying themes: <i>Public transit, shared mobility services</i>

We do this through a variety of programs and events, like our annual summit and monthly webinars, and through the written word.

For the last four years we’ve built the CityMinded.org blog into a large library, full of practitioners’ projects and predictions about the future of cities and the people who live in them. The website inhabits a unique space—not a company blog, and not a media outlet—that allows urban sustainability professionals to tell their stories with their own words. Nearly 300 people have written over 600 articles that share their visions for smart, resilient cities.

CityMinded.org is the communal bulletin board to which change-makers and innovators pin their thoughts for the benefit of the rest of the community. You should visit. You should write for it. This magazine contains some of the best posts from the last 12 months—but there are many more. I encourage you to visit the website frequently to keep up-to-date on our industry and our community.

Thank you for reading,

Dave Hahn
dave@cityminded.org

Table of Contents

Ecosystems Enable Urban Evolution <i>Jennifer James</i>	3
Climate Change: Creating an Abundance of Private Sector Opportunities <i>Mary Scott Nabers</i>	5
Three Ways to Bring Better Broadband to Residents <i>Britt Harter</i>	7
Smart Cities Development: What is the Role of Insurance? <i>Steve Fifita and Eric Grossi</i>	9
Partnerships, Data, and Technology are the Future of Sustainable Cities <i>Moiz Kapadia</i>	13
Why Plans Fail: The Five Pieces of Neighborhood Revitalization Infrastructure <i>Calvin Gladney</i>	15
Creating a Smart, Resilient Water Future <i>Amir Cahn</i>	19
Zero-net-energy Schools <i>John Addison</i>	21
Changing Mobility Data Collection to Build Smarter Transportation Systems <i>Laura Schewel</i>	23
Urban Innovator of the Week: Brandon Nicholson <i>Nicole Rupersburg</i>	25
Mayors Leading on Creating Sustainable, Connected Cities <i>Brooks Rainwater and Trevor Langan</i>	27
Urban Futures Road Map: It Finally Arrives in Your Bookstore <i>Gordon Feller</i>	29

Ecosystems Enable Urban Evolution

By Jennifer James



The ecosystem concept, once confined to its biological origins, has found new life in the smart city.

When natural systems begin to evolve, there is at first low diversity and complexity. Over time, diversity expands, system interactions get more complex, and cooperation across biota is necessary to ensure the success of the community.

Similarly, early smart city programs consisted of a limited number of participants and technologies. Many were top-down efforts that emphasized using technology to help city systems operate more efficiently. Over time, communications networks and the Internet of Things (“IoT”) expanded connectivity across sectors, assets and citizens. Accordingly, the range of smart solutions and participants has skyrocketed, and smart city silos are giving way to collaborative arrangements across sectors, solution providers, stakeholder

groups and infrastructure assets.

Partnering for Progress

Why is this collaboration happening? Just like ecosystems in nature, the challenges smart cities seek to solve are too complex to be left to a few players and too interdependent to be addressed in a piecemeal fashion. There are no well-defined, cookie cutter answers in this constantly-changing landscape. It’s a time of massive innovation and experimentation, favoring creativity over structure. As evolution suggests, cooperation among diverse participants is an advantageous strategy in this type of situation.

This is all playing out in the urban field right now. City leaders from many departments, citizens and NGO’s, technology companies and consultants, academic institutions and industry groups, and private and government financiers

– all of us, in different combinations, are figuring it out, together.

There is no single model for how these groups come together or how they get organized for action, but one successful approach is having a coordinating non-profit entity act as orchestrator, matchmaker and advocate for results-driven smart city collaborations. Cleantech San Diego and Envision Charlotte are great examples. It is truly inspiring to be part of a public, quasi-public, private, academic and non-profit group that pushes politics to the side and innovates together to build more sustainable, resilient cities.

Innovation Beyond Technology

Repeatedly, we see these ecosystems of partners redefine the old standards in business as innovation extends beyond technology. Financing options and

Jennifer James is Smart Cities Solution Lead for global engineering company, Black & Veatch. She works with internal teams, clients and industry partners to develop smart and integrated infrastructure solutions that enable more effective and holistic management of city systems.

business models are morphing to better support the cash-strapped smart evolution. According to Black & Veatch’s Strategic Directions Smart City/Smart Utility Report (2016), Public Private Partnerships (P3) was surveyed as the #1 most promising model for financing smart city initiatives, and for good reason. We are seeing exciting P3 models emerge such as ad-funded smart street kiosks that are owned and managed by private sector groups while serving city goals for public safety, citizen engagement, traffic management, and digital equity via free Wi-Fi, smart sensors and associated analytics. We’re even seeing an evolution in city Request for Proposals (RFPs), with some RFPs now asking for financing options as well as technology solutions. The Smart Cities Council, another leading group of collaborators, publishes Smart Cities Financing and Smart Cities Readiness Guides that outline many additional funding and business model options for successful smart city programs.

With the financing hurdle cleared, cities can dream big. To boost progress, ecosystem partners are coming together to develop smart city roadmaps that define how to deliver on the smart vision. Analytics-based planning tools can help cities compare the costs, benefits and risks of many project options against multiple scenarios and stakeholder objectives. This results in a prioritization of capital projects and programs that can be shared and adjusted with different stakeholder groups and ecosystem partners. We are seeing in cities, just like in nature, that richer information supports more diverse and more effective strategies and behaviors.

Connecting the Dots for Smart Results

This systems perspective is needed to

identify synergies and evaluate potential impacts. Through information sharing and collaboration, industry stakeholders better understand innovative and sometimes disruptive technologies, how to enable their complex integration, and how to manage for optimal outcomes. In some cases, smart cities can suffer from “innovation frustration” where new technology is both beneficial and problematic. Distributed Energy Resources (DERs) such as rooftop solar and electric vehicles (EV) are great examples. DERs can help reduce greenhouse gas emissions and put sustainability within reach of cities, but they can destabilize the grid if left unplanned and unmanaged.

As we have seen in integrated planning programs with utilities in California and Hawaii, connecting the dots between technologies and approaches yields smart results. Utilities can get in front of DER impacts by using planning approaches and analytics to understand the potential combined impact of a broad set of DERs on the grid in order to drive system upgrades and modify rates, customer engagement programs and operations. As my colleague, Scott Stallard, will discuss at the Meeting of the Minds annual summit, an integrated analysis of DER potential, load growth, customer adoption rates, hosting capacity, bulk load impacts and the associated technical, financial and rate impacts is required to stay ahead of DER technology impacts.

On-the-ground Deployment and Operation

Just as important as strategic planning is on-the-ground deployment. Innovative pilot projects are being stimulated by academic institution-city ecosystem partnerships, such as the MetroLab Network, that attempt to bridge the gap between R&D and

commercial-scale solutions. Initiatives such as NIST’s Global Cities Team Challenge are bringing together teams of ecosystem partners to design and implement smart city projects in the field. Both organizations emphasize experiential over theoretical approaches as well as the sharing of solutions and lessons across teams.

Beyond the pilot stage, city plans have to scale to meet real-world deployment and operation. Ecosystem partners answer this call by creatively merging innovative technologies and programs with experience in large-scale distributed infrastructure deployment and a scalable data management and analytics infrastructure. This is where private sector program management and integrator skills are invaluable. Traditional project management does not suffice. What’s needed is a much more creative approach that strikes the right balance between project control and program adaptability, between individual project ROI and integrated program optimization. A “live” system management approach is needed in which there is an on-going digital dialogue between projects, programs, stakeholders and circumstances.

Ecosystems Enable Smart Cities

To enable successful smart city programs, the ecosystem of smart city players has evolved into a collaborative community of leaders that blends top-down vision and community-led innovation. Through cooperation and innovation in technology, financing, and strategic integration of all the moving parts and players, cities are scaling towards true sustainability. Just as natural systems adapt and refine functions to stay dynamic, so too must city-systems, which requires the insight of a multi-dimensional partner ecosystem. ■

Climate Change

Creating an Abundance of Private Sector Opportunities

By Mary Scott Nabers

Mary Scott Nabers is President and CEO of Strategic Partnerships Inc., a business development company specializing in government contracting and procurement consulting throughout the U.S. Mary is also co-founder of the Gemini Global Group (G3), and works with national and international clients on business development, P3s and other types of government objectives.

The effects of climate change present daunting challenges for government at all levels. And, it's only going to get worse.

According to a July 2016 report from the RAND Corporation, roads, bridges and seawalls will require ongoing attention because of the ravages of weather, population growth and age-related issues. While the issues are increasingly worrisome, the potential for groundbreaking collaboration between public and private sector partners is abundant. Companies able to provide efficient and cost-effective infrastructure solutions will find business opportunities in the near future for projects that represent hundreds of billions of dollars in revenue.

Confronted by extreme weather over the last two decades, public officials now recognize the real-world effects of climate change and they are grappling with solutions. In 2014, for the first time, the National Climate Assessment addressed infrastructure issues related to climate change. The report found that rapidly changing weather poses threats to every kind of infrastructure in the United States. That includes utilities, parks and public facilities, universities, hospitals, prisons, community housing and transit. Severe storms, rising sea levels, damaging water surges, extreme heat and icing events are among the primary effects of climate change.

The climate change problem is particularly urgent in coastal areas, where some of the most densely populated and fastest-growing communities are located. Rising sea levels and violent storm surges in these areas threaten roadways, rail lines, energy infrastructure, airports, port facilities and military bases. Major storms have increased substantially in the United States, most notably in the heavily populated Northeast. This part of the country experienced a 71 percent increase in extreme weather events.

Extreme heat also brings grave risks. Rising temperatures cause spikes in electricity use, often causing major

blackouts. Heat also damages transportation infrastructure, softening paved roads and causing buckling of surface rail lines. As average temperatures increase, utility infrastructure must be fortified to handle the increasingly high demands of power required for air conditioners.

The concerns are complicated, and possible solutions will involve many different technologies and various types of expertise. To combat the effects of heat, some roads will require resurfacing with more durable materials. Adapting bridge infrastructure to flooding events

could cost \$140 billion to \$250 billion over the next 50 years. Maritime shipping patterns will change in response to rising sea levels and new storm patterns, so ports will be impacted as well. Inland waterways must accommodate changing water levels caused by droughts and flooding. Coastal roads and railways will require barriers or relocation.

Firms positioned to profit from the multi-billion-dollar bounty of infrastructure opportunities will be expected to bring innovative, cost-efficient solutions to public officials. They should also

be prepared to accept and respect the culture and the environment of government executives who will be struggling to develop complicated engagement agreements while also balancing budgets, providing essential services, mitigating weather-related problems and satisfying constituents. None of it is easy, and when everything converges at the same time, it is a bewildering experience for both sectors. However, insightful public officials and wise business leaders have proven for decades the benefits of successful collaborations.

Recent news from Florida illustrates

how new collaborations will likely begin to take shape. Miami Beach officials began negotiations in July to develop a public-private partnership for a light-rail streetcar line along the famous South Beach district. An increasingly popular tourist destination, Miami Beach, is plagued with frequent flooding that threatens to restrict future growth. Conversations are occurring now with potential private-sector partners who have solutions for consideration. In an ever-changing world, scenarios just like this will be played out hundreds of times in the near future. ■



Three Ways to Bring Better Broadband to Residents

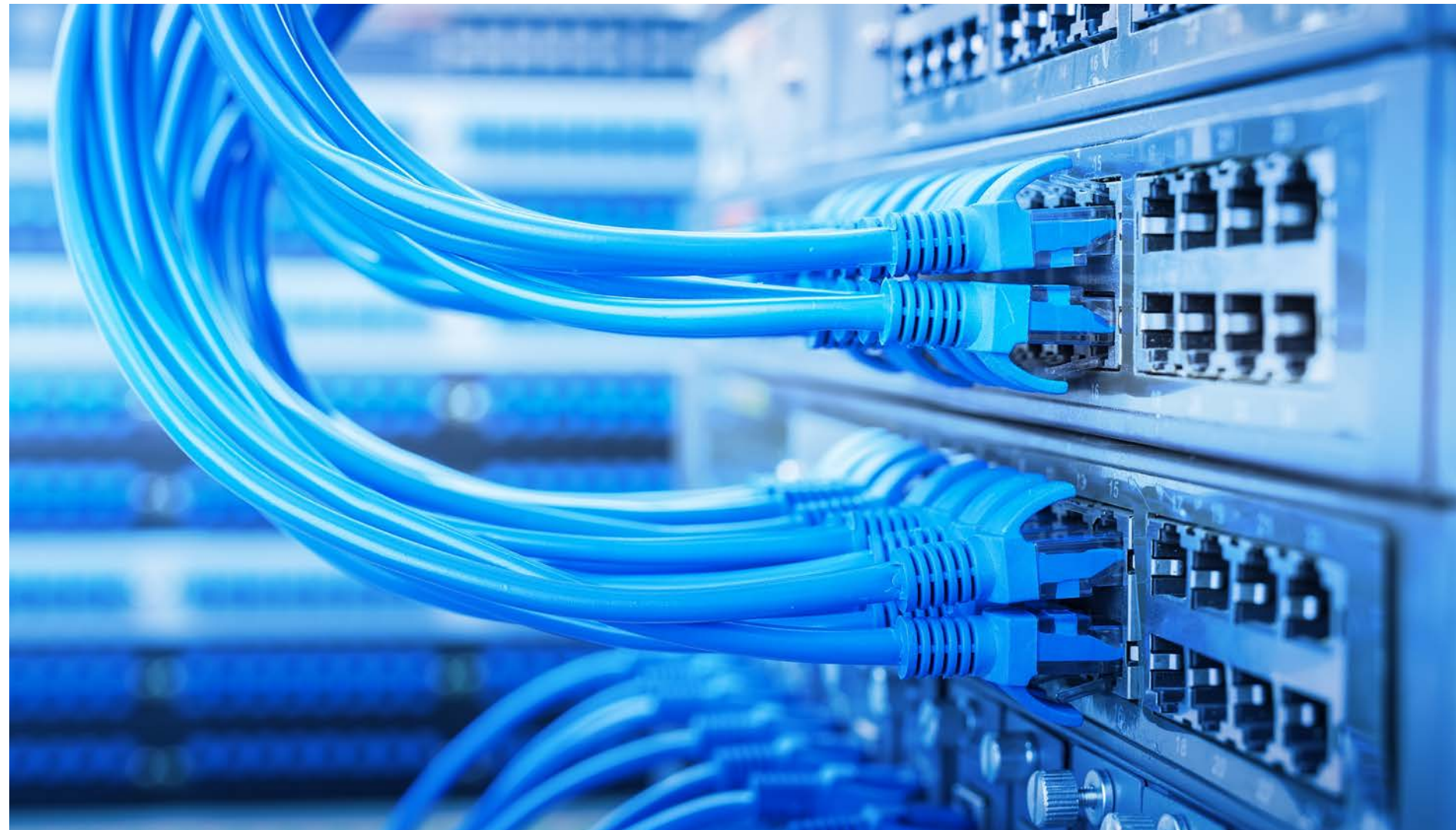
By Britt Harter

The federal courts recently ruled that high-speed internet service is a utility – a decision that affirmed the government’s view that broadband is as essential as the phone and power, and should be available to Americans. In doing so, they paved the way for broader adoption of affordable, reliable, high-speed broadband service.

The stakes are high for getting this right. Academics and thought leaders agree that broadband delivers significant benefits today and will unlock even greater ones in the future. From increased educational attainment to improved delivery of city services, broadband access helps residents. For cities, it drives economic growth and attracts 21st century innovative businesses. It also provides a platform to reach Smart City solutions that deliver cost savings, improved public safety, and quality of life benefits like traffic and air quality.

Despite the value at stake, those on the ground in the U.S. know that broadband currently underperforms the needs and expectations of businesses and residents. In most U.S. cities, high infrastructure costs create barriers to entry and allow existing market players to deliver speeds and prices that lag international cities like Seoul, Tokyo, Paris, and London. This lack of competition also exacerbates the “digital divide” for those with limited resources.

Even when the problem is well known, solving it can be challenging for city officials. The topic is very active with a commotion of new technologies at various levels of maturity touting reduced infrastructure costs and improved coverage (e.g., fixed wireless and 5G). Emerging players as well as powerful cable and telecom incumbents offer low-capital-cost deals to cities, but sometimes leave difficult-to-reach residents behind. Additionally, municipally owned and operated solutions, while appealing, can require substantial new capital spending, skills, and head-count.



The time is now – city governments should work to deploy broadband across their communities. There are three key approaches cities can take to leverage the tested tools of economic development:

Reach an open and competitive broadband market by leveraging the unique strengths of your city

The end goal is ubiquitous, accessible fiber that allows for competitive access

by broadband providers. This will create a proliferation of offerings and drive competition on key service aspects like access, speed, price, and reliability. But each city needs to use its unique context and strengths to reach that common end state. While a massive, municipally controlled fiber build-out will deliver ubiquitous fiber access and allow the city to control key service outputs, that is not within the reach of all cities. Strategic cities are solving this challenge by building off their current strengths

to improve broadband in their city. In some cities like Chattanooga or Lafayette, a municipal model is logistically manageable and palatable to the populace. In London, a formerly centralized system telecom created a platform for access to a common network. In others cities, they are combining existing fiber (e.g., subways, disaster resilience, and schools) to create the beginnings of an open network.

Plan additional interventions for

closing the “digital divide”

The future requires fiber, and lots of it. But fiber alone will not close the “digital divide”—giving the benefits of internet to at-risk or low-income residents. Like housing, many cities will have a meaningful number of residents who cannot afford market-priced options, even in a well-functioning market. Broadband has additional complexities (e.g., hardware and skills) that can prevent even those with affordable access

from reaping the benefits of broadband. Cities will need to allot specific budget and skills to engage those without internet access—understanding and targeting the unique barriers of its communities.

Develop a solid execution plan that stakeholders work together to carry out

One reason that broadband in the US is slow to make progress is that execution is particularly challenging for governments. It requires the coordination of a wide range of complex skills (e.g., strategy, technology implementation, contracting and enforcement, low-income resident engagement, permitting, infrastructure construction and maintenance). Many cities struggle with execution because of the breadth of agencies and skills required to turn a plan into a reality. Successful models empower one entity to direct and coordinate fiber deployment and oversight. This allows for a strategic coordination of existing fiber, new deployment, and the ability to capture efficiencies and benefits across agencies. However, each city’s implementation plan needs to be acceptable to key stakeholders and within the skills and powers of those charged to execute.

Cities can play an enormous role in broadband expansion – and there is no greater incentive or motivation than improving the potential of their communities and residents. ■

Britt is a Director in PwC’s Sustainable Business Solutions practice. He is the leader of PwC’s Cities of the Future initiative that addresses issues at the interface of environmental, social and economic sustainability for state and local clients.

What is the Role of Insurance?

By Steve Fifita and Erin Grossi

Steve Fifita is Executive Director of City Digital and Managing Director of Technology & Incubation for UI LABS. Drawing on his background in corporate strategy and technology innovation, Fifita's current role includes identifying external engagement opportunities and establishing new business models for the UI LABS consortium.

Dr. Erin Grossi is Director of Strategy & Market Development for UI LABS, where she leads strategic initiatives around thought leadership and external relations to advance the organization's market reach. Grossi joined UI LABS from UL—formerly Underwriters Laboratories—where she spent 11 years, most recently as Chief Economist.

As a first-of-its kind innovation accelerator, UI LABS works on the front-lines with universities, national laboratories, and industry representatives to catalyze digital manufacturing and speed the development of smart cities. We are constantly reminded in our daily work of how nascent the digital revolution really is, in that traditional industry sectors are only beginning to feel its impact.

While the technology and its promise to improve lives never ceases to dazzle people and grab media headlines, the messy business of forging new industries with capable personnel to operate, manage and protect them is the difficult work that goes on in the trenches around the world, quite often behind-the-scenes. In many ways, this is also the reality of a handful of industry players that have proven to be the most essential to major industrial transitions; namely, the insurance industry and standards and codes development organizations.

The general public is content in the knowledge these organizations exist and serve their respective purposes, but rarely do people seek to understand how they actually work, in complementary ways, to support the development and adoption of new technologies and the growth of new industries. These organizations promote economic expansion, in general, by providing the essential information and feedback loops the market needs for trust and confidence to multiply within business communities.

The opportunity that insurers have when they lean-in to consortia efforts that are on-going within the UI LABS context and others worldwide is two-fold: they gain a better sense of risk profiles for infrastructure and how those are changing as digital technologies are adopted, and they gain insights regarding the creation of new, digital asset



classes and related insurance products that can be created.

A Look Back: Insurance Supports the Industrial Revolution

When one considers the role that insurance played in the Industrial Revolution that first started in Europe in the mid-17th century and the United

States in the mid-18th century, it was the realization that aggregating risk, pricing it, and spreading it across many organizations that allowed for coordinated activity to take place in a number of burgeoning “risky” opportunity spaces. Shippers in Great Britain reasoned that if 100 ship owners each chipped in some money, then some of the ships that were damaged or lost in overseas

expeditions could be rebuilt with the collected funds. Extreme losses following the Great Fire of London in 1666 led to the creation of the world's first actual insurance company, The Fire Office. What it did was pool the resources of many firms in order to provide indemnity against losses related to future fires.

By shielding policy holders from

some of the significant property losses associated with fires, insurance reduced the risks associated with aggressive economic development. Fire insurance also provided the critical financing to support the development of new infrastructure. The historical role of insurers, and the critical role they still play today, is essentially to price risk, aggregate it, and distribute it so that no

individual company or entity has to assume 100% of the exposure to risk. Those who are capable of supporting more risk have always been called upon to do so in insurance schemes.

Standards Development Closes Gaps in Data and Understanding

When one considers the kind of infrastructure investments and technology development that city officials and industrial firms are catalyzing around the world today, in order to make cities more livable, sustainable, and resilient, it becomes easy to identify parallels with the earlier Industrial Revolution. However, there are some key differences that digital technology is introducing, which insurers, standards developers and other stakeholders are currently grappling with.

The biggest challenge in these early days of the digital revolution, from the perspective of insurers, is to evaluate the new risks that “digital connectedness” and the increasing collection of data are posing at both an individual product and a systems level. If the great benefits of digital technology for cities is to capture and better utilize data, then insurers are evaluating the risks involved with amassing data as a new asset class. If another key benefit is to allow for greater connection and interoperability of various commercial and industrial equipment, then insurers are trying to get their arms around the risks to the entire system of highly interconnected infrastructure. Early cyber-attacks have demonstrated what insurers anticipated early-on, which is that the weakest of interconnected links often can be manipulated in ways that threaten the entire system.

In this effort, insurers face a classic problem related to their traditional business model. Kirk Chamberlain, Senior Vice President of Marsh & McLennan



Companies, Inc. explains, “Smart cities is an unknown risk area. Insurers can look back 50 years and tell you what the expected risk of something would be, based on what happened in the past. However, when historical data doesn’t exist for a particular risk, they struggle to develop accurate risk models.”

The pervasive blind-spots that exist for insurers in their constant efforts to look back at historical data in order to better forecast future risks often get filled by standards development organizations, making them natural commercial allies. Organizations like UL LLC (formerly Underwriters Laboratories) identify and describe key risks in their standards development processes, which they then use to evaluate products and systems, often before

they are installed and utilized in the market. UL was actually born during the public electrification era in the United States, and early standards drafted by the company’s Founder helped the underwriters of the day get comfortable with the new electrical technology and infrastructure that was making its debut.

Today, Rachna Stegall, Director of Connected Technologies for UL, says the company has developed standards they are now using to evaluate the cyber-security of software and communications channels embedded in a variety of commercial and industrial products key to the development of modern smart buildings. They are finding that a significant portion of manufacturers do not have a common, foundational

method of assessing or mitigating potential risk associated with software built into a product or system. UL is thus perceiving a security gap in the market overall, and moving in to help, largely through the development of these foundational methods, which UL expects will make it easier for manufacturers to develop safer and more cyber-secure products.

Their efforts are welcomed by insurers, that acknowledge they need more information and data to better evaluate cyber-security risks associated with infrastructure development, but would otherwise have to employ their own researchers to investigate claims made by technology manufacturers. The more that organizations work together to evaluate and share information about the

risks and benefits of digital technology, the better the system is able to absorb it and make use of it to society’s best advantage.

Moving Forward: Collaborating with Insurers to Support Smart City Development

Recognizing that stakeholders in the marketplace often lack a neutral platform to collaborate on the massive, systemic issues that smart cities pose, UI LABS was established to help fill the void, getting its start in the Midwest of the United States. City Digital, a UI LABS consortia launched in 2015 with the mission of catalyzing smart cities development, has already been connecting large industrial manufacturers, academics and service providers with city officials to develop and pilot new technology in Chicago. Today, City Digital is focused on bringing insurers, standards and codes developers and product specifiers for buildings, including architects, increasingly into these efforts to ensure that investments in technologies for smart cities will continue and increase over time.

Karen Weigert, former Chief Sustainability Officer for the City of Chicago and currently Senior Fellow on Global Cities for the Chicago Council on Global Affairs, points out that cities are beginning to deploy various aspects of smart cities. “Features like sequenced traffic lights, more advanced streetlights, or more transparency across city infrastructure should lead to a better experience for residents and businesses,” Weigert notes. “In the process, various risks are likely to change. As the way the city performs overall changes, there may be new opportunities for insurers. But we are in the early days.”

In order to answer key questions about shifting risk profiles with digital

technology impacting city infrastructure, insurers are seeking out new sources of data that, when combined with their existing, historical data-sets, will provide valuable insights to assist in underwriting new technologies that are being rapidly developed today. Chamberlain predicts the insurance industry will increasingly experiment with acquiring more real-time data feeds moving forward, finding ways to combine them with historical data sets to inform the next generation of insurance models. In some cases, the experimentation has already begun, with auto insurers like Allstate, for instance, developing its Drivewise program and new insurers like Metromile springing up in the market. These companies are collecting real-time data feeds from sensors loaded into cars to provide more personalized insurance rates for drivers, based on individual behaviors and/or driving habits detected and measured by devices.

Real-time insurance models are a clear goal for the industry, which will provide tangible incentives to stakeholders to invest in smarter technologies over time. Machine learning, Artificial Intelligence (AI), neural networks, etc. being developed today are all aimed at improving man’s ability to predict things in the future based on data analysis. In order to reach these goals and realize the promise of data, insurers need good visibility to emerging technologies as they are being developed. Issues like water management, energy management and ensuring the safe and efficient mobility of citizens are pervasive ones for cities that technology proposes to solve. Insurers need access to evaluate these claims in order to do their part in the underwriting and investment process. UI LABS is pleased to be doing its part to bring these critical stakeholders together to address pressing systemic challenges, within the great city of Chicago and beyond. ■

Partnerships, Data, and Technology are the Future of Sustainable Cities

By Moiz Kapadia



Washington, D.C. has an ambitious goal to become the healthiest, greenest, and most livable city in the United States by 2032.

The District laid out a wide range of sustainability goals, which includes net-zero energy buildings, green infrastructure, and connected transportation to name a few, to improve the built environment and their economy. But implementing these strategies comes with high costs and move at a pace too slow to immediately benefit the climate.

Cutting through red tape

The Department of Energy and Environment (DOEE), who steward the Sustainable DC plan, have two powerful weapons at their disposal: the

Downtown Business Improvement District and Open Data.

The Downtown DC Business Improvement District (BID) is “a catalyst, facilitator, and thought leader that promotes public/private partnerships to create a remarkable urban environment.” As a non-profit, the BID can move much faster than the District government and designated themselves an ecoDistrict to experiment with the latest sustainability technology.

Along with Interface Engineering consultants, the BID and DOEE wrote a smart city vision: a data-rich city model that captures all of the energy and water flows within the District. The District is looking for a “single source of truth” model that simulates the triple bottom line costs and benefits of

infrastructure improvements. By measuring sustainability metrics within the model, the government can convince citizens of the value of planned green projects.

Bill Updike, Chief, Green Building & Climate Branch, DOEE explains, “We want to use the model to test multiple ‘what-if’ scenarios for policy changes, technology adoption, or behavior change. For example, how much energy will lighting retrofits save and which buildings should we target? How much stormwater runoff could we reduce if we implemented green infrastructure on the District scale?”

Because of their strong sustainability initiatives and connections to stakeholders, the BID is a great place to deploy the city model. Once the model is

useful to the BID, it can scale to the rest of the District.

Technology based sustainability strategies

The BID was able to skip the bureaucratic processes that DOEE would need to go through, and partner directly with the Autodesk Sustainability Solutions team to create their city model. Autodesk’s powerful 3D visualization and simulation tools enable the bid to conduct a virtual analysis of the BID’s energy efficiency and green infrastructure potential. Autodesk’s InfraWorks 360 generated a model of the Downtown ecoDistrict that was used to:

- Detect which buildings are ready for retrofit and which systems to upgrade, using Rapid Energy Modeling
- Model green infrastructure at the site scale to calculate stormwater retention credits, and at the district scale to retain 100% stormwater, using Green Stormwater Infrastructure
- Calculate triple bottom line benefits of the National Mall Underground project, using AutoCASE

Unlocking Building Energy Efficiency Potential

With only the basic building information and weather data from the National Oceanic and Atmospheric Association, Autodesk was able to simulate the energy consumption of buildings within the BID. The simulation was informed with building energy data from DOEE’s landmark Building Benchmarking Disclosure Ordinance. This combination of simulation and open data enabled the BID to determine the energy and cost savings from upgrading lighting, windows, and HVAC

systems across the entire ecoDistrict.

Implementing Green Infrastructure

When it rains in cities, stormwater washes contaminants from the streets into either the combined sewer system or directly into local water bodies. Pollution from this runoff can be dramatically reduced by green infrastructure that retains and filters stormwater on-site. To accelerate adoption of this approach, DOEE started the first market for Stormwater Retention Credits. Owners gain credits for installing green infrastructure, and can sell these credits to developers who need them to comply with regulations.

To demonstrate the benefits of on-site retention to stakeholders, engineers can use Autodesk’s Green Stormwater Infrastructure tool (GSI) to design and analyze green infrastructure. And using the built-in compliance checker, they can evaluate if the solutions meet code and calculate the dollar value of stormwater credits attained. GSI was used to calculate runoff capture, credit value, and code compliance of rain gardens and bioswales in the re-design of the ecoDistrict’s historic Franklin Park.

GSI also enables evaluation of city-wide green infrastructure implementation. First, GSI determined that the ecoDistrict must manage 2.5 million cubic feet of stormwater during a typical storm. Then it was used to find how green infrastructure could reduce the runoff. One analysis showed that runoff to rivers could be reduced 35% by converting 45% of hard surfaces to natural cover and adding green roofs to 30% of the BID’s buildings.

Making the Business Case

Washington, D.C. residents are all too familiar with flooding and

congestion in the National Mall. Tour buses that idle along the streets cause traffic problems, pollute the air, and limit available parking. In 2006 a major storm flooded many prominent museums and caused damages that cost millions to repair. To solve these problems and improve the experience of the National Mall, a multipurpose infrastructure solution has been proposed by Dewberry engineering consultants.

In crafting their rather unconventional design Dewberry used AutoCASE, a triple bottom line analysis tool from Autodesk partner Impact Infrastructure, to justify a design with significant social return on investment. This entailed green space on the surface level, moving parking underground and storing stormwater in an underground irrigation cistern. AutoCASE showed how a comprehensive design with a higher upfront costs was viable once the full range of social, environmental, and economic benefits were taken into consideration.

Partnerships, Data, and Technology

Washington, D.C.’s sustainable cities story is best looked at through three lenses:

- Partnerships that cut through red tape
- Open Data that is used to inform consultants, the public, and track progress
- Technology solutions that enable triple bottom line solutions

Each of these forces are continuing to grow in cities across the world, and serve as a framework for designing, building, and living in sustainable cities of the future. ■

Why Plans Fail

The Five Pieces of Neighborhood Revitalization Infrastructure

By Calvin Gladney



Do you ever wonder why the grand visions of many neighborhood plans fail to materialize? Have you heard neighborhood residents and stakeholders complain of planning fatigue?

I’ve recently been thinking about why plans fail as I work in a number of urban areas where there has been extensive analysis and planning, but little execution and implementation. After 15 years of working in urban neighborhoods around the country, I have a new theory.

The #1 Reason Neighborhood Plans Fail

As you can see in the list below (shout-out to former Mosaic team member Sophie McManus for being my muse on this analytical framework), there are five pieces of neighborhood revitalization infrastructure:

1. *Hard* Infrastructure;
2. *Planning* Infrastructure;
3. *Enabling* Infrastructure;
4. *Implementation* Infrastructure; and
5. *People* Infrastructure.

The core insight of this analytical framework is that comprehensive, sustainable and equitable neighborhood revitalization requires certain infrastructure to be implemented. This infrastructure is not just the physical infrastructure (e.g. streets, sidewalks and water systems) which is discussed most often, but also other types of infrastructure as well.

There are two types of neighborhood revitalization infrastructure problems:

1. Pieces of neighborhood revitalization infrastructure are missing or weak; or
2. The pieces are not working well together.

Let’s discuss.

Hard Infrastructure

You’ll notice that I use the word “infrastructure” in a way that’s broader than you’ve heard it used in the past. Oftentimes, the term “infrastructure” is used in the neighborhood context to mostly refer to what I call “hard” infrastructure. Hard infrastructure are those critically important support mechanisms that are physical and tangible such as:

- Pedestrian-focused improvements like sidewalks, streetscapes and lighting;
- Transportation investments like streets, BRT or DC’s newly running streetcar;

- Data, telecommunications and technology infrastructure like the groundbreaking improvements being made by the City of Leandro; or
- Better bicycling infrastructure and improved small-scale public spaces.

And yes, sewer, sanitation and water systems also count as necessary hard infrastructure.

Planning Infrastructure

My definition of planning infrastructure includes the plans themselves, the government's planning staff and planning process, and the community engagement and input that is an important part of any neighborhood plan. I won't take a lot of time to explain planning infrastructure—most neighborhoods and cities are clear on what it is and why they need it. An awesome example of a city positively leveraging new planning infrastructure is the City of Detroit's use of its Detroit Future City Framework Plan, and hiring of thought leaders like its planning chief Maurice Cox. Planning infrastructure is helping to move the great American City of Detroit forward.

The final three pieces of neighborhood revitalization infrastructure—"Enabling," "Implementation," and "People" infrastructure—are the pieces of revitalization infrastructure that are most often overlooked or under resourced. I have found that those three can be the supportive glue that makes the difference between a vision that is implemented and a vision that remains, well, just a vision.

Enabling Infrastructure

Enabling infrastructure are the supporting analyses, resources and systems that allow revitalization investments to happen. It is the "back office" of neighborhood revitalization because it helps doers get things done, but it is not an implementer itself.

Enabling infrastructure has three key roles:

1. Supports the implementers by making it possible or easier to execute on a vision (e.g. Prince George's

County, Maryland's Expedited Transit-Oriented Development process);

2. Incentivizes implementers to execute in a way that actualizes a specific vision (e.g. Detroit's geographically-targeted use of federal blight removal funds to stabilize certain neighborhood markets so that developers focus on those areas); and

3. Helps the implementers overcome market-based challenges to executing a vision (e.g. DC's density bonuses to support citywide affordable housing requirements).

Here's a quick list of enabling infrastructure for neighborhood revitalization:

- Land Use and Zoning Regulations
- Data, Data, Data
- Market and Feasibility Analyses
- Government Organizational Structure & Capacity
- Political Support and Coordination

The support and coordination of your elected officials and government staff might be the most important enabling infrastructure. It's hard, if not impossible, to get things done if you don't have the coordinated support of your government staff and local elected officials. That's a micro example of revitalization infrastructure not working together: Government staff advocate for one thing, but the elected official is championing something entirely different.

Oftentimes, a neighborhood will have a great vision and plan, but the enabling infrastructure isn't in place that would mandate, incentivize or support making that vision a reality.

For example, you may be surprised at how many municipalities don't have the raw data necessary to make smart infrastructure decisions. For example, not only does Flint, Michigan, Jackson, Mississippi and other cities have a problem with lead pipes, they often don't know the location of the pipes with the most lead contamination. It's hard to

make decisions with a better probability of success without the underlying data and analysis to buttress the decision. Data and analysis (e.g. market, development or fiscal impact analyses) can also help you convince stakeholders that you're not making arbitrary or biased decisions, and that they should support or co-invest in your revitalization efforts.

Or, for another example, the local land use codes and zoning regulations might make it difficult or even impossible to build dense, mixed-use development. Some codes do not give the proper incentives or mandate the implementation of a neighborhood's vision. I've seen cities where the zoning codes allow for denser, higher-rise mixed-use development on a site, but also allow a land owner to do a one-story McDonald's with street frontage surface parking. What do you think gets built on those sites? The vision of a walkable, vibrant, mixed-use place dominates the vision in the plans, but the actual land use codes don't enable the vision. The enabling infrastructure exists but is weak.

Implementation Infrastructure

Implementation infrastructure are the supporting tools that help the doers in neighborhood revitalization execute on the vision. Have you ever seen a neighborhood plan, backed by analysis and political support, still not happen? The culprit might be missing implementation infrastructure that is needed for proper execution of the vision.

Here's a list of the most important implementation infrastructure for neighborhood revitalization:

- Implementation Strategy—Champions (Who will support the plan & support the doers?)
- Implementation Strategy—Priorities (Where will we focus? Why? What will we do first, second & third? Why? When should we see results? How will we measure success?)
- Municipal Financing Tools & Programs (How will we close financial gaps? Do we have tools and programs that match our revitalization goals? Do we have the latest tools?)



April Anderson inside of her store in Detroit.

- Public Private Partnerships (P3s both as a delivery tool and a financing tool)
- Organizational Capacity (Public, Private and Non-Profit sectors must all be capable)
- Job and Skills Training Programs
- Small Business Training, Funding and Support Mechanisms
- Non-Profit and Community Member Capacity Building Initiatives
- Social Services Support
- Equity and Inclusion Decision-making Lens

What's the difference between enabling infrastructure and implementation infrastructure? One example would be the difference between the land use and zoning codes in a City and the City's implementation of those codes through its permitting and approvals office. Many cities will announce visions for green infrastructure, but not have enough staff (or appropriately-trained staff) to actually approve infrastructure projects and investments that fit their green vision.

People Infrastructure

People infrastructure are the mind-sets, mechanisms and programs that support the people in the targeted neighborhood or urban area. This is the fundamental idea behind "People + Place" strategies—there must be people infrastructure in place to help people benefit from the place-based strategies being implemented. People infrastructure are the connective tissue that leads to more equity in the revitalization of our urban areas.

Here's a quick list of some of the people infrastructure for neighborhood revitalization:

An example of people infrastructure in action is a project we worked on with the City of Detroit's Economic Growth Corporation. The City was implementing a place-based retail storefront strategy on a major thoroughfare called Livernois (you don't say "Avenue" in Detroit, by the way). The core of the idea was to pick a key section of the Livernois corridor and fix up the storefronts that were vacant and/or blighted. The next step was to place in those storefronts local small business owners who could try out their business ideas in a brick-and-mortar setting. It was a classic pop-up retail placemaking project.

A big challenge was identifying local small business owners who had a viable business idea, and marrying them (figuratively speaking) with the appropriate storefront location. We helped the Detroit Economic Growth Corporation secure philanthropic ArtPlace funding for the project, create the evaluation process and understand what

infrastructure needed to be in place to support the small business owners. One great result of the program was to bring April Anderson to Livernois to open her business called April's Good Cakes and Bakes.

Not only did April's cake business idea work in 2013, she's recently won a competitive prize to expand her business into ice cream! The City has expanded the work of the small business pilot on Livernois citywide. Detroit's Motor City Match program now awards \$500,000 of matching grants each quarter!

Conclusion

If we truly live in the golden age of cities, and we agree with Harvard's Edward Glaeser that the city is one of our greatest inventions, then we must also believe that getting neighborhood revitalization right is imperative for our cities to succeed. Neighborhoods bring such diversity, authenticity and life to cities, that we cannot ignore the critical infrastructure they need to be revitalized comprehensively, sustainably, and equitably. We all want the same thing: To go from groundbreaking visions to actual groundbreakings. Let's all join together to put the five pieces of neighborhood revitalization in place so we can get things done. ■

Calvin Gladney, LEED AP, is Managing Partner of Mosaic Urban, and has worked on urban revitalization projects throughout the United States including projects in Baltimore, Baton Rouge, Boston, Denver, Detroit, the District of Columbia, Houston, Jacksonville, Kansas City, Memphis, Oakland and Prince George's County, Maryland. Mr. Gladney is a Trustee of the Urban Land Institute. He graduated cum laude from Harvard Law School and received his B.S. from Cornell University. He is the author of the www.publicprivatepassion.com blog, and you can keep in touch with him on Twitter and Instagram (@mosaicurban), or on Mosaic's Facebook page.

Creating a Smart, Resilient Water Future

By Amir Cahn

Today, cities are confronted with a unique challenge: they face budget constraints and aging infrastructure, yet increasing customer expectations. In addition, cities must often deal with the impacts of urbanization, climate change, and an aging workforce. To meet future water needs, cities will need to become more efficient and resilient by investing in “smart,” data-driven technologies. Forming industry partnerships is now imperative through collaborative platforms such as the Smart Water Networks Forum (SWAN) and Meeting of the Minds.

Becoming Smart

Smart water technologies are changing the way customers make decisions about their water use and how cities make decisions about monitoring and controlling their networks. A Smart Water Network links multiple systems within a network to share data across platforms. This allows cities to better anticipate and react to different types of water network issues, from detecting leaks and water quality incidents to conserving energy and tracking residential water consumption. By monitoring real-time information, network operators can stay informed about what is going on in the field at all times and respond quickly and appropriately when a problem arises. This results in the city becoming more efficient and reducing the overall cost of service for the customer. However, before purchasing and installing hardware, it is important that cities understand what data is right for them and develop a data management strategy which maximizes its use.

To help cities understand how a Smart Water Network interconnects, SWAN devised a five-layer, architecture model – See Figure 1.



Figure 1

The first, “Physical” layer comprises the necessary components for delivering water (e.g. pipes, pumps, valves, reservoirs and other delivery endpoints). The second, “Sensing and Control” layer represents the first “smart” layer, containing sensors and meters that measure important parameters (e.g. flow, pressure, water quality, reservoir levels, water temperature, acoustic information, etc.). This data is then transmitted and stored through the “Collection and Communications” layer, which includes fixed cable networks, radio, cellular, Wi-Fi, etc. The fourth layer, “Data Management and Display” interfaces information for human operators such as SCADA (Supervisory Control and Data Acquisition), GIS (Geographic Information System), and other network visualization tools. The fifth and most advanced layer, “Data Fusion and

Analysis” integrates data from the below four layers to provide real-time data analytics, hydraulic modeling, and automatic pressure and energy optimization systems.

Becoming Resilient

In the future, becoming smart may not be enough as cities will need to become resilient, as well. Resilient goals include economic and social sustainability, quality of life, efficiency, and technology and citizen participation. The UK water regulator, Ofwat defines “resilience” as “the ability to cope with, and recover from, disruption, and anticipate trends and variability in order to maintain services for people and protect the natural environment, now and in the future.” Resilient responses range from chronic stresses such as environmental pollution, ground water depletion or deforestation, to acute stresses such as floods, droughts, earthquakes, hurricanes or wildfires.

“Water service resilience” relates to four key pillars: providing safe water (quality), reliable service (customers), secure systems (IT) and efficient operations (O&M). Each of these pillars can be optimized by transforming collected data into actionable information using smart water technologies. To become resilient, cities need to think in

the long-term, build partnerships, and leverage best global practices in order to develop solid business plans.

SWAN’s Helping Hand

The Smart Water Networks Forum (SWAN) is the leading, global hub for advancing the use of data technologies in water and wastewater networks, making them smarter, more efficient and sustainable. SWAN members vary from international water utilities, technology providers, engineering and consulting firms, academics, and investors. As a non-profit organization, SWAN provides its members with cutting-edge research, international networking opportunities, and the chance to proactively influence the future of the water sector.

To help cities understand the benefits of adopting a Smart Water Network, SWAN developed the SWAN Interactive Architecture Tool, which is available for free at www.swan-tool.com. The Tool is based on an international survey of 33 cities. Since each city has unique business drivers and challenges areas, the Tool enables cities to jump directly to a solution that interests them such as Leak Detection, Water Quality Monitoring, Customer Metering, Energy Management, Pressure Management, or Water Network Management. A new Wastewater Management solution is currently under development. Tool users

can click on individual technology components within the SWAN five-layer architecture to learn about their function, benefits, and system requirements, as well as view informative case studies and benefit analyses. Users may further evaluate their network intelligence by taking the SWAN SMART SCORE, a 13 multiple choice survey, as well as navigate through a database of available smart water solutions on the Solution Providers page.

To accelerate smart water and wastewater development in the U.S. and Canada, SWAN recently introduced the SWAN North American Alliance, which is also open for free to join. The Alliance Planning Committee is comprised of leading SWAN, North American water utilities and technology partners contributing their vast industry expertise.

All Alliance members are guaranteed access to:

- A special meet and greet at WEFTEC
- Cutting-edge case studies and research reports
- Free webinars on smart water topics
- A free utility workshop in San Diego in January

To gain a global perspective, SWAN’s 7th Annual Conference will focus on the theme of smart water and resilient systems. The event will take place May 9-10th, 2017, at the Tower Hotel in London and offer a great opportunity

to hear from global industry experts and innovative city leaders. Last year’s SWAN Conference drew over 180 attendees from 24 countries and included speakers from 20 global water utilities and top technology companies like Cisco, Qualcomm, IBM and Microsoft. SWAN members will receive free pass to the Conference. Learn more at: swan-forum.com/swan-2017/

Securing Our Water Future

Like Meeting of the Minds, the goal of SWAN is to share global knowledge to achieve sustainable growth. Now is a critical time for different water stakeholders to communicate effectively. Global water challenges will continue to grow requiring long-term planning. The technology solutions are there – more and more cities are witnessing the benefits of creating smart, resilient cities. SWAN can assist cities in this journey through its free resources such as the SWAN Interactive Architecture Tool and SWAN North American Alliance, as well as the SWAN Annual Conference, which offers a chance to learn from international experiences.

It’s time to collaborate. Let’s reinvent our water future. Learn more at: swan-forum.com ■

Amir Cahn is the Executive Director of the Smart Water Networks Forum (SWAN). He holds master’s degrees in environmental science and public affairs from Indiana University. He can be reached on Twitter @AmirCahn or by email: amirc@swan-forum.com.



Zero-Net-Energy Schools

By John Addison

In the Marx Brothers comedy classic Duck Soup, Groucho as a nation's president said, "Why a four-year-old child could understand this report. Run out and find me a four-year-old child. I can't make head nor tail out of it."

When it comes to zero-net-energy (ZNE) buildings, children are leading the way. In one year, a ZNE building generates with its own renewable energy the equivalent energy it consumes in that year. Typically, some months a ZNE building is generating excess electricity that is supplied to the grid, other months a ZNE building is using electricity from the grid.

After ZNE homes, schools have more ZNE buildings than any other sector of our built environment. There are 100,000 public schools in the U.S, so we are just getting started. Currently, children miss 14 million-school days due to asthma and lung diseases. In ZNE buildings, children are absent less and learn more due to better lighting, natural daylighting, and use of more healthy materials.

We need to invest more in education. These children are our future in a competitive global economy. Currently, U.S. schools, kindergarten through twelfth grade (K-12), spend \$8 billion annually on energy, more than on computers and textbooks combined. Over a 20-year period, energy efficiency and renewables save billions that can be invested in better education. RMI Report

Schools Lead in Zero Net Energy

The Energy Lab at Hawai'i Preparatory Academy is ZNE and the first K-12 school facility to achieve "Living" certification through the Living Building Challenge (LBC) by harvesting at least as much energy and

water as it uses over the course of a year, using low-impact building materials, and producing zero waste. It's great for learning, with strong use of natural lighting and ventilation. The science building houses classroom and meeting spaces for a school curriculum focused on renewable energy, and includes rainwater harvesting, onsite wastewater treatment, and a 26 kW photovoltaic array. NBI Report

Locust Trace AgriScience Farm is a ZNE-certified technical high school near Lexington, Kentucky. In addition to preparing students with English, science, math, all the needed core courses, Locust Trace provides hands-on training in agriculture with spacious classrooms with adjoining labs, 6.5 acres for gardening, a state-of-the-art greenhouse with an aquaculture area for raising fish, an equine barn and arena, and an on-site veterinary clinic. Roofs are graced with 175kW of solar PV. Three separate zones are heated and cooled only as needed, using a dual-stage water source heat pump and an energy recovery dedicated outside air unit. Since the building has much higher heating loads than cooling loads, solar thermal radiant heating system is included and produces an average of 40,000 BTU per day.

When my grandfather grew up in Kentucky, it was a coal state. Now coal jobs are at the lowest level in 118 years, with 6,900 working in the coal industry. Yet there are 74,000 construction workers in Kentucky, with more creating high-performance buildings than those that ever worked in coal. Kentucky is showing ZNE leadership in schools.

Big Impact of Lighting, Heating, and Cooling

For most school districts, it is easier to start with one ZNE building, rather than with an entire campus. It could be a library, environmental center, music building, or district office building. ZNE is easier to accomplish in a new building than in retrofitting.

In a typical school building, 30

percent of energy is for lighting. LED lighting uses only a fraction of the energy of older lights. Add low-cost sensors and controls, and lights are automatically turned-off when no one is present. Design classrooms to make good use of natural light and students learn more, have less behavioral issues, and use even less electricity. Studies have documented 20 to 26 percent test improvements in natural daylight environments.

In a typical school, 35 percent of energy is for heating and cooling. More schools, like Hawai'i Preparatory, use good passive design to orient the building for warmth in winter and cooling for hot days, and make best use of natural ventilation; more learning, less energy. HVAC demands are minimal in buildings with well-insulated walls, roofs, and windows. With ground source heat exchange, HVAC can often be eliminated.

The Collaborative for High Performance Schools (CHPS) is the United States' first green building rating program especially designed for K-12 schools. CHPS provides information and resources to schools in order to facilitate the construction and operation of high performance institutions. A high performance school is energy and resource efficient as well as healthy, comfortable, well lit, and designed for a quality education.

Many states have excellent programs. For example, the California Clean Energy Jobs Act of 2012 (Prop 39) provides up to \$550 million per year to improve energy efficiency and increase the use of clean energy in public schools and community colleges. The Prop 39 ZNE Schools Pilot assists schools in retrofitting existing facilities to ZNE. By 2025, all new government buildings in California must be ZNE. By 2030, California will be 50 percent renewable energy.

University of California = Carbon Neutral 2025

The UC Carbon Neutrality Initiative

ltron

CREATING A MORE RESOURCEFUL WORLD

From integrating renewal energy at Reunion Island—off the coast of Africa—or reducing water use by over 40% at a customer in water-stressed California to partnering with cities like Spokane, Washington on their smart city vision, ltron is building stronger communities, smarter cities and a more resourceful world.

ltron.com

is dedicated to achieving net-zero greenhouse gas emissions by 2025 across all 10 UC campuses. This is ambitious due to the energy demands of over half a million people, power-hungry research labs, and hundreds of buildings. Yet, the UC system is already a model example of clean energy.

The University of California Irvine, my alma mater, was ranked No. 1 in Sierra magazine's "Cool Schools" ranking of the nation's greenest colleges. Buildings are energy-efficient, with over 20 buildings LEED Platinum and Gold. When I visit the campus, solar roofs and parking structures are visible everywhere.

Sister campus, UC San Diego, saves over \$10 million annually in utility bills by generating its own electricity with solar, 30 MW of combined heat and power, and fuel cells. The campus has its own substation and microgrid and with multiple thermal and battery storage systems.

The UC Carbon Neutrality Initiative is also inspiring the communities of the 10 UC campuses. Near UC Davis, two

thousand people live in the ZNE community of West Village in Davis. The project includes 662 apartments, 343 single-family homes, 42,500 square feet of commercial space, a recreation center and study facilities.

The Davis homes are super efficient and typically use solar power. Energy efficiency is achieved with tight construction, triple pane windows, great insulation everywhere, Energy Star appliances and LED lighting. These homes are designed and ventilated to stay cool in the summer and warm in the winter. Heat pump and space cooling is used instead of energy-hungry conventional HVAC. With excellent energy efficiency, solar power can meet most energy needs.

Other UC solutions include an 80 megawatt solar array in the Central Valley (the largest at any U.S. university), an experimental anaerobic digester that is using food waste to produce biogas, a molten carbonate fuel cell that generates 2.8 megawatts of electricity from municipal wastewater treatment emissions, smart lighting and

smart building systems, and a solar greenhouse that selectively harvests light for solar electricity. Research labs may need air conditioning at the same time that classrooms need heating. Intelligent heat exchange can dramatically reduce the energy for heating ventilation and air conditioning systems (HVAC).

From a first grader, learning more in a naturally lighted and ventilated classroom, to a new university graduate eager to make the world better, students are increasingly experiencing that all our energy needs can be met with zero-net energy. ■

John Addison is the author of two books – Save Gas, Save the Planet that details the future of transportation and Revenue Rocket about technology partner strategy. Prior to being a writer and speaker, he was in partner and sales management for technology companies such as Sun Microsystems.

Changing Mobility Data Collection to Build Smarter Transportation Systems

By Laura Schewel

Our cities' transportation systems have a tremendous impact on quality of life – just ask anyone who commutes by car in a major metro area. As James Alosi pointed out in a recent CityMinded blog post, “[Today’s auto-centric mobility] system cannot scale easily, not without significant damage to...the quality of life we seek in urban environments that are truly livable.” Americans have begun to take notice. According to the Mineta Transportation Institute’s 2015 survey, “more than 75% of Americans support using tax dollars to create, expand, and improve public transportation in their communities.”

Despite this broad support for public transportation, Americans managed to drive a record-setting 3.148 trillion miles in 2015 per U.S. DOT calculations. While popular public transportation systems in major metropolitan areas like San Francisco and New York face challenges like overcrowding and maintenance delays, systems in smaller cities face lower ridership. It’s clear that there is plenty of room to improve mobility in cities across the U.S. and globally. To build the smart cities of the future, we need to retool the way transportation infrastructure systems are developed so that they’re designed to meet the needs of residents.

Changing Our Data Collection Philosophy

Changing the way that we collect data for transportation planning is one of the most important steps. Instead of relying on old methods – think costly, time-consuming, and infrequently updated household, intercept, and license plate surveys – to build the regional travel demand models that inform major decisions, cities need on-going and accurate data collection.

Perhaps the best opportunity for cities to get such information comes from Big

Data. For the purposes of this article, by “Big Data” I mean anonymized locational data from mobile devices like smart phones, connected cars, and commercial fleet management systems that is supplemented by contextual data sources. This data accurately, comprehensively, and precisely describes residents’ mobility behavior, so it provides a much more accurate framework for decision-making traditional sources.

It’s not enough to just collect Big Data, though. To build truly smart and sustainable transportation systems, cities must put this Big Data to work. That means using it to 1) Prioritize projects, 2) Drive accountability, and 3) Communicate with the public.

Measure Twice, Cut Once: Using Big Data to Prioritize Projects

Measuring where people go today can help city planners identify gaps in the public transit systems, estimate which projects will impact the greatest number of people, and even identify new opportunities. By using objective measures to determine the projects that stand to make the biggest difference in residents’ quality of life, transportation planners are much better equipped to maximize the impact of valuable tax dollars.

The key elements of “measuring twice, cut once” when it comes to transportation are quantifying the behavior you want to change (i.e.: the number of people in single occupancy vehicles during rush hour) as well as the behavior you want to encourage (i.e.: the number of people carpooling or using a transit shuttle instead of driving).

Let’s say that you’re a city planner who is considering several transportation projects to reduce demand for the limited space on your region’s roadways: a new express shuttle to an existing subway station, expanding that subway’s

capacity, and extending a subway line to a new station. Without knowing how many automobile trips have the potential for conversion to other modes, it’s impossible to determine which project has the highest potential.

Thanks to the ubiquity of smart phones equipped with navigation apps (and other apps that use “location services”) as well as “connected cars” equipped with GPS systems, this information is already being collected by private sector companies. Instead of designing complex studies to count traffic, city planners can utilize Big Data to measure travel patterns efficiently and cost-effectively.

Measure After You Cut: Using Data to Drive Accountability

Since the effects of many transportation infrastructure decisions last 20+ years, measuring “after you cut” is even more important than measuring “before you cut.” Transportation planning as a practice needs to develop better habits by evaluating the impact of the policies, infrastructure changes, and technologies that are deployed. Without measuring after making major decisions, we don’t have evidence of how projects actually perform over time.

By measuring the way a service is used before and after a policy change, urban planners can hold themselves accountable to their goals and to the communities they serve. This means that for every policy or infrastructure change, it’s critical to:

- Collect “status-quo” data: How was this service used previously? (If you measured “before you cut,” that part is easy.)
- Collect “aftermath” data: Has user adoption increased, and have services improved?



- Report back: it’s not enough to simply collect both sets of data. Planners must step back and evaluate whether or not the policy change was effective, too.

Other industries, like Building Energy, have come to pursue performance-based measurements and accountability, and the same benefits will hold for transportation. A great example of this process in action in the transportation industry is Boulder, Colorado’s Living Labs initiative.

As the city of the Boulder implements different pilots of multimodal projects and policies that relate to its 2014 Transportation Plan, they’re collecting data, and they’re sharing it with the public as they do so. The pilot environment has allowed the city to quickly backtrack on projects, such as a controversial road diet, that increased commute times for city residents. Likewise, Boulder is now expanding one of its protected bike lane initiatives because the data showed their efficacy.

Using Big Data to Communicate with the Public

Public opposition or support for critical infrastructure improvements and policy decisions can define a project’s success or failure. Construction and alterations to core infrastructure that disrupts the movement of goods and people through communities often face stringent opposition, even when the project is designed to drive major quality of life improvements. However, effective public engagement can also help planners win funding for much-needed initiatives, as well as uncover unforeseen issues before they arise.

To gain the public’s trust and support, urban planners should use the Big Data they collect in stakeholder communications. Coming to the table with the evidence to support your project’s potential can transform the way community meetings unfold for the better. Instead of a dialogue focused on subjective personal experiences, city residents can evaluate the lived reality of

their commutes in the context of empirical data. The result is more meaningful feedback for planners, and more meaningful engagement from communities in their transportation systems.

Where We Go From Here

To build truly smart, sustainable transportation systems that improve quality of life, transportation planners must redefine the industry’s approach to data collection. Using data everyday on an ongoing basis as a decision-making tool, and sharing project results nationally so that communities can easily learn from one another are two of the most important first steps. ■

Laura Schewel is the co-founder and CEO of StreetLight Data, a mobility analytics provider that transforms Big Data into useful Metrics for smart city leaders, transportation planners, and companies.

Urban Innovator of the Week: Brandon Nicholson

By Nicole Rupersberg

Brandon Nicholson, Executive Director of Hidden Genius Project in downtown Oakland, was born and raised in Oakland and attended Oakland Public Schools before attending prep school in Marin County. Seeing the contrast between Oakland's schools and the prep school sparked in him an interest in education equity and policy, so he studied policy during his undergrad at Princeton and went on to earn his Ph.D. in Educational Policy from UC Berkeley.



Brandon Nicholson

"In that time I was really enthralled by issues around access and justice, and people from different backgrounds being able to engage in these opportunities and build a high quality of life for themselves," says Nicholson. "I have dedicated my life to improve opportunities for folks who cannot advocate for themselves."

Hidden Genius Project was founded by a group of five Black male entrepreneurs and technologists who had gone

to Harvard together and had determined it was important to provide young Black males in the Oakland area with an opportunity to engage in the ongoing tech boom, introducing them to the pathways and skills they can use to become high-performing entrepreneurs and technologists in the modern global economy.

When they founded the Hidden Genius Project, they reached out to Nicholson, whom they knew was from Oakland and had a background in education policy. He came on board as a pro-bono consultant, and they all worked together on the project as an entirely volunteer-driven effort, with everyone involved still working their full-time jobs and not taking a salary.

The very first cohort of five male high school students began in the summer of 2012, with full days of instruction Monday through Friday for the duration, and Hidden Genius ran like that every year until 2015.

"We realized it wouldn't be sustainable so they brought me on as Founding Executive Director," Nicholson explains. "I was the first staff member."

The vision was there, he says, but everyone working on it was too busy with their full time jobs that they didn't have the bandwidth to pursue funding. When the Rockefeller Foundation took an interest in their work and gave them seed money they were finally able to take the project full-time.

Hidden Genius Project now has two main arms of programming: "Catalyst" and "Immersion." Catalyst programs are free single- and multi-day events and workshops held throughout the year with the express aim of igniting interest and exposing Black males to

mentors, basic computer programming, and pathways to careers in tech.

The Immersion Program is a free 15-month intensive boot camp and mentorship program that provides computer science, software development, entrepreneurship, and leadership training to Black male high school students entering 9th, 10th, or 11th grade. Nicholson says no programming skills are required and they aren't looking for specific GPAs.

"We really just look for them to be really interested in doing this for two summers in a row, bookending the school year," he explains. The program runs daily Monday through Friday during the summer and continues during the school year with meetings once a week and one Saturday per month, plus students also put in office hours.

By the end of the program, students will have spent over 800 hours of time with Hidden Genius.

The application process is "intentionally clunky," Nicholson says. They are looking less for high scores on standardized tests and minimum GPA requirements than they are for a genuine interest on the student's part. In the initial application, the student must explain why he is interested in the program. If his answer shows serious effort, he is invited in for an interview.

40 volunteers assist with the interview process, bringing all the potential candidates in to get a better feel for each of them and "how committed they will be."

"Some of these guys are not always going to be the most outgoing or the most articulate all the time, but we can get a sense of where their hunger is or if they're hungry at all," says Nicholson.



"We might have a guy who is hungry but he's struggling in school," which is why they don't rely on academic metrics.

For the latest cohort starting on June 22, they had over 70 applications, brought in 45 students to interview, and accepted 22 of them.

Students are a mix of Black male high schoolers: kids from private schools, public schools, single-parent households, households with two college-educated parents, and a wide range of socioeconomic backgrounds. "There is a lot of shared experience from the Black male perspective but there is also a difference in their day-to-day material realities. It's important to have a mix."

Tuition is entirely free and students get a stipend and meals as well as their own computers to work on (which they can keep upon completion of the program).

Hidden Genius has partnerships with Oakland schools and districts, including the African American Male Achievement program of the Oakland Unified School District (the first program of its kind in the country), but also relies heavily on referrals and word of mouth. Nicholson says they also have contacts with other districts in the Bay Area and get students from the Mission and Berkeley, but most of their direct outreach is done in local public schools.

"We try to be intentional in engaging young men; the guys who aren't necessarily high flying but guys who have

potential at the bottom," he says.

Over the course of the program, students build a software project from conception to creation, including programming to design, as part of their technology creation and software development education. Hidden Genius Project also emphasizes entrepreneurship, so students learn to be self-empowered, and leadership is a major focus as well. "We're trying to raise these young men into the highest quality people they can be so they can perhaps one day be in a position to uplift their communities by being great citizens and maybe even hire within communities."

Some of the students might go on to college to study computer sciences, and some might jump into working for themselves right away. Whatever they choose to do after the program, Nicholson says, "Fundamentally we just want them to be in a better place than when we got them, so they can understand that working for themselves is an option, or that they can work for people in the community building websites and applications; there is a wide range of potential opportunities. Also, we want them to know that, no matter what, they have that ability to leverage those skills and develop more skills to make them more marketable and enable them to thrive in their communities."

Part of the Hidden Genius Project's mission is to also educate their students on the culture of Silicon Valley – and

that they might not like it, even if social barriers were eliminated.

"Even if companies were hiring from a more diverse pool of applicants and underrepresented groups, that doesn't mean their experience will be positive," says Nicholson. "A culture of respecting experiences across backgrounds also doesn't necessarily mean these companies would be excited about their work. It's important for our students to understand that no matter what they do in life, they can be their own agents to leverage their skills and pursue their own interests."

Hidden Genius wasn't built to solve Silicon Valley's diversity problem, and Nicholson acknowledges this. Still, the organization works to address some of the struggles young Black men have in the tech industry, and empowers them to create their own opportunities.

"Those factors related to class and race are very real in our society, not just as barriers to opportunities or education, but sometimes being overlooked based on socioeconomic status or just outright racism," he says. "There are those companies that understand the need to be more diverse or see that benefit or potential, but we want our students to realize they don't have to wait on a paradigm shift in order to succeed." ■

Nicole Rupersberg is the project editor and lead writer of Urban Innovation Exchange and Creative Exchange.

This profile was originally published by Urban Innovation Exchange in partnership with Meeting of the Minds and Kresge Foundation. For more stories of people changing cities, visit UXXCities.com

Mayors Leading on Creating Sustainable, Connected Cities

By Brooks Rainwater and Trevor Langan

To view the National League of Cities State of Cities 2016 report, go to CityMinded.org/state-of-cities-2016

Cities are the places where we live and interact. We expect our city leaders to keep them healthy, safe and vibrant. Mayors fill the potholes, provide needed services to people and grow the economy. Even more, the nation's mayors are leading the charge to develop sustainable, livable, smart cities.

Every year, mayors deliver state of the city addresses in order to reflect on their city's recent accomplishments, current challenges and roadmap for the future. By reading and analyzing speeches from cities of all sizes and parts of the country, we are able to take the pulse of America's cities. In this year's State of the Cities report from the National League of Cities, we uncover the issues that matter most to city leaders.

While cities are the true laboratories for innovation and the economic engines that bring all the pieces together, there are at times challenging fractures in the larger civic puzzle, from affordable housing to racial equity to gun violence. In our analysis, we heard mayors talk about these issues with increased importance this year.

For mayors, the fight to combat environmental and energy challenges takes on increasing importance with each passing year. Last year was a monumental one for mayors leading the sustainability charge. The increasing global influence of cities can be seen in climate policy, where mayors were both instigators and critical participants in the COP21 Climate Talks in Paris.

This was not only the first time that mayors played an outspoken and advocacy role but also the first time since the Kyoto Protocol that real action was taken and global agreement was reached. Atlanta's Mayor Kasim Reed attended COP21 as part of an NLC-led delegation and was one of 510 global mayors who traveled to Paris to be part of the historic agreement and sign the Compact of Mayors.

In Mayor Reed's state of the city speech, he said: "We're doing our part

here at home to answer our moral obligation and build the clean energy economy. We've launched a new program to install low-cost solar panels on our city's buildings, we're a leader in a national effort to conserve water and energy and we have reduced our water consumption by 20 percent."

Closer to home, cities continue to install LED streetlamps and to weatherize homes and municipal buildings. In Duluth, Minnesota, the cost savings from energy efficiency projects will be "reinvested into a dedicated energy fund for additional improvements," said Mayor Emily Larson.

Fayetteville's Mayor Lioneld Jordan noted the success of the city's Property Assessed Clean Energy (PACE) Improvement Project, the first in the state, and described the project as "a creative financing mechanism allowing commercial property owners to borrow money at very low interest rates for weatherization, energy efficiency, renewable energy or water conservation improvements."

Many initiatives are a response to pressing environmental challenges. A number of mayors from western cities discussed the impact that drought is having on their communities. "While we have every reason to believe that we have sufficient water for our current and future requirements, we need to be extremely vigilant," said Carson City, Nevada, Mayor Bob Crowell.

In Riverside, California, the city's public utilities are leveraging good finances to create long-term sustainability. Announcing a new water recycling project, Mayor Rusty Bailey explained that "we have an opportunity during an historic drought for long-term infrastructure improvements."

Salt Lake City Mayor Jackie Biskupski announced "a new Department of Sustainability with air quality as its primary goal." Elevating from a division to a department, sustainability will now be on equal footing with



every other function of city government.

Furthermore, cities are using data and technology to make themselves smarter—more efficient and effective—to enhance service delivery. We saw this in a number of this year's speeches.

The mayors of Columbia, South Carolina, Nashville, Tennessee, and Escondido, California, all committed to making their cities smart, where classrooms, neighborhoods and businesses leverage data and technology to become better connected and more productive. "We need to focus on new technologies, because the solutions we envision today may be obsolete 10 years from now," said Nashville's Mayor Megan Barry.

"Businesses appreciate that we run Kansas City [Missouri] using data, facts and evidence to give our customers taxpayers, residents, visitors and companies what they expect," said Mayor Sly James.

Kansas City, which hosted TechWeek in September, became a finalist city for a \$50 million U.S. Department of

Transportation Smart City grant. Columbus, Ohio, was the ultimate recipient and was tasked with becoming country's first city to fully integrate innovative technologies—self-driving cars, connected vehicles and smart sensors—into its transportation network.

Cities are also moving their operations online and into the cloud to increase transparency and efficiency. "Greenwood is the first city in Indiana to use OpenGov, a software platform that is transforming how governments analyze, share and compare financial data," said Mayor Mark Myers. "It's a remarkable tool, and I urge all citizens to visit the City's website and take a look." In Syracuse, residents can submit and track requests for things like sewer backups, trash removal and pothole filling anytime online using "City Line."

In all of these examples of city leadership, mayors are learning from one another, taking in good ideas, improving on them, and implementing these ideas into operations. Cities know that there is no one size fits all solution, but rather

a myriad of ideas woven into the tapestry of the American body politic. This diversity is our strength.

Mayors share information with one another; good ideas and best practices that surface in one city are continuously transferred to other cities where they are assiduously brought into the operations of those cities. This knowledge transfer further reinforces the network effect that cities have at the microlevel, at the state and regional levels that scale nationally, and all the way to the global level where cities are increasingly influencing policy.

Mayors are the leaders of our cities, working from the bottom up, not the top down, to make things happen. These leaders are bringing people together to create opportunity-filled, socially cohesive, safe places for all, now and into the future—moving our country forward.

As national politics continue to fracture people along ideological lines, it is in our nation's cities where forward-thinking policy solutions are being

formulated. The mayors' State of the City speeches provide a clear view into America's economic and cultural progress, and the leadership we need to move the country forward.

It is in our cities where what's best about our country—innovative ideas, entrepreneurship, and social dynamism—are incubated, implemented, and elevated to the broader national consciousness. From New York to San Francisco, and small- and mid-size cities in between, the future is being forged by the thinkers and doers congregating in our city-centers. ■

Brooks Rainwater is the Director of the City Solutions and Applied Research Center at the National League of Cities. Follow Brooks on Twitter @BrooksRainwater.

Trevor Langan is the Research Associate for the City Solutions and Applied Research Center at the National League of Cities. Follow him on Twitter @TrevorJLangan.

Urban Futures Road Map

It Finally Arrives in Your Bookstore

By Gordon Feller



Roadmaps are sometimes hard to read. But you can be sure that they're always much harder to create. I kept that thought in mind during my enjoyable read through a new and important book, "The Well-Tempered City: What Modern Science, Ancient Civilizations, and Human Nature Teach Us About the Future of Urban Life", by Jonathan F. P. Rose. It does a superb job for city-focused readers like me.

Rose provides much more than just a list of the elements needed for any city to become both a 'smart-city' and a 'just-city'. His book provides something of far greater value: the map

itself. This differentiates "The Well-Tempered City" from the multiple city-of-the-future titles flooding the book market. It helps to define this book's "difference that makes a difference".

Rose avoids giving mere lip service to powerful forces at work inside our cities, but he starts by truly getting to the core of these trends: democratization and citizen engagement; inclusion at both the social and economic levels.

From a stage in Alpbach, Austria during the European Forum Alpbach 2016, Rose said that "only by seeing the whole can we heal the whole." Rose

argues that the emergence of a whole-systems approach— informed by up-to-date research on brain science and human behavior – is an approach which sees the whole city greater than sum of the parts.

But, you'll want to ask, 'exactly how do the pieces fit together?' This is where "The Well-Tempered City" shows its true colors. Rose offers critical guidance which city leaders need, whether a public sector leader (an elected or appointed), a private sector leader, or an independent sector leader (in NGOs, academia, etc.).

Rose leaves out the extraordinary

story of his company and the pioneering work with affordable housing upgrades, and the parallel upgrading of the surrounding urban systems and urban services. Readers will want to do some research and read this extraordinary investment track record; you'll find it a worthwhile story to review. Readers will understand better how Rose's principles work themselves out in the real world where a profit-centered organization innovates within the constraints of low-income housing.

Some of Rose's big insights are drawn from the latest science research. One of these could be quite important for our cities: Affordable housing is essential, but it's certainly not sufficient to make a sustainable and nurturing community. Public housing is a living lab, and it's been such since the days of Charles Abrams and his "City as Frontier". Rose's aim here is not to equalize every human being, but to equalize all opportunities. He sees the city, and most especially the housing in each city, as a system situated at the crux of that challenge. Where Rose is going with this is something he calls "communities of opportunity". As he defines and develops the concept, this is a new way of framing the conversation. Rose is focused on those citizens who, all too often, are situated outside the mainstream of urban opportunities.

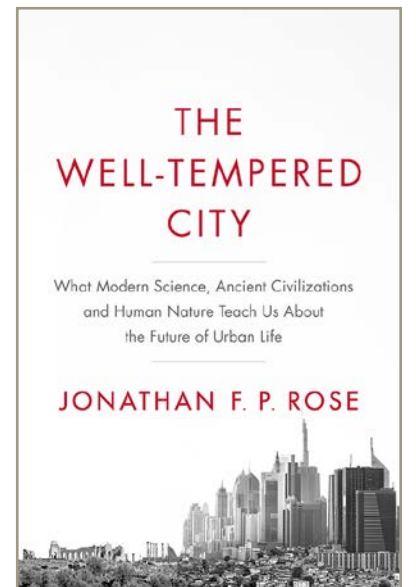
Rose is anxious to emphasize something else drawn from science that we readily forget: Nature has an amazing restorative capacity, and urban ecosystems are no exception. Thus, Rose shows the importance of getting out of the way in cities, such that biodiversity can flourish. Actions informed by a whole-systems approach are making it possible for city ecosystems to recover from the damage done since the Industrial Revolution.

What are some of this book's big take-aways? There are too many to list

here, but consider just a few of them:

- Some pioneers are actually making high-margin investments in our inner cities, enhancing economic return while reducing environmental impacts.
- Doing the right thing makes more economic sense. Believe it or not, as Rose shows in a dozen different ways, optimizing urban systems makes it possible to optimize shareholder value.
- Buildings actually have positive economic benefits, especially when you consider the building's ability to capture rainwater for toilets, returning water to the ecosystem after cleaning within the building, etc.
- Rethinking the city's 'linear infrastructure' comes when you consider the full systems which comprise a city's metabolics. In a linear city, 98% of the resources which come into the city leave it as waste within 6 months. In a circular city that doesn't happen. Regenerative systems go well beyond current urban resource-recovery systems, including recycling services of the type that San Francisco provides to (and with) her citizens. In this regard, please be sure to read through to two of Rose's outstanding examples: the State of Virginia's solid waste policies and Windhoek's story of extreme wastewater. Rose puts to rest the power of linear while giving circular its rightful place at the center of our decisions.

There's some very good news embedded inside this book: Replicating the magnificence of nature is not impossible, as Rose's examples show us. By tying it back to the 'cities of opportunity' Rose enables us to drill down



into each of the elements and reversing the isolation of people, families and income groups. By calling for an infusion of compassion into our urban-development agenda, Rose reminds us that the output we get from our society is a true reflection of the shared values which we infuse into the city.

Be forewarned: Our mental maps are not accustomed to applying the abstractions of systems dynamics to the mundanities associated with affordable urban housing investments.

Inside this book you'll find some compelling symbol of human aspiration, and one of those offered by Rose is J.S. Bach, especially his truly amazing Well-Tempered Clavier. In that spirit, Rose's urban-development business thinks that its core goal is realizing the full potential for humans, believe it or not. ■

Gordon Feller is the Co-Founder of Meeting of the Minds, a global thought leadership network and knowledge-sharing platform focused on the future of sustainable cities, innovation and technology.



Meeting
of the Minds