Letter from the Editor

This was a great year for the Meeting of the Minds Blog. We published 150 articles from urban practitioners from all over the world. We launched a brand new website at MeetingoftheMinds.org. In April, Hannah Greinetz joined our digital team as the Managing Editor of the blog. Led by Hannah’s hard work, we’ve increased our readership by 35% over this time last year. We received dedicated grants from Google, VREF, Wells Fargo, Black and Veatch, and the JPB Foundation to help support our work, for which we are incredibly grateful.

Something else is happening, though. The work we all do on cities is becoming more important. Hurricanes and earthquakes test our resilience; political gridlock tests our resolve. Urban professionals are looking to each other for ideas and best practices. How can we bridge the digital divide? See page 9. How can we fund resilience projects? See page 25. How can we adapt our current infrastructure to meet the needs of our citizens? See page 31.

Lastly—and this is quite important—see page 34. There you'll find the writing guidelines for the Meeting of the Minds blog, so you, too, can contribute to this discussion. We would welcome your participation.

Sincerely,

[Signature]
And so on! Clearly, there is no one size fits all with AI and smart cities, and the applications of it that work best will depend what each city is trying to achieve. A smart city focused on efficiency, for example, might use AI for asset optimization; one focused on sustainability or neighborhood empowerment might encourage the use of AI to enable micro grids and community energy schemes to be balanced with the main grid; or a smart city focused on livability might use AI for crime prediction and prevention.

Topology, traffic and industrial activity. The tool, deployed first in Beijing and now in Johannesburg and Delhi, enables “hotspots” in particulates, smog and other pollutants to be predicted on a 1km² grid, 24 hours ahead, in time to allow curtailment or adjustment of polluting activities. Like all AI systems it learns as it goes, so its predictions get better over time. It will also enable urban design solutions to be evaluated; and a similar tool is also used to predict output from groups of wind turbines within a wind farm.

Accentuate the Positive

Smart cities are hard to define. They have different objectives for their “smarts”, relating variously to efficiency, service levels, economic vitality, social equity, the environment, livability, or some combination of these. One generalized definition might be that smart cities represent the intersection of the Internet of Things (IOT) and analytics—and increasingly, AI—with public infrastructure, public services and city life, in pursuit of whichever of the above objectives the city may have adopted.

Like smart cities, AI can be hard to pin down. It spans many techniques including some things that computing has achieved for 20 years or more. Once again one is forced into a generalization: AI may come from existing models and tools but it increasingly comes from computing technologies that integrate vast amounts of structured and unstructured data, identify patterns, reason about what they have identified, learn and improve their conclusions with experience, and in some cases interact with humans in natural language.

However, even at this generalized level, the potential for AI and smart cities should be clear. According to Gartner, cities are the fastest growing area of the IOT, with 3.3 billion devices due to be connected by 2018. Something has to analyze that data; it is increasingly clear that AI will be that something, enabling multiple systems to be optimized together, detecting emergent patterns, and providing wholly new capabilities in ways that traditional analytics tools cannot.

Two examples illustrate the potential power of AI in cities:

• Autonomous vehicles are clearly approaching the threshold of mass adoption, enabled by AI in several forms. Autonomous vehicles promise to provide radical solutions to traffic and its resulting pollution by enabling much more efficient use of road space, while significantly improving safety and enabling mobility for those who cannot drive.

• My employer, IBM has created an AI-powered tool, “Green Horizons” to enable high resolution predictions of air pollution, based on weather (wind, humidity and temperature), and so on! Clearly, there is no one size fits all with AI and smart cities, and the applications of it that work best will depend what each city is trying to achieve. A smart city focused on efficiency, for example, might use AI for asset optimization; one focused on sustainability or neighborhood empowerment might encourage the use of AI to enable micro grids and community energy schemes to be balanced with the main grid; or a smart city focused on livability might use AI for crime prediction and prevention.

By Dr. Peter Williams

Dr. Peter Williams is the Chief Technology Officer, Big Green Innovations, at IBM. His focus areas are resilience to natural disasters and chronic stresses; Smarter Cities; and cloud computing for government. He has had a major role in developing the intellectual foundation for IBM’s “Smarter Planet” and “Smarter Cities” initiatives, and in identifying and integrating their technological components – both IBM-originated and from outside the company.
On this more positive path, therefore, AI is absolutely a force for good. But now let’s look at the other, more negative path—and how to avoid taking it:

Eliminate the Negative

For all the opportunities that AI offers to improve the city functioning and city life, there are at least five traps that it might fall into when applied to smart cities. These could discredit both AI and smart cities, unless solutions are implemented as AI tools are deployed.

The first trap comes from the propensity of smart cities for integrating different systems within the city’s “system-of-systems.” For example, using water pumping for demand response integrates water and energy, using cell-phone location signals to manage traffic integrates communications and roads, and so on. Ordinarily this type of integration delivers additional value for the city that would not be possible if each system remained separate. But it can also bring risk, by expanding the impact of failures: failure in one system can propagate to another in a cascading failure, or failure chain. Sometimes, as with the major energy blackout in the US North East and parts of Canada in 2003, many of the systems involved may be operating as designed—it’s just that the existence and nature of the interconnections may not be known.

Add AI to this picture—a tool whose raison d’être is often enabling integration of data and systems in wholly new ways to deliver yet further value—and in so doing we may be adding to the possibility of emergent cascading failures, by accidently creating single points of failure with wider impact. If those connections are embedded deep in the logic of an AI tool, they may not be apparent until too late.

The solution, however, is readily identifiable: systematic analysis of the interconnections, spanning all relevant systems and their owners. This might perhaps use a methodology such as Failure Modes Effects and Criticality Analysis (FMECA), that the military has used for some years for complex military hardware like aircraft carriers—where a city in their technological complexity and interconnectedness, even if not their size. When the existence of a failure chains is exposed, it can either be mitigated in advance of a failure, or at least planned for.

The second trap is an adjunct of the first—the possibility of emergent privacy risks that may also come from integrating data and systems in novel ways. Two data files held separately on different systems may be innocuous in themselves, and yet have privacy implications when combined, for example if they allow a citizen’s health status to be inferred. Alternatively, they may be held in appropriate conditions (for example under HIPAA regulations) on their “home” systems, but become exposed when integrated in an AI tool that does not have the same protections. As with cascading failures, to the extent that the power of AI encourages system and data integration, it may also exacerbate the risk of privacy failure. However, as a solution it may be possible to regard privacy breaches as possible failure modes that can be identified and mitigated or planned for in advance like any other failures.

The third trap is that an AI-enabled tools might be found to be biased or discriminating in some way against some segment of the city’s population—the inhabitants of a neighborhood, or specific ethnic groups or genders, say—simply as an accidental result of the assumptions embodied in their creation. For example, suppose a tool designed to improve nutrition recommends pork to someone of a religion that does not eat it. Though regrettable, that might be manageable in its impact, but suppose an AI crime prediction tool was trained (as AI tools need to be) with data from disproportionately from a neighborhood where there is a high proportion of a given ethnic minority, and where, therefore, criminals are inerently more likely to be from that minority. Without corrective action, this might mean that the tool was then predisposed in some way to suggest that anyone of that minority, wherever they were encountered, had a higher risk of being a criminal. That would potentially be catastrophic in its adverse impact.

The solution here is algorithmic transparency. It must be clear why an AI tool has produced a given conclusion or recommendation. With AI, however, that may be easier to say than do—with many of the machine and deep learning techniques now becoming available that use different types of neural networks, for example, it can be very hard to tease out exactly how the tool learned what it did. Perhaps the best news here is that applications of AI in other areas have the same issue, so there is a shared interest in solving it. It is difficult to see, for example, how AI could be permitted for safety critical applications like driving a car or flying a plane without enabling the required level of algorithmic transparency. It is also difficult to see how potential cascading failures, as described above, could be detected without this transparency.

The fourth trap is that AI in smart cities realizes the fears of those who believe that it will destroy jobs—and that it is used to replace city workers as opposed to enabling them to be more productive. Clearly, AI is highly likely to change the way in which the city’s work is done, especially in combination with the automation potential of the IoT. But cities that want to avoid antagonizing their workforces (both blue and white-collar) will do well to define policies in advance for how the productivity released by AI is going to be redeployed.

The fifth and final trap is alienation. Of the criticisms of smart cities is that they are technocratic to the point of disenfranchising the population and being anti-democratic or even repressive (read Adam Greenfield’s book, “Against the Smart City”). And truthfully, while I think the argument is willfully overblown, some implementations of smart cities have deserved the criticism because they have focused more or less exclusively on the “top down,” government-to-citizen aspects of city management—the “pay this,” “apply here,” “don’t do that” functions. Applying a technology like AI, of which people may already be suspicious, to merely enabling the “top down” to happen better, faster and cheaper, is a recipe for increasing those criticisms and undermining the legitimacy of would-be smart cities that try it.

In part, this will be a case of AI taking the blame for the political climate that led to the top down approach in the first place, but fairly or not it could stunt the adoption of AI and smart city technologies generally. As I have argued in other articles, smart cities need to adopt what I called a “U-shaped model,” where the top down applications of technology (one side of the “U”) are balanced by “side to side,” citizen-to-citizen applications (the bottom of the “U”), and “bottom up,” citizen-to-government feedback and communication (the other side of the “U”).

The same may be said of AI. It needs to be applied to enabling citizen-to-citizen activity (perhaps, for example, a neighborhood tool for assessing the suitability of soil in vacant lots for urban gardening and identifying what might best grow there; or enabling energy trading between energy generators and energy users on neighborhood micro-grids). AI also needs to be applied to bottom up applications, for example in correlating citizen feedback with crime or sickness patterns.
Building Towards Resiliency with Healthy Digital Ecosystems

By Greta Byrum

We are only starting to understand the power of networked technologies. And our learning comes at a cost: we are increasingly divided in our increasingly interconnected world. The Internet has become balkanized: we absorb information in echo chambers of affinity and animosity, and argue over whose reality will rule the day. The power of algorithms amplifies the most divisive rhetoric, which is often the least anchored in truth and the public interest. Meanwhile, bad actors with digital privilege prey upon this unhealthy digital ecosystem, exploiting the uninformed.

As someone who has fought for years to connect the unconnected, I am increasingly ambivalent about hyper-connectivity, the Internet of Things, smart devices and intelligent objects. We seem to be inadvertently creating a dystopian future with our technologies. We’ve all seen pervasive flaws, weaknesses, and attacks on smart devices, with no real plan for regulating them to protect safety and security, especially at the global level. Moreover, even when these technologies work as intended, they extract our personal data and make it impossible to put our most private selves up for sale or capture.

As I write this, a flaw has arisen over the New York Times’ decision to hire a new opinion writer who expresses skepticism about climate change, perhaps the most polarizing and emotional issue of our time. Climate change is an existential question wrapped in politically hyper-charged dialogue. Is it “anti-human” or “anti-growth” to advocate for taking measures against a grave threat that we don’t fully understand? Are we sitting by as disaster capitalism hoards water and profit from a new abundance of natural disasters?

“Often the most holistic ideas come from places with fewer resources, where people think about how technology and media can support solutions rooted in their communities.”

– Diana Nucera, Detroit Community Technology Project

I fear that in digital space, we focus on frictionless and hyper-mediated national debates at the cost of what’s right in front of us: time with family, loved ones, neighbors. Everything that sociologists like Robert Sampson and Eric Klinenberg have shown makes our communities stronger and more resilient to shocks and disasters.

This is not just a matter of intellectual debate or abstraction. Many coastal communities are experiencing “daylight flooding,” or in other words, they are sinking. People who live in housing projects built in flood zones, people who live in floodplains near refining facilities or other toxic sites, people who simply live in seaside communities—even in the most expensive real-estate markets—are seeing increasing insurance rates and sinking property values. And in America, nothing validates legal rhetoric like a property rights argument.

Managed or strategic retreat from coastal communities is a reality in a place like New York City, where home and business owners, along with local government, have learned the hard way about what happens after a natural disaster. And as the national discourse grinds on in its information warfare trenches, people have to prepare and adapt, since it seems we’ll never find the national unit to develop reasonable climate policies.

Fight Climate Realities, In Digital Space

As we write this, a flood has arisen over the New York Times’ decision to hire a new opinion writer who expresses skepticism about climate change, perhaps the most polarizing and emotional issue of our time. Climate change is an existential question wrapped in politically hyper-charged dialogue. Is it “anti-human” or “anti-growth” to advocate for taking measures against a grave threat that we don’t fully understand? Are we sitting by as disaster capitalism hoards water and profit from a new abundance of natural disasters?

Building the Infrastructure for Resilience

We’re trying something new in New York: making communities more resilient by building healthy place-based digital ecosystems. Resilient Networks NYC is a multi-stakeholder partnership building local wireless networks in six Superstorm Sandy-impacted neighborhoods. In each neighborhood, New America’s Resilient Communities Program is partnering with a local community organization on the front lines of climate adaptation and economic resilience. With our support, our partners are training local residents as “Digital Stewards” to conduct outreach, collaborate with local businesses and leaders, design, install, and maintain resilient public WiFi systems.

Typical block-scale design of a resilient neighborhood wireless network

When telecommunications systems are functioning normally, these public WiFi networks will provide access to the internet. Because commercial networks often fail in emergencies, however, the networks also feature redundant connections, local hosting, and backup power systems. This design will allow the networks to function as response and resilience organizing platforms in emergencies, enabling community-based organizations to communicate with each other, with local residents, and with first responders, even when other systems fail.

This work emerges from New America’s community technology partnerships with organizations in Detroit, New York, and around the world since 2011. To pilot and refine a curriculum and training approach, we have worked closely with Diana Nucera and the Detroit Community Technology Project since 2011. We field tested this approach in partnership with Brooklyn’s Red Hook initiative in 2012, supporting the development of a mesh network there that served as a lifeline after Sandy, even throughout the two-week communications system outage in the neighborhood. Based on our Red Hook case study, we are now working in six partner NYC communities to train local residents as Digital Stewards to design, organize, and build local wireless networks as a support layer for the digital and social infrastructure of resilience. While the networks will bring storm-hardened broadband connections to local small businesses, they will also provide a platform for training residents to install, maintain, and leverage wireless communications infrastructure for preparedness and other locally-defined community goals.

Day-to-day, the networks will also provide wireless hotspots at small business sites, increasing digital access in low-income neighborhoods, drawing foot traffic, and bringing life to the streets. We see this project as a way of leveraging broadband technology to build the physical infrastructure needed to create healthy digital public spaces. Technology built by and for communities themselves to address local challenges can reduce social isolation and build community relationships and cohesion. While much investment in technology for preparedness and emergency management—surveillance systems and security checkpoints, for example—have not sown trust, but have fractured critical social relationships, we hope our work will contribute to building relationships of mutual trust among neighbors.

The potential uses for local mesh networks are endless—beyond emergency response, they can be used as hyperlocal information and news ecosystems, stores for locally managed privacy-protected data, platforms for cooperative businesses and platform services, and a forum for local advocacy. In fact, they suggest a different kind of future for the internet: one that is rooted in community trust, norms, and needs.

Resilient Networks NYC addresses the interrelated issues increasingly facing many marginalized communities in American cities, including the impact of climate change, limited technology access and ownership, decreasing public investment, concerns around digital privacy and data stewardship, and a need for training and employment opportunities. After Sandy, many New York neighborhoods forged new alliances or built relationships in a spirit of collaboration and mutual support. Our work seeks to build upon that spirit by adding infrastructure assets to increase preparedness and deepen community ties themselves to address local challenges. Our work will contribute to building relationships of mutual trust among neighbors.

Greta Byrum imagines the way we design, build, control, and distribute communications systems. As Director of Resilient Communities for the policy institute New America, Greta oversees Resilient Networks NYC, an initiative providing training, tools, and equipment for storm-hardened local WiFi to residents of six Sandy-impacted neighborhoods.
I don’t consider myself a techie. I don’t know how to code, I couldn’t tell you the first thing about how my iPhone works and although I grasp the idea of data science, I’m by no means a practitioner. Despite this and the fact that my educational background is in business and public administration, I work for a technology organization, and technology and the internet are integral to both my personal and professional life.

Increasingly, stories like mine are becoming the narrative of the 21st century. Technology is permeating nearly every facet of our lives and technology know-how and skills are becoming prerequisites, not just for tech jobs but for employment across all sectors.

Meanwhile, the city of Cleveland retains its ranking as the third least connected city in the nation, behind only Detroit, Michigan and Brownsville, Texas. Approximately 50% of Cleveland residents don’t have broadband internet connectivity at home.

The Digital Divide Slows Workforce Development

That’s an astounding figure! Think of the variety of ways you use the internet every day. From your morning news, to social media, to staying connected at work, to paying your bills, taking a class online, checking in with your child’s teacher, reviewing your test results from your doctor; the list goes on and on. Meanwhile, half of Cleveland’s residents don’t have broadband internet access at home.

A Solution: Internet Connection and Workforce Training Programs

At DigitalC, we are committed to addressing the issues of access and digital skills building for the most vulnerable members of our population. Through two pilot programs, we will begin proving the impact of home broadband access and digital literacy training for improving social and economic outcomes for Cleveland residents. Our first program, Connect the Unconnected, will bring broadband connections to approximately 800 residents of CMHA high rise communities, as well as residents of the Lutheran Metropolitan Ministries Men’s Shelter and students at Stepstone Academy. Recipients of the connectivity will also be provided with the opportunity to complete a basic digital literacy training course, teaching the fundamentals of computer and internet use, after which they will receive a refurbished computer to utilize at home.

Growing out of this effort at connectivity and basic training, DigitalC is also piloting ReStart, a technology skills building program aimed at creating on-ramps to the digital economy for underemployed and unemployed Clevelanders. Utilizing local assets and resources, DigitalC is collaborating with community workforce and training partners to embed digital skills training curriculum into existing workforce development programming, providing opportunities for marginalized populations to access everything from basic, foundational training in computer use, to intermediate curriculum in areas like computational thinking and Microsoft Office Suite, to certification and credentialing opportunities that can act as pathways to employment or higher education preparedness.

Together, Connect the Unconnected and ReStart are creating opportunities to chart a new course in Cleveland around connectivity and access for all. We may not all want or need to be techies, but the speed and impact of technology and innovation isn’t slowing down anytime soon. It’s up to us as a community to ensure that everyone in our region has the resources and tools to keep pace.
Big Data, Automation, and the Future of Transportation

By Susan Shaheen and Adam Cohen

Susan Shaheen is a pioneer and internationally recognized expert in shared mobility. She is also actively involved in researching automated vehicles and alternative fuel vehicles. She is an adjunct professor in Civil and Environmental Engineering and Co-Director of the Transportation Sustainability Research Center (TSRC) at the Institute of Transportation Studies at the University of California (UC), Berkeley.

Adam Cohen is a shared mobility researcher at TSRC, UC Berkeley. Since joining the group in 2004, his research has focused on innovative urban mobility solutions, including shared mobility, Smart City technologies, smartphone apps, and other emerging technologies.

In recent years, a variety of forces (economic, environmental, and social) have quickly given rise to “shared mobility,” a collective of entrepreneurs and consumers leveraging technology to share transportation resources, save money, and generate capital. Bikesharing services, such as BCycle, and business-to-consumer carsharing services, such as Zipcar, have become part of a sociodemographic trend that has pushed shared mobility from the fringe to the mainstream. The role of shared mobility in the broader landscape of urban mobility has become a frequent topic of discussion. Shared transportation modes—such as bikesharing, carsharing, ridesharing, ridesourcing/transportation network companies (TNCs), and micro-transit—are changing how people travel and are having a transformative effect on smart cities.

Although the concept of shared mobility is not new (ridesharing traces its origins to World War II), early concepts of shared mobility have evolved from manual operations to highly dependent information-technology operations. For shared mobility, technology is a critical enabler and “multi-modal multiplier.” Technology dramatically multiplies the effectiveness of shared modes, allowing existing modes to serve more riders, more trips, and more miles with fewer resources than before. Digitization of shared mobility (and the broader transportation network) — from real-time analytics, mobile applications, sensors, and satellite navigation — allows travelers to be more informed, agile, and mobile in their transportation decisions. Leveraging data and real-time analytics at all stages of the traveler process is key for shared mobility and broader transportation operations and planning. Data understanding can aid public agencies and transportation operators (public and private) build a more intelligent, responsive, and agile transportation network.

The dramatic increase in intelligent transportation systems, location-based services, wireless, and cloud technologies — coupled with the growth of data — has the potential to notably alter our transportation network in a number of ways.

First, end users are employing mobile websites and apps for an array of transportation functions, such as vehicle routing and parking, information services, trip planning, and fare payment. In particular four types of mobile services are having an impact on the transportation network. These include:

- **Mobility services**, which assist users with routing, booking, and payment of single and multimodal trips. This can include shared mobility (business-to-consumer and peer-to-peer sharing apps), public transit apps, real-time information apps, taxi e-Hail, and multimodal aggregators; transportation service providers, such as public transit and ridesourcing/TNCs (e.g., Lyft and Uber), use a variety of data and data sources in their modelling and operations, big data coupled with data sharing has the strong potential to enhance transportation planning and traveler services by empowering operators and policymakers to better understand the current state of the transportation network and more accurately identify services gaps and respond through immediate service adjustments and longer-term infrastructure improvements.

- **Vehicle connectivity services**, which provide vehicle diagnostic information and enable remote access and dispatch emergency services (e.g., accident and roadside assistance, unlocking a vehicle); and

- **Smart parking services** provide information on parking costs and availability. This includes “e-Parking” services to reserve and pay for parking and “e-Valet” services that connect vehicle owners to valet drivers to pick-up, park, charge or refuel, and return vehicles.

Second, invisible to the traveler but impacting the traveler everywhere, real-time data analytics, and algorithms are being used in a variety of ways to improve the traveler experience, enhance operations (such as managing crowdsourced and flexible routing), provide predictive analytics to more accurately forecast and respond to demand, and improve operational responses with natural or manmade hazards impacting usual transportation operations. Together these transformative trends are creating vast amounts of data that will enable travelers, transportation providers, and public agencies to make smarter, more intelligent, and efficient transportation decisions. While aggregating data provides local
Establishing Open Licenses and Standards

Public–private data sharing can support innovation and will continue to form the foundation of future transportation innovations. Public agencies should consider establishing open licenses and standards that allow for interoperability.

Data sharing and interoperability has limited the use of data by public and private sector parties. With the rise of multiple transportation modes (e.g., drones, robots, equipment, sensors), smart infrastructure, and public agencies, interoperability will be key to document and track safety incidents, security breaches, and operational issues.

The U.S. Department of Transportation has defined different levels of automated vehicles starting from Level 0 (no automation) to Level 5 (full automation). Levels 0 through 2 are designed to assist or replace human control, while Levels 3 through 5 are self-driving. Level 5 vehicles are completely self-driving without human controls in all driving environments that can be managed by a human driver.

For more information on shared mobility service models, please see the U.S. Department of Transportation’s Shared Mobility: Current Practices and Guiding Principles.

Robotic Delivery

Across the country, grocers, retailers, and food establishments are experimenting with delivery robots. These electric delivery vehicles typically use a combination of cameras, sensors, and satellite navigation systems to operate on local sidewalks. Overseas, Chinese e-commerce retailer Jingdong has recently experimented with robotic delivery. Similar plans are underway to launch a delivery robot in Japan in the coming months.

While the full impact of these technologies is only just beginning to be recognized, these four transportation innovations could be among the biggest game-changers for urban mobility and goods delivery since the development of the internal combustion engine.

1. For more information on shared mobility service models and definitions, please see U.S. Department of Transportation’s Shared Mobility: Current Practices and Guiding Principles.
2. For more information on smartphone applications impacting transportation, please see U.S. Department of Transportation’s Smartphone Applications to Influence Travel Choices.
3. For more information on data sharing best practices and guiding principles, please refer to the U.S. Department of Transportation’s Smartphone Applications to Influence Travel Choices (Chapter 6).
Leveraging Technology to Improve Transportation in Nairobi and Beyond

By Christina Olsen

Meeting of the Minds took a few moments to talk with Jacqueline Klopp about using technology to improve transportation in Nairobi and other African cities. She is an Associate Research Scholar at the Center for Sustainable Urban Development at Columbia University. Her research focuses on the intersection of sustainable land use, transportation, planning and democratization. She is writing a book on the politics of planning in Nairobi and is taking an increasing interest in ICT and questions of public participation in policymaking around planning. She is also a co-founder of the blog NairobiPlanningInnovations and the Digital Matatus project that mapped minibuses (matatus) in Nairobi and produced the first public transit map of minibuses for the city. Klopp received her B.A. from Harvard University and her Ph.D. in Political Science from McGill University.

What are some of the transportation issues you research through the Center for Sustainable Urban Development?

Our center is in New York but our work is primarily in Nairobi with networks to many other African cities. We are all a part of a global conversation around how to build better cities. African cities are very diverse with different histories; some of them are relatively new and many are growing very fast. For instance, Nairobi is just a little over 100 years old with a population increase rate of about 4% per year, and even higher in some of the surrounding areas.

In parts of Africa the stark transition toward an urban future is unfortunately not equitable. Problems are emerging like poor air quality, lack of walk-ability, lack of accessibility and housing, and higher rates of traffic crashes, fatalities, and injuries. A lot of infrastructure going in is also highly inequitable. The elite who have cars are a small but growing minority in places like Nairobi and they think of transportation as building more roads. They want freeways. Almost any of the big African cities also have very serious traffic congestion problems. This is a result of high growth rates and under investing in more transit oriented development, walk-ability, and more harmonious land-use and transport infrastructure. While these are problems cities face all over the globe, what’s unique about a number of African cities is their high growth rate and high number of transit users. So these issues are very urgent.

How do you even begin to tackle such problems?

What struck us after working with a wonderful set of colleagues in Nairobi for over ten years is that there is a win-win policy direction when you have a city that has 70% of its people every day using what is basically public transit in the form of private mini-buses. In addition, a good chunk of the population walk, especially the poorest. Essentially Nairobi is a walking and transit city. So that’s an opportunity to emphasize good transportation: walk-ability, non-motorized transport, safe design, clean transport, and mixed use. These are what we need to make cities work, particularly regarding public health, transportation access, climate change, and the sheer livability of a city.

All of that makes sense from every direction except it’s not really what’s happening. So a lot of our research is on how public transit is working: how people are using it, how it can be improved, and how we can raise its profile in investment and policy conversations that tend to be dominated by interests that want to build highways. Roads are very important but highways are not good when they go through dense urban cores.

There’s a lot that we don’t know and data we don’t have. In Nairobi everybody pretty much has a telephone so with the help of the Kenya Alliance of Resident Association (KARA) we did a phone survey. We found that over 80% of people feel they are never consulted in transportation decisions and that 30% of people with cars would enjoy riding a bike in the city if there was safe infrastructure. Biking hasn’t even been on the policy agenda.

How do you leverage the findings to create solutions?

One project we’ve been involved in is called Digital Matatus. The city of Nairobi did not have a public transit map of bus stops or where the little minibuses—called matatus—went. So partnering with University of Nairobi, the Civic Data Design Lab at MIT, and a little firm called Groupshot, we mapped out the public transit system and made that data open. So now there’s real public information and there’s been a lot of research done with it, particularly on accessibility and networks. One of the things we are quite proud of is that it’s the first African minus system up on Google maps.

We’ve also been thinking about children and public health as a way to raise issues that people may not always think about. For example, there is resistance to lowering speed limits, partly because of the general image that car owners have of the pedestrian as an annoying adult that is trying to cross the street when they want to go fast. But they don’t even think that a pedestrian can also be a child trying to get to school, which often isn’t considered by the public either. When they think of the safety of children walking on or near a street, their priorities change. So shifting the conversation by bringing children into planning is very important. To help with this we collaborated with filmmakers to get children struggling on Nairobi’s streets to speak for themselves.

Through our air quality studies we’ve compiled data previously missing for African cities. We found that a lot of the pollutants come from vehicles. Particulate matter, that is particularly egregious from a public health point of view, is well above the world health organization standards in Nairobi. Sixty percent of people in our public opinion survey said there was a problem with the air and the majority felt it was affecting their health. This is another
example of the kind of work we’re doing to put information and research on the public policy agenda in cities where it wouldn’t be otherwise.

Are there lessons that cities in other parts of the world could learn from your research?

I think we always learn from each other. For instance, our minibus mapping work showed that it’s possible to provide public data for transit systems with high levels of informality, such as those with shifting routes, a lack of schedules, and bus stops that are irregular, non-designated, or not well-known. There is a particular standard for this kind of data called GTFS, or General Transit Feed Specification. If you put your data into this standard it is very easy to have it work with Google maps, transit planners, and other open source software. However, the specification was really made for formal bus and train systems like those in European and North American cities. Our Nairobi data didn’t fit perfectly so we had to figure out how to modify the standard to be able to include data from a more flexible kind of transit system. We engaged one of the Google employees and from those conversations there was a refinement to the standard.

A tech start-up out of Portland is working for the state of Vermont to build a passenger information service there, which will include rural transit systems that look a little like the minibus systems in Africa. The revised GTFS actually got applied to their work. That’s a wonderful example of innovation coming out of Africa having a useful impact elsewhere. Also, as the population ages there will be a lot more of what we call paratransit—different kinds of minibus systems that are more flexible and on-demand—for elderly or disabled people here in the US who are no longer able to drive. The African systems will be relevant to that too.

There’s also an activist hacker—or hacktivist—community around this. For a long time transit agencies were developing data but not making it open or putting it into a standard that would allow it to be used with open source technology. Bibiana McHugh at TriMet came up with the idea of creating a standard to get transit data on the maps of one of the big Internet companies. That led to GTFS, which was originally the Google Transit Feed Specification before it got renamed. Activists then started pushing for transit agencies like the one in New York to make their data open so that they could build apps to allow seamless navigation of public transit. Being able to easily figure out how to make connections to easily get from point A to point B encourages people to use transit. So a lot of people on the tech side are heavily engaged as transportation advocates. They even get together each year at an event called Transportation Camp. We need to support this kind of innovation that helps make public transport attractive and easy to use.

Do you think coming from a well-known academic institution in the global north helps or hinders your work in Africa?

It’s a bit of both. It’s always helpful to have an outsider perspective on any place. Which is why it’s also very enriching to have our African colleagues come to the United States to see our cities and give us commentary on them. There are also disadvantages because the people who should be leading all of this are the local citizens. That’s why my explicit policy is that I work only in collaboration and that my African colleagues are the leaders in the conversations and activism. I have a huge amount of respect for the community groups in the lower income areas of Nairobi and the hard work they do. There are very basic things we have in common, like whether the roads are safe or our children get to school safely. So that’s the basis for a very interesting conversation and collaborative creative intellectual process.

What’s coming up next for your work with the Center for Sustainable Urban Development?

Coming out of our mutual work on minibus systems, Herrie Schalekamp of ACET in Cape Town (see Researcher and Paratransit Operator Collaboration in South Africa) and I are going to be working on a project with the National Treasury in South Africa. Cities there have realized that they’re not going to replace minibus systems with BRT (bus rapid transit) or some shiny expensive system and a lot of them can’t afford these new forms of transit anyway. So there’s a need to improve the existing transit systems to get clean, safe, and higher occupancy vehicles with rationalized routes and passenger information. We also have to keep improving commuter rail, bikeability, and walkability.

So we’re going to look at where interesting innovations have already happened in South Africa and learn wider lessons from them including for Nairobi. These innovations include creating passenger information systems, minibus incentive schemes for improved driving, and fleet renewal with cleaner vehicles. For it to work we need to engage with the people who really run transit in African cities. So we’re exploring creating new classes and curriculum including for minibus operators. Building on knowledge gained across the globe, we have also started a new class here at Columbia University on “Access, Innovation and the Urban Transportation Transition”. We’re also continuing building on these new ideas globally in collaboration with the other Volvo Research and Education Foundations centers and partners so that’s pretty exciting.
One Payment System is Needed For All Transportation

By Boris Karsch

The cutthroat battle for customer bases—whether bankcard, bank account, or cash—across multiple transportation modes allows users to determine the most efficient route for their journey—including first-last mile options—and results in an overall reduction in congestion as passengers are naturally dispersed over a wider variety of transportation modes. It also supports all payment sources—including bankcard, bank account, or cash. For city agencies, cash still pays a crucial role in ensuring access to mobility for all citizens and demographics.

As data advancement will allow us to reach our goals of efficiency and optimization, technological advancements will allow us to reach our goal of providing mobility services to every traveler. From designing and developing new transportation tools such as driverless cars to designing new strategies for the maintenance and utilization of our existing infrastructure, we must work tirelessly to solve issues such as traffic congestion, the last mile problem, and climate change. Integration and collaboration are key to these advancements as well. Very few companies have the answers to all of the questions; instead, many industry-leading companies or executives offer a wealth of expertise in a single subject area such as cloud computing, mobile application development, or data analysis. For our passengers to benefit from broad, turnkey solutions in the transportation industry, companies must collaborate generously and openly to pool resources and make strides that would otherwise be impossible. Enabling new mobility solutions are built on technical architectures that facilitate integration significantly reduces technical barriers for collaboration between solution and mobility providers. In my own work, I am proud that we can count on companies such as Microsoft for their Azure cloud platform and Mastercard for their mobility and purchasing statistics; these invaluable resources make progress towards Cubic’s NextCity vision possible.

This is not at all to say that companies shouldn’t be competing or that we should abandon individual dreams and goals for one common vision. There is no room at the mobility table for advances of all kinds, and many of these will undoubtedly result from competition: striving to provide a solution that is better, faster, or more affordable than someone else’s. I only wish to point out that more information to sort through than ever before, and with more complex problems than have ever been faced in the transportation industry, a healthy dose of goodwill enabled by open-technology architectures could go a long way in helping us to reach our goals faster.

For us to understand the role that integration will play in the future of mobility, we need look no further than the cell phone found in their purse or pocket. Our smartphone represents the cell phone found in their purse or pocket. Our smartphone represents the most convenient possible route for every journey and every passenger. While we may not be there yet in terms of providing that service to travelers, it can be achieved through integration and collaboration. These potentials abound throughout the transportation industry. We only need to come together to see them become realities.

Boris Karsch is the vice president for strategy at the California-based Cubic Transportation Systems. He leads the execution of Cubic’s NextCity vision for the integration of payment and information systems with direct responsibility for strategy development, partnerships, and acquisitions.
Replicable and Scalable Urban Park Management

By Douglas Blonsky

When people think about urban parks, New York City’s Central Park often comes to mind. Regardless of age and life experiences, most people have heard something about Central Park: that it’s a destination they should visit some day; that it used to be derelict; that it is now a beautiful oasis in the middle of the largest city in the United States.

Hopefully they’ve also heard of the role of the Central Park Conservancy. In 1980, in the midst of a major fiscal crisis, the Conservancy was formed to bring consistent management and private dollars to the public park. The partnership that was formed with the City of New York through its Department of Parks and Recreation was groundbreaking, and the first example of a public-private park partnership (or P4, as we like to call it).

The Central Park Conservancy was instrumental in saving Central Park. In fact, our P4 model has been emulated in hundreds of other parks—showing that our restoration and management successes are replicable and scalable by other urban park professionals caring for green spaces around the country and beyond.

How Did We Do It?

Given Central Park’s and the Conservancy’s history, we receive a lot of questions from other park groups. In 2016 alone we responded to 200 requests for advice and assistance from 115 parks in the United States, as well as 25 parks abroad.

The list of questions we receive is endless. How do we keep our lawns lush and green while welcoming over 42 million pairs of human feet (plus hundreds of thousands of dog paws) visiting Central Park every year? How are we able to open ballfields for play soon after a rain event? How do we honor the Park’s original design intent while planning restorations for current and future needs? How do we measure our success? How do we raise private funds for a public park? How do we engage visitors? How do we manage volunteers?

The detailed answers involve turfgrass science and soils engineering, circulation studies and user surveys, funding and communications tactics, and archival research, among other things. More important, they require knowing the context. Who’s asking? What’s their role/relationship to the park and/or city in which it’s located? In what type of political, funding, and physical environment is the park situated? Is the question focused on a particular landscape, like lawns or woodlands or water bodies, or is it broad based to include the entire park? Is the question related to management of the public agency or private organization entrusted with its care? Are there resources already allocated for taking care of the park, or is identifying and garnering these resources the task at hand?

Of course, nobody knows another park’s context like the people taking care of it. Our continued care of Central Park we are happy to share our management practices, but always emphasize that what’s replicable is the approach—not necessarily our tactics.

How Does Our Experience Translate?

We acknowledge that Central Park’s context is unique. It is a cultural landscape and designated historic landmark. Its 843 acres of democratic space span several of the highest-population-density and real-estate-value neighborhoods in the country. People use Central Park for everything from birthday parties and family picnics to landscape-scale art installations and major concerts—although 70% of visits are for quiet contemplation and to connect with nature.

The Central Park Conservancy’s context is also unique. Despite being “the” case study for public-private park partners, a vast array of P4 models exist—ours is just one, albeit the first. Being the first private group to manage a public park came with a host of challenges. New York City’s fiscal crisis, disinvestment in parks and other urban infrastructure services; the Park’s decline to its worst shape ever in the 1970s; graffiti, trash, broken glass, bare soil, crime, abuse, and other negative use; a period of no accountability. We learned from our failures and overcame a variety of challenges before we reached “success.” And we’re still learning today.

So when asked, “How do you do it? How do you keep Central Park so beautiful and inviting?” the scalable and replicable answer that we give to everybody is a 3-step framework: Restore, manage, and engage. From day one of the Central Park Conservancy, our logic model has been built on the belief and experience that if we restored Central Park, managed it, and engaged the public in its use and care, it would become (and remain) a vital part of New York City life. It worked here, and we’re confident it can help parks everywhere.

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1. Restore

Start small, choosing projects that don’t cost a lot but will make a large visible impact. Visibility is key to gaining public confidence. Our first projects were focused on safety and cleanliness—lights, benches, and zero-tolerance for graffiti and litter—before moving on to larger restorations.

Lights, Benches, Trash, and Graffiti: We repaired all 715 lamp posts and designed new luminaires so people could see as they commuted through Central Park [because in those days nobody strolled through it], then repaired and painted 9,000 benches so people could actually sit and stay for a while. Since the Conservancy’s founding, we prioritized a graffiti- and litter-free Park, subscribing to the idea that a place that doesn’t look like it’s cared for invites negative use.

3-Step Process

2. Manage

And for managing we carried out a comprehensive Strategic Master Plan (SMP) and a Dynamic Management Plan (DMP). The SMP is the vision for what we’re trying to accomplish: over 200 requests for advice and assistance from 115 parks in the United States, as well as 25 parks abroad.

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3. Engage

Finally, the most important component of our approach is engaging the public. The Central Park Conservancy’s 3-step framework is designed to be broad based to include the entire public—local, national, and international. The Park is a cultural landmark visited by millions every year. Since 1980, the Conservancy has received nearly 200 requests for advice and assistance from 115 parks in the United States, as well as 25 parks abroad.

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Great Lawn, after restoration.

Great Lawn, before restoration.

**Lands**eces: Our first major landscape project was managing the newly-restored Sheep Meadow, a 15-acre lawn-turned-dustbowl after decades of unfettered large-scale events and inconsistent care. We restored New York City’s iconic “City Green” to the peaceful meadow it was intended to be.

2. Manage

We knew that if we didn’t maintain the restored Park infrastructure and landscapes that our gains would be immediately lost. From the beginning we embraced the idea that capital restorations without consistent management were unsound investments.

**Operations management:** Our first major land- and capital restorations.

**City Contract:** In 1998, the Conservancy formalized our public-private park partnership and signed a management agreement with the City of New York as the ultimate testament of public trust in our work. The City owns the land and retains all right to set policy, and the Conservancy is responsible for day-to-day management and capital restorations.

3. Engage

Once we achieved beautiful green space and had a plan to keep it that way, we invited people to enjoy it—and help us. Public engagement takes many forms, but at the core it’s all about partnering with visitors to protect your park. Public engagement is stewardship.

**Community Programming:** The 11-acre Harlem Meer and surrounding areas at the northeastern corner of the Park underwent a major restoration in the early 1990s, including the construction of a new visitor and education hub, the Charles A. Dana Discovery Center. Early efforts to consistently provide community engagement programs such as catch-and-release fishing and Harlem Meer Performance Festival—a weekly summertime concert series that features local emerging and established artists on the Discovery Center’s outdoor plaza—led to major funding support for visitor services and public programs a few years later and solidified the once-again vibrant and beautiful Park in local culture and community.

**Stewardship:** Getting young people involved in the Park is key to building a broad base of stewards for the long-term. We provide opportunities for families, students, teens, and college students to support our stewardship of the Park by raking and mulching, picking up litter, supporting visitor services and public programs, and helping with woodland restoration projects. Programs also give young people a potential pipeline to a meaningful and rewarding career. When young people help care for the Park, they come to really care about the Park, which is a critical to our long-term success.

“Getting young people involved in the Park is key to building a broad base of stewards for the long-term.”

**Walk Don’t Run**

Central Park’s renaissance didn’t happen overnight. There was a lot that needed to be done. We started with a huge vision, but implemented small, achievable projects—leveraging volunteer support—that accumulated public trust and engagement along the way.

The Central Park Conservancy’s work is built entirely on our goal to break the cycles of decline and restore that had plagued the Park since its opening in 1858. Our experience shows that if you fix up a park, take care of it, and program it, public trust and positive use will follow. It’s critically important to plan and design for the long-term. Ask yourself, “How can I ensure that my park will be beautiful and inviting 10, 20, and 50 years from now?”

In essence, long-range planning—that contemplates the 3-step process of restore, manage, and engage—is the most scalable and replicable park practice we can promote. Walk before you run, and take time to think about what your park will look like when you’re running. Managing our parks is like running a marathon, not a sprint. In light of increasing urban population size and density, we have no choice but to manage our parks for the current and future generations of park lovers and stewards.
Walking through my Midwestern neighborhood, I spy innovations that suggest we are up to the challenges that a changing climate triggers. I see storm sewers with “rain blockers” that delay rainwater’s approach to them during and after big rains; “permeable alleys” that absorb water through pores in their concrete; and bioswales of plants and spongy soil that absorb water runoff from roofs and roads. And underground, a mile or so away, deep tunnels take precipitation from heavy rains and snowmelts to distant reservoirs to prevent overflows of sewage and storm water.

It’s a cornucopia of innovation with the city as a lab. And it’s paid for with water.

Vent overflows of sewage and storm precipitation from heavy rains and snowmelts to distant reservoirs to prevent overflows of sewage and storm water.

As we enter an era of demands on cities sparked by climate change—induced shocks and stresses, ingenuity by cities is in high demand. Various estimates of adaptation/resiliency funding needs exist. For instance, the United Nations Development Program projects that adaptation costs could range from $140 billion to $300 billion by 2030—and between $280 billion and $500 billion by 2050. In the U.S., the Union of Concerned Scientists, a source for cost estimates to remedy such risks, estimates that sea-level rises of 13 to 20 inches by 2100 would threaten privately insured coastal property valued at $4.7 trillion.

In addition, the Risky Business initiative notes that increases in temperature, heat waves and humidity will drive up demand for energy and require the equivalent of 200 new power plants nationwide that could cost up to $12 billion a year by 2100. Plus, we already know how costly it can be to respond to climate change. Hurricane Sandy in 2012 cost New York $32 billion in damage and loss.

Earlier, thunderstorms, tornadoes and flooding in the summer of 2008 caused more than $18 billion in damage and 55 deaths nationwide, primarily in the Midwest. Communities need funds to shore up their critical infrastructure assets, such as transportation infrastructure, wastewater treatment, telecommunications networks and electricity and gas supply. Funds are required for projects where resilience is a primary function to enhance a particular geography (e.g., a new sea wall) and to boost traditional mainstream projects’ resiliency attributes (e.g., elevating an existing bridge).

Both primary function and resilience functions can bring big paybacks. Global reinsurer Zurich calculates that for every dollar spent on targeted flood-risk reduction measures, five dollars can be saved by avoiding and reducing losses.

Where will cities find the funding to support inventive resilience-related projects that strengthen the capacity of governments, communities, institutions and businesses to survive, adapt, and grow in the face of increased climate-driven shocks and stresses? Baseline strategies for project readiness in the Global Adaptation and Resilience Investment work group and on dozens of conversations with resiliency fund leaders, resilience initiatives, hazard mitigation experts and regional collaborations (primarily in support of the Regional Plan Association’s Regional Resilience project for the Fourth Regional Plan entitled “Establishing a Regional Resilience Trust Fund”), here are three elements to a fresh era of market finance.

In many communities, those most at risk from climate impacts are poor or disenfranchised residents. Their greater risk can reflect such factors as lower insurance penetration, fewer savings, language-barriers, fewer funds to dedicate to maintenance, more unemployment, less access to information and more assets in lower-lying areas. When planners focus on improving infrastructure and social structures in more vulnerable communities, projects reap collateral benefits, known as “resilience dividends.” In these situations, a future disruption doesn’t become a disaster and shorter-term economic and social benefits are realized. The key lies in setting priorities for proposals that decrease economic vulnerability along with climate vulnerability.

For practitioners, three practical ways build these collateral benefits into projects:

1. Include government officials, project developers and citizens in project planning to create engagement and literal and figurative buy-in.
2. Promote breaking traditional departmental silos to identify funding that can be used collaboratively.
3. Emphasize system benefits over project benefits to promote projects that have positive impacts across both the targeted and surrounding communities.

### Lessons from developing-country adaptation finance:

The largest sources of approved funding for adaptation projects globally are currently the Pilot Program for Climate Resilience (PPCR) of the World Bank’s Climate Investment Funds (CIF), the Least Developed Countries Fund (LECF) administered by the Global Environmental Facility (GEF), the Special Climate Change Fund (SCCF) and the Adaptation Fund (AF). New funds are being established, including the $353 million Adaptation for Smallholder Agriculture Program (ASAP) under the International Fund for Agricultural Development (IFAD). The largest adaptation fund is expected to be the Green Climate Fund (GCF) at $1 billion/year by 2020, which will split its funding equally between mitigation and adaption projects, with initial allocations starting in 2016.

There are existing market-finance groups. For instance, the P8 Group consists of 12 of the world’s leading pension funds collectively managing $3 trillion. P8’s aim is to create viable investment vehicles to simultaneously combat climate change and promote sustainable growth in developing countries. New entrants to the developing world adaptation finance marketplace include the Rockefeller Foundation/Asian Development Bank Urban Climate Change Resilience Partnership.

Just as development finance options do in emerging economies, in the US, in collaborations with market investors, cities can structure deals where they take the first loss position, with the mid debt taken up by a patient capital (such as pensions) and the senior debt by institutional investors.

### Collateral Benefits

Collateral benefits refer to the various economic, social and environmental benefits that can be derived from climate adaptation projects. These benefits often go beyond the primary purpose of the project and can include infrastructure improvements, job creation, increased property values, and enhanced community resilience. By fostering innovation and supporting projects that achieve both climate resilience and broader social goals, a fresh era of market finance can help cities and communities prepare for the challenges of a changing climate.

### Benefit Cost Analysis (BCA)

Many city leaders already have a long-term mindset. They plan for their city’s well-being 20, 30 and 50 years into the future. But they need to develop it in their financiers by modeling long-term benefits and costs through assessments that go beyond a normal benefit cost analysis and include elements of equity, land use, safety and stability. Typically, basic project BCAs evaluate direct financial benefits (e.g., project revenues...
Funding Mechanisms for Resilience Financing

Community Reinvestment Act (CRA) investments
- Banks have shifted away from meeting their CRA goals with their general market share in low-value mortgages in the post-housing bust. The statute is flexible enough to allow investments for resilience that improve communities.

EPA Supplemental Environmental Projects (SEP)
- Organizations (more than 600 across the country) such as utilities that are fined for violating various environmental statutes should finance resiliency solutions process across the states and territories.

EPA Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF)
- For local and regional infrastructure agencies.

FEMA Hazard Mitigation Grant Program (HMGP)
- Funds for projects that mitigate future hazards after a president declares a disaster area can receive such monies.

FEMA Disaster Deductible Program (DDP)
- A funding model under consideration by FEMA to promote risk-informed decision-making to build resilience and reduce the costs of future events.

Green Banks
- With tools such as green bonds and property assessed clean energy (PACE) programs, Green Banks are well placed to pivot to adaptation if their legislated authority enables the change.

Green Bonds
- Already funding resilience, Climate Bond Initiative (CBI) and others are working to introduce adaptation/resiliency components of all Green Bonds, and Standard & Poor’s has established a green bond rating system that includes resiliency elements.

HUD Section 108 Loan Guarantees
- HUD’s existing borrowing authority.

HUD Community Development Block Grants (CDBG)
- Relatively flexible funding for community improvement that has a recent history of focus on resiliency.

Patient Capital
- Investors with longer-term perspectives, such as pension funds, where the expectation of market return enjoys a longer timeframe.

Philanthropy
- Including existing funders Kresge Foundation and Rockefeller Foundation, and Climate Resilience Fund (CRF).

Property Assessed Clean Energy (PACE)
- With reforms, it could become a Property Assessed Resiliency (PAR) program where debt and assets transferred with the property.

Public-Private Partnerships (PPPs)
- PPP projects require long-term commitment and appropriate allocation of risk and, thus, are a fit for some adaptation projects.

Social Impact Bonds
- Investors with longer-term market returns who make payments when targeted social outcomes are achieved.

Special Climate Change Fund (SCCF)
- Designed to finance and execute activities, programs and measures that relate to climate change in generally higher income countries.

Taxes and Fees
- Local governments can establish special resiliency districts that assess taxes or fees. The California Earthquake Authority (CEA) is one model.

Potential Sources of Finance

- The National Disaster Resilience Competition, Department of Housing and Urban Development. (While this BCA is considered a good practice because it focuses on finance loss and return in terms of both future risks and future benefits and is a U.S. government source, its discount rate is likely too short for most projects because it doesn’t reflect the useful project life of 50-100 years).

- The International Financial Stability Board’s Task Force on Climate Related Financial Disclosures is finalizing a yearlong process to, among other things, create measures of climate risk.

- Standard and Poor’s system for “Evaluating the Environmental Impact of Projects Aimed at Adapting to Climate Change.”

1. In the most basic definitions, “adaptation” is when an entity evolves to address changing conditions, while “resiliency” is the ability to bounce back and become stronger in response to changes.

2. Union of Concerned Scientists, Climate Change in the US, the Prohibitive Costs of Inaction The Star-Ledger New Jersey On-Line: “Cuomo: Sandy Cost NY, NYC $32b in Damage and Loss”

Conclusion

In today’s political climate, how can we pull this off? It is key to brand your resilience projects with a positive message (and offering solutions to a catastrophe). Your resilience projects promote safety, security and stability, and you can illuminate how they improve well-being of people, communities and property. Resilient infrastructure serves as a foundation less likely to crumble, flood, catch fire, be inundated, buckle or otherwise fail from the extremes of climate change. Herein lies a future that markets will depend on.

Special thanks to Nick Shafie with JulZack Resilience for collaborating to compile these resources.
Over the past fifty years, development in the rapidly-growing cities of the Arabian Gulf has been based primarily on ‘greenfield’ development. Recently, however, investment is turning towards revitalization of existing urban areas. The drivers for this shift vary, from promoting cultural tourism to developing new models for citizen housing. Overall, the revitalization initiatives provide an opportunity to promote the sustainability and livability of the urban core and have the potential to catalyze a fundamental shift in urban lifestyles.

Downtown Living

Dubbed “The World’s First Sustainable Downtown Regeneration Project,” the Msheireb Downtown Doha project is perhaps one of the first and most obvious examples of a revitalization project in the Middle East. Made possible by significant investment from the Qatari government, this project aims to provide a new model for sustainable, high-end living in Doha and the wider region. Through careful planning and design, the new mixed-use development aims to achieve the highest sustainability performance against international rating standards such as LEED® while remaining authentic to the region’s architectural heritage and culture and accommodating the sometimes-harsh local climate, particularly during the summer.

The project is car-free at surface level thanks to a development-wide basement providing parking and logistics access. Its central location will provide future residents and users with excellent accessibility and maximize their benefit from the upcoming public transport network, a clear advantage over other greenfield ‘sustainable cities’ in the region. Msheireb also aims to offer a more sustainable housing alternative by providing high-end, medium-density apartments as opposed to large detached villas, which are currently norm for subsidized citizen housing in the Gulf.

The first phase of the project is expected to be fully functioning soon and will provide an interesting case study on the impact of sustainable revitalization projects on urban behaviors and lifestyles in the Gulf. Of course, it will then also remain to be seen whether or not the sustainability performance can be replicated at a more affordable cost.

What’s Next?

The above projects are only the beginning. There is yet to be a comprehensive revitalization plan for any city in the region, as most cities are either in the process of developing plans or are focusing on easier greenfield investments. What should a revitalization plan for a Middle East city look like? It should address the challenge of introducing walkability and effective public transport into existing urban cores, especially since most cities have been developed in the era of cheap oil and fascination with the motor car. This will require addressing both the land use mix and the transport network (e.g. road width, availability of shaded pedestrian walkways, integration of bus lanes and potentially rail). Providing accessible and functional public open spaces is another related challenge which could be a primary goal for revitalization projects. Of course, the spatial dimension will require a strong policy framework to assist in changing norms and behaviours, and generating finance for projects.

Large revitalization projects would also be an opportunity to address broad challenges such as city resilience. Whether it is adapting to climate change (e.g. sea level rise) or promoting a collective social identity, there are many fundamental topics to the long-term prosperity of a city which have been side–stepped by the focus on building new. This cannot go on forever. Creating communities where both citizens and expats of various income levels can live and work is possible, as was the case fifty years ago, in many Gulf cities.

Future revitalization plans also need to consider options for avoiding the full displacement of existing residents. This could perhaps be easier undertaken through smaller-scale infill projects, whereby empty or underutilized areas between existing large developments are developed. These projects could provide some of the much-needed open public space and community-scale facilities. Although not strictly an infill project, the Wadi Hanifah project in Riyadh demonstrates the value of a redeveloped natural public open space within a city.

What is stopping this revitalization from happening? For the larger projects, there are the political difficulties of reappropriating land from private owners and negotiating land-use changes. The logistical challenges of construction in an existing area, particularly in an existing busy downtown area, are also a barrier and can lead to theoretically feasible projects becoming “too difficult”. The biggest drawback is probably the availability of cheap, accessible land for new development.
Bus Stops and the Future of Digital Placemaking

The typical urban bus stop is a miserable thing: a piece of metal attached to a pole; a strip of colored paint on a curb; a beaten up shelter. Such bad design is often compounded by locations only a vehicle could love: on lonely medians; next to terrifying off-ramps; along deserted and dimly lit blocks; and in all manner of beaten down, neglected and ignored scraps of urban space.

Transit Agencies in the Public Realm

Some agencies don’t care because it’s not their assigned role: most agencies just operate transit services and have no requirement to take care of the streets as well. Or perhaps they believe their job ends at the door of the transit vehicle, so they shouldn’t need to care about the places nearby. Other agencies feel they simply can’t care: their efforts and budgets are consumed in pulling together halfway-decent transit service.

To them, the idea of thinking deeply about the transit agencies’ role in the public realm is an impossible luxury. Either way, this is tragic: agencies have more discrete points of potential influence on public space than almost any other city, state or federal agency. Not making use of that influence is a luxury few cities can afford.

We believe there is much agencies can do, once they realize that placemaking is something they should and can care about.

Should, because otherwise agencies are leaving their accessibility mission half done; there are no great places, and indeed places have no value to us, without a way to access them. Transit agencies must acknowledge they are already inextricably tied to place. Public transit itself is public space. Every origin and destination of any transit network exists in physical space, in or connected to communities of people. Even the vehicles themselves are public spaces. Transit agencies, as part of the public realm, have an obligation to make that space better. Better, meaning friendlier, and more useful to people. A sad bus stop, waiting area and curb as part of a bus stop, waiting area and curb as part of a transit system.

Digital tools are often limited to a public engagement role in placemaking. We believe that they can play an important role in transit agency efforts to make its physical infrastructure work better for people. Here’s why:

Digital Placemaking is Lightweight

You can digitally placemake with the tools your agency already has. A website or mobile app, a data feed, digital signage, third party apps, all can be repurposed to placemake.

As two officials of a distressed public agency facing down the consequences of a long history of underinvestment, we are acutely sensitive to the need to get things done on a budget. We are also technologists, which brings us to the idea and potential of digital placemaking for mobility infrastructure: the repurposing of web, mobile and other software and hardware tools to bring new value to the places around the physical nodes and artifacts of the transit system.

Digital Placemaking is Fast

You can prototype a placemaking initiative in a web app in a day. With digital mapping or augmented reality, there may even be no direct physical connection to any hardware.

Digital Placemaking is Cheap

Physical things and top-down planning cost time and money to prepare and install. Software isn’t free to develop either, but it’s certainly faster and easier and therefore cheaper to experiment with a digital product. We already work in a beta-first, prototyping mindset: doing so for placemaking purposes is a natural extension.

Digital Placemaking is Versatile

There’s an app for almost every conceivable need on the world’s app stores. We can turn a digital tool to almost any placemaking need: creating community, providing access to activities, provide opportunities for fun and rest, and giving a unique digital badge to every neighborhood.

While we’re working on mostly software products, all our software is focused on making the experience of the physical system better. It’s a short step from there to thinking about the experience of place that our riders have. Perhaps most importantly, digital placemaking for mobility is an easy entry point for transit agencies that are uncomfortable with or unwilling to extend investment into the physical environments and communities around their infrastructure. For a transit agency without the budget or the remit, it’s impossible to argue for hundreds of thousands of dollars to revamp a bus stop, waiting area and curb as part of a placemaking initiative. It’s a lot more possible to deploy a digital presence at that bus stop, such as through an augmented reality app, in a way that meets...
an important service need. Perhaps the app is primarily about orienting the rider to which services are coming next, but it could also work harder to place-make by communicating directions to the nearest barber shop, how to get to City Hall, or even layer on historical context to a view of the street.

What We’re Doing at the MBTA

As technology specialists at the MBTA, it’s not strictly in our remit to get involved in traditional placemaking. Nonetheless, that’s exactly what we’re doing with some of our ongoing projects:

PATI
Before our time, our System Wide Accessibility group, led by Laura Brelsford, initiated the Plan for Accessible Transportation Infrastructure (affectionately known as PATI). PATI involves the intense surveying of all the MBTA bus stops and nearby places, including measurement, pictures, and professional judgement on the accessibility of stops to the public, and particularly to those of our customers with additional accessibility needs. The effort has been mammoth, and is leading to all sorts of projects, from reinvesting in the physical infrastructure of key stops, to removing stops that are unused and unusable, to updating the locations of our stops in our open data platforms for where they actually are, to collecting contextual clues for Blindways to help people with visual impairments find a bus stop.

Beacons
In Watertown and Cambridge, we’re partnering with the Perkins School for the Blind to augment the Perkins Blindways app. We’ve installed bluetooth beacons on two bus lines, and are integrating them with BlindWays, which is already a fantastic tool for layering on rich contextual directions to app-based navigation. This integration lets the user know how close they are to a bus stop. Not only is this good for transit ridership (more accessible stops means more riders carried), it also makes the street environment around our bus stops a little bit more friendly, a little bit safer, and a good deal more useful for people. If it works the way we hope it will, we’ll be able to expand this initiative across the system. And we’re building it as an open platform first; once we get traction, we plan to open up the SDK so that all developers can use these beacons.

What might digitally connected citizens do with them? We imagine that they’ll:

• Make accessibility the default standard in all apps
• Improve geolocation and findability of bus stops
• Trigger local notifications about community meetings or block parties
• Send back estimates of how many people are waiting and for how long
• Find uses that we haven’t even thought of yet

Digital signs
We’re exploring the deployment of e-ink displays at oathing green line stations and bus stops around the network. While we can install real-time displays of bus arrivals information in some larger shelters, the ubiquitous pole-and-sign combo presents more challenges. The cost of installing digital signage is not in the signs themselves, it is in the civil work to get power and communications to a far flung site. e-Ink is lower cost and potentially more durable than other screen technologies, and can open up a world of displayable content for a bus stop. Remember, we have 8,000 bus stops: imagine a screen at your stop, providing not only useful onward journey information but also community-generated content to make you look up, around and into the local neighborhood.

What’s Next for the MBTA

We’re just getting started. For us, placemaking is not our core objective, but we’ve come to see that placemaking is as much the point of what we do as our broader efforts to improve the transportation experience. We can’t pour as much concrete as our city partners who own the streets and most of the bus stops, or even other departments at the T. But with the right tools, we can offer a digital presence almost everywhere, at very low cost, to help make our cities places worth living in.

How can you help? Spread the word in your city. Tell your elected officials and all your friends that we need to invest in infrastructure and technology at the same time. And, if you’re a technologist, come join our team.

Why Write for the Meeting of the Minds Blog?

Our blog is a collection of articles written by busy professionals working in a fast-paced industry. We know that you have a lot on your calendar, and that committing to write for the Meeting of the Minds Blog is a big ask.

So why should you spend time on this?

Reach Influential Decision Makers

Our audience is a lot like you — working professionals interested in wonky, detailed descriptions of ideas and projects happening in the urban sustainability and smart cities industry. They are executive and senior level leaders interested in staying up-to-date with the newest innovations in the industry, and looking for the “big picture.”

Third-party Validation

Our mission at Meeting of the Minds is to connect people and ideas working at the leading edge of urban sustainability, in order to catalyze positive change in cities worldwide. There is a community of people looking to us to find and spotlight the trends and innovations happening in this space, and our blog is your opportunity to present your thoughts to this community — backed by the validation of our platform.

Editorial Assistance

When you sit down to write for the Meeting of the Minds Blog, you are not alone. We have dedicated staff to help you craft your message. From basic things, like fixing typos, to larger issues of tone and substance, we are here to help.

Promotion

Your article will be emailed to the 25,000+ people on our email list. It will be deployed on all of our social media channels, and re-deployed on our social media feeds at regular intervals for the next two years. Your article will be archived on all of the major search engines, and may even rank on the first page of search queries related to your topic.
Transportation Communications

No One Told Me It Would Be This Hard

By Joseph Barr

That headline might sound like the cry of an engineer who is being forced to speak at a public meeting, but it’s really about how we get vehicles, sensors, and other devices to communicate with each other and eventually, to communicate with people.

As the leader of a transportation agency, there is no shortage of people ready to tell me how technology is going to revolutionize the way we do business. Autonomous vehicles, on-demand sensors, drone-based package delivery, solar-powered roads, road-straddling super-buses (that one turned out to be a bust); it’s a veritable cornucopia of real and not-so-real revolutions. And within that world of technophiles, there’s a subset waiting to tell me (and you) about how wireless communications will underlie and enable all of those revolutions to our transportation systems. As with so many things in life, they’re totally right, and yet it’s so much more complicated.

Why Communications Matter

As we look at a world of smart cities, internets of things, on-demand customer expectations, and real-time transactions, communications obviously matter. In the transportation world, we’ve known this for a long time (for example, traffic signals generally work better when they can talk to other traffic signals), but we haven’t always recognized the power of the network or the multiplier effect that can result. Looking more deeply, it is becoming clear that there are many reasons why the ability to communicate throughout our transportation system is absolutely critical.

Customer Expectations

From ridehailing apps, to travel time displays on highways, to tracking the delivery status of your package, our customers have become accustomed to a world where all types of information and functionality is at their fingertips, all the time. Twelve years ago, the idea that you could find out on your phone when your bus was going to arrive was mostly a fantasy; six years ago it was an interesting novelty offered by more advanced public transit agencies. These days, if you can’t tell me precisely when my bus is going to arrive then you might as well not bother pulling it out of the garage in the morning. In the world of municipal transportation, we are making progress in things like parking payments and traveler information, but progress is still slow and somewhat haphazard.

Operational Effectiveness

Communications (and technology in general) has the potential to improve our operations; making us more efficient, allowing us to do our job better, and saving us money. Tracking snow plows in real time not only allows us to better supervise the work that is being done, it also allows us to tell customers when their street was last plowed and make sure that private plowing contractors are billing accurately for their work. While that may not sound very exciting, it can be extremely valuable (and it gives you something to do) when you’re a resident stuck inside in the middle of a Nor’easter.

Safety

In 2016, Cambridge (like many progressive cities around the country) made a commitment to Vision Zero and eliminating traffic fatalities and serious injuries. Although achieving Vision Zero will require a wide range of multi-disciplinary activities, improved communications technologies has the potential to enable many of them. These could range from simple things like providing maintenance staff with real-time, detailed information about the roadway safety defects they are being asked to fix (while being careful not to distract them from their driving); to more complex improvements such as sensor-equipped, automated streetlights at crosswalks that get brighter when they detect pedestrians waiting to cross, to make people more visible to passing traffic.

Why Communications are Hard (and Expensive)

Getting back to the headline of this article: while it’s clear that the future success of transportation will increasingly depend on our ability to deploy, manage, and effectively use a range of
new and emerging communications technology, it’s not as easy as it looks. At the municipal level, it’s hard enough to find and retain the technical knowledge we need to properly manage our transportation networks, much less expand our capabilities to include dealing with all of the new technologies that are coming at us (and if you’ve ever watched an engineer struggle to set up a presentation projector, you know what I mean). At the same time, we are often trying to integrate legacy and newly deployed systems (neither of which are always well understood by users), a range of potential communications technologies (that are, again, not always well understood), and customer needs that are always evolving (and also not particularly well understood—do you see a theme here?). Finally, communications costs money (and potentially lots of it). Whether we own and maintain the networks ourselves or whether we use third-party networks, there are significant capital and operating costs, and those operating costs don’t go away. What really scares me (financially) is the thought of tens of thousands of smart cities devices out there “at the edge” doing great things, but each with its own little $20/month cell phone plan.

Mini Case Study: Pay-by-Phone in Harvard Square

As an example, let’s look at Cambridge’s recent deployment of a pay-by-phone system pilot in Harvard Square. From the customer side, this seems like a simple initiative: you download an app, fill in your customer information (name, license plate, credit card), and you’re ready to go. But on our side, there’s much more going on. From a pure communications and technology perspective, we had a very challenging integration between two vendors: Passport Parking, which provides the pay-by-phone system; and Conduent, which provides our Parking Management Information System (which still runs partially on a mainframe) and manages our Motorola handheld ticketing computers (which use a fairly ancient version of Windows Pocket Edition). We also had to activate wireless data communications on those handheld computers, which costs tens of thousands of dollars per year. Don’t get me wrong: this is a great benefit to our customers and it is clearly the right thing to do, but it’s equally clear that we have to think carefully about the cost and complexity of the initiatives, so we can make the right strategic investments that truly benefit our customers, our operations, and the safety of our communities.

What We’re Doing in Cambridge

Although Cambridge (like almost every other city) is in the early stages of figuring out the best applications for technology, there are a few examples of things we’re doing that might be of value to others.

We’re Improving Coordination

Cambridge is a very collaborative municipality, but figuring out communications in a municipal environment requires even tighter coordination. We can work even harder to take advantage of network effects and avoid missed opportunities. Although our E-Gov IT governance process can feel a little bureaucratic at times, it provides a venue for making sure that coordination occurs, and for identifying the resources that will likely be required to implement projects.

We’re Deploying Internal Tools

There are some great tools out there for things like asset management, work order management, and project management; all of which get even better when we connect them together in real time. Many of our current initiatives are focused in that area, not only because it helps to make our operations better, but also because when implementation doesn’t go totally smoothly and we need to work out the bugs, it’s not on public display.

We’re Getting Connected

On the transportation side, we are working to create a communications network to support our operational needs, particularly for our traffic signals. And we are taking an “all of the above” approach that involves a combination of fiber, microwave, mesh, cellular, and potentially other networks to make those connections. In assembling this network, we are also trying to anticipate and accommodate potential future needs, but without becoming so paralyzed by those future unknowns that we aren’t able to move forward.

What Comes Next

There are a number of potential steps we need to be working on to ensure that we have the right communications approaches in place, and that we actually use them the right way.

Partnerships Between Sectors

Communications technology creates new and interesting opportunities for partnerships, and not just the type where the public sector gets a ride by the private sector. In this case, the public sector controls assets (right-of-way, streetlight poles, traffic signals) that may be useful to other sectors. In addition, there are new partnerships emerging in response to new needs. For example, the municipal utility in Stratford, Ontario is leveraging a network it built out to support the installation of smart electricity meters, to provide broadband access that may eventually grow into a communications backbone for transportation. This is also a good example of a government mandate (to install those smart electricity meters) creating unexpected co-benefits.

Build the Expertise the Right Way

It’s no longer considered particularly brilliant to point out that government agencies need new skill sets to address technology challenges. But as the ad for Huntington Learning Centers reminds us, “saying it and doing it are two different things.” The technology experts we hire need to also be experts in analyzing, questioning, and improving our business processes, both to address technology and communications, but also to reflect industry best practices. In Cambridge, many of our departments are setting out to hire business analysts who can lead their technology initiatives while also helping to generally improve how they operate. As this expertise becomes dispersed around City government, we become both less dependent on our IT department, and better able to work with the IT department when we need to.

Unlock your city’s potential

At Deloitte, we see cities not as they are, but as they could be. We look forward and seek bold ideas while dreaming big. We team with city leaders to identify and tackle problems that others think are impossible to solve—helping usher cities into the future.

To learn more about Smart Cities, visit smartcity.deloitte.com.

In Summary

While communications are absolutely critical, they are also more difficult than you might think, or than others might lead you to believe. But since the world doesn’t stand still, we all need to move forward and try to tackle this issue. My advice is to start with a problem you really want to solve, build some expertise, and grow from there. And if anyone tells you they have this all figured out, they’re either lying to you, or lying to themselves.

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