

WHAT'S NEXT?

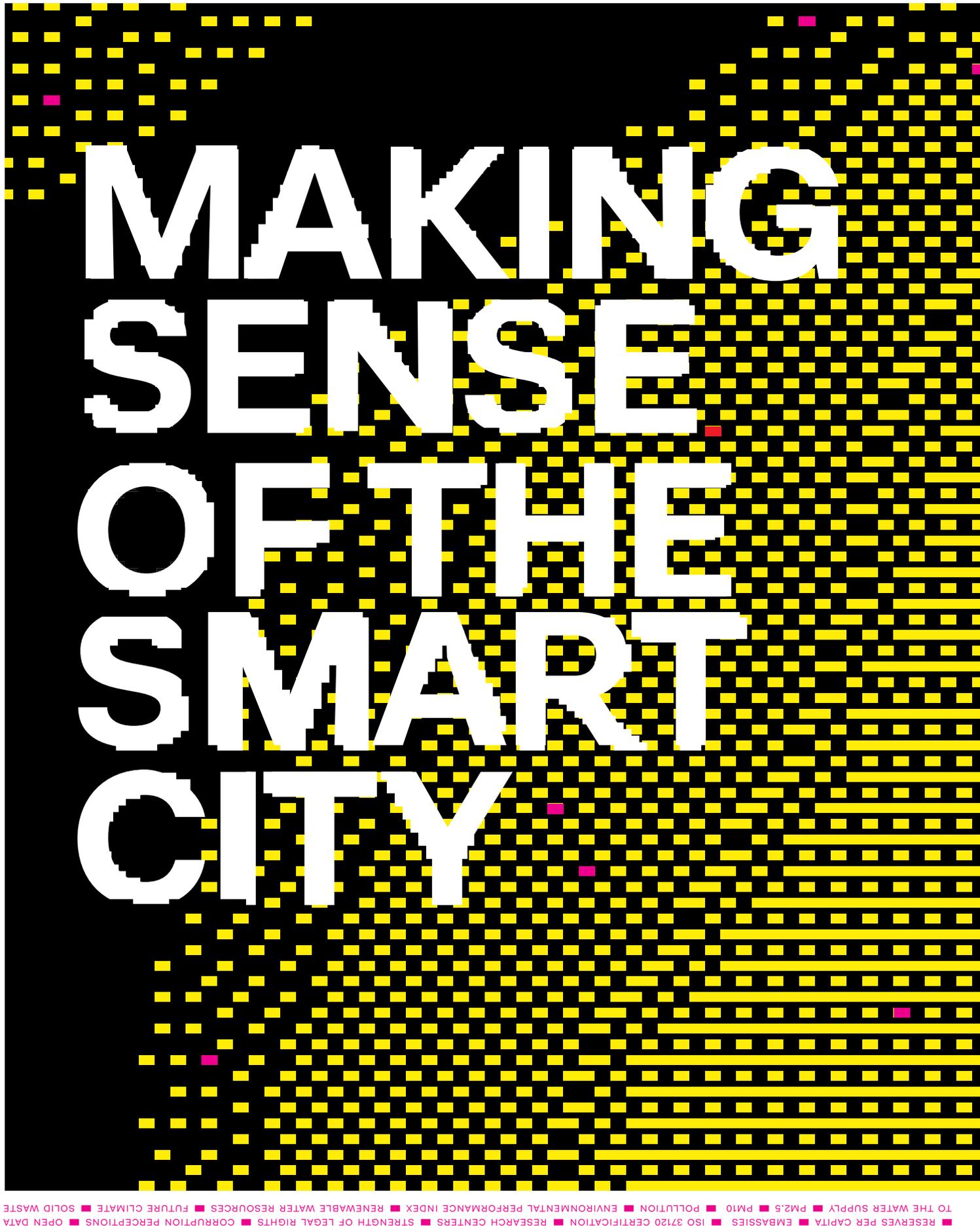
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**MAKING  
SENSE  
OF THE  
SMART  
CITY**



THE UNIVERSITY OF NAVARRRE IESE BUSINESS SCHOOL'S ANNUAL CITIES IN MOTION INDEX USES 83 CRITERIA TO JUDGE A CITY'S "SMARTNESS": ■ HIGHER EDUCATION ■ MORTALITY ■ CRIME RATE ■ HEALTH ■ UNEMPLOYMENT ■ GINI INDEX ■ PRICE OF PROPERTY ■ FEMALE WORKERS ■ GLOBAL PEACE INDEX ■ HOSPITALS ■ HAPPINESS

TRAFFIC INDEX ■ INEFFICIENCY INDEX ■ INDEX OF TRAFFIC FOR COMMUTING TO WORK ■ BIKE SHARING ■ METRO LENGTH ■ METRO STATIONS ■ FLIGHTS ■ GAS STATIONS ■ HIGH-SPEED TRAIN ■ BICYCLES FOR RENT ■ PERCENTAGE OF THE POPULATION WITH ACCESS TO SANITATION FACILITIES ■ NUMBER OF PEOPLE PER HOUSEHOLD ■ HIGH-RISE BUILDINGS ■ BUILDINGS ■ MCDONALD'S ■ AIRPORTS ■ NUMBER OF PASSENGERS PER AIRPORT ■ SIGHTSMAP ■ NUMBER OF CONFERENCES AND MEETINGS ■ HOTELS ■ TWITTER ■ LINKEDIN ■ FACEBOOK ■ MOBILE PHONES ■ WI-FI HOT SPOT ■ APPLE STORE ■ INNOVATION INDEX ■ LANDLINE SUBSCRIPTIONS ■ BROADBAND SUBSCRIPTIONS ■ INTERNET ■ MOBILE TELEPHONY ■



RESERVES PER CAPITA ■ EMBASSIES ■ ISO 37120 CERTIFICATION ■ RESEARCH CENTERS ■ ENVIRONMENTAL PERFORMANCE INDEX ■ RENEWABLE WATER RESOURCES ■ STRENGTH OF LEGAL RIGHTS ■ CORRUPTION PERCEPTIONS ■ OPEN DATA ■ TO THE WATER SUPPLY ■ PM2.5 ■ PM10 ■ POLLUTION ■ RESEARCH CENTERS ■ ENVIRONMENTAL PERFORMANCE INDEX ■ RENEWABLE WATER RESOURCES ■ FUTURE CLIMATE ■ SOLID WASTE

**What is a Smart City?** Since the concept gained widespread prominence in the aughts, its definition has been ever-evolving—and elusive. That’s in no small part because of the staggering pace at which technology has developed: Broadband was cutting edge at the turn of the century while today we live in an age of big data and the internet of things. In its 2018 report, “Smart Cities: Digital Solutions for a More Livable Future,” McKinsey Global Institute defines smart cities as **places that “put data and digital technology to work with the goal of improving the quality of life.”** Imagine countless sensors tracking building performance, traffic conditions, city services, and citizen and pedestrian preferences, creating an endless stream of information that can help make urban living more productive, cost-effective, and sustainable.

**At least that’s the utopian vision.** Very few ground-up projects have actually been built, and the ones that have, for the most part, have fallen well short of those ambitious aims. Consider Songdo, in South Korea, which sports serious technological efficiencies but has been disparaged by critics as characterless. **What makes a city smart can’t be defined solely by its tech.** How do you measure a city’s soul, the kind of urbanism that Jane Jacobs espoused, with lively neighborhoods and sidewalks and gathering places that encourage serendipitous encounters among its residents?

At a 2014 European Union conference about smart cities in Brussels, Rem Koolhaas, HON. FAIA, took the stage after several gurus had already presented. **“I had a sinking feeling as I was listening to the talks by these prominent figures in the field of smart cities because the city used to be the domain of the architect, and now, frankly, they have made it their domain.** This transfer of authority has been achieved in a clever way by calling their city smart—and by calling it smart, our city”—i.e., the city of the architect—“is condemned to being stupid.” He continued: “Because the smart city movement has been apolitical in its declarations, we also have to ask about the politics behind the improvements on offer.” Caveat emptor.

Mega-corporations such as GE, Intel, and AT&T have been charging headlong into the arena, and no wonder: A March 2018 report estimated that **the smart city market will grow to \$2.57 trillion by 2025. Will their visions verge more on utopia or dystopia?** The rise of a certain type of smart city—let’s call it the sensor city—could certainly be a formula for cleanliness and efficiency, but it could also lead to an exacerbation of inequality, expansion of state and corporate surveillance, and further erosion of privacy. **Engaged citizens are pushing back,** lobbying for a more inclusive, ground-up approach to the integration of technology with city building and management—one that respects individual rights, civic life, and the public purse.

Given that the majority of the world’s population now lives in urban areas, **how the smart city movement evolves will have untold significance for how we will live in the not-so-distant future.** In the following pages, as explored in case studies, a debate between leading visionaries, and other stories, we attempt to separate hype from reality, and demonstrate the key roles architects can play in this promising but ill-defined, and potentially even nefarious, landscape.



**Union Point,  
Weymouth, Mass.**

What is a Smart City?

# Marketing Spin

A massive mixed-use development near Boston was championed as a cutting-edge smart city. The reality has proven to be far different.

TEXT BY KARRIE JACOBS

PHOTOS BY TOM MCMAHON



The rendering, by the Boston-based Elkus Manfredi Architects, shows a pleasing little city in the woods. It's a dense, amoeba-shaped cluster of mid-rise buildings, some sporting green roofs or expansive photovoltaic arrays. Maybe it isn't the most radical architectural vision, but it's a solid, forward-looking, optimistic one. The project is called Union Point, planned for what was once the South Weymouth Naval Air Station. During World War II, the base housed a fleet of blimps that patrolled the East Coast for German U-boats; like many such bases, it was decommissioned in the 1990s. More recently, for the past year or so, it's been repositioned as a smart city.

LStar Ventures, a Raleigh, N.C.-based developer that acquired the 1,500-acre site in 2015, aspires to attract technology firms and their employees to Union Point, where self-driving cars will rule the roads and residents can hack their lives with a series of apps. Or, as David P. Manfredi, FAIA, put it in a blog post more than a year ago (Elkus Manfredi drafted the master plan with Sasaki), Union Point will be "a connected urban environment that integrates multiple information and communication technologies to manage a city's assets, improve the efficiency of services, and meet residents' needs."

Every city lately, it seems, aspires to be smarter. Tech firms almost universally are eager to install sensors to collect every bit of data city dwellers generate as they go about their lives. They want to use that information for efficiencies large and small, to distribute electricity more effectively or monitor the availability of treadmills at the gym (a convenience touted by the developers of New York's Hudson Yards). Everyone feels compelled to optimize everything.

Most smart city projects in the U.S. involve retrofitting existing cities: setting up an energy-efficient electric grid in Boulder, Colo., or helping drivers find parking spaces in San Francisco. Smart cities built from the ground up tend to be in Asia or the Middle East, and when they are located here, such as the Bill Gates-backed Belmont outside of Phoenix, they tend to involve remote sites in the desert southwest. So it was a welcome surprise to discover that someone was planning to build a 21st-century city, from the ground up, on the stodgy East Coast. Once I got beyond the renderings, however, I soon realized that Union Point was more a case study in smart city hype outpacing reality.

### "Being the Future"

Unlike a lot of schemes that never get past the clickbait phase, Union Point, at first glance, is entirely logical. It's in greater Boston, home to MIT

and Route 128, a ring road that has become Silicon Valley East. Route 128 doesn't extend all the way to Weymouth, a blue-collar town about 12 miles south of center city, population 55,664, which saw its last major growth spurt when school desegregation plans in Boston in the 1960s and '70s triggered white flight. But that was the beauty of the Union Point plan: It promised to transfuse some MIT-inspired luster into Weymouth. As LStar's website puts it: "Union Point is where artful design meets green living, where the landscape inspires human potential, where life itself feels expansive." The website artfully blends renderings showing a lively pedestrian-oriented commercial district and photos of existing homes, the sort of faux-historic cottages that are common to New Urbanist influenced developments, as well as some unremarkable apartment complexes. "What makes Union Point distinctive? Urban technology partners, such as GE, Arup, and Optimus Ride, are working with our developers to build in resilient energy systems, sustainable design, and fuel-free transportation alternatives. Energy efficiency translates into cost savings and consumer approval. That's not getting ready for the future—that's being the future."

By the time I called Mayor Robert Hedlund of Weymouth in mid-November, reality had already intruded on that breathless sales pitch. About two months earlier, LStar had filed suit against Kyle Corkum, one of the company's own managing partners and the person directly in charge of Union Point. The mayor himself had just entered into the fray. "I just shut their water off," he told me—or at least he had on paper.

And so I drove up from New York to try and understand how the project had come undone. Union Point, accessible via a gateway decorated by a Navy jet mounted like a hood ornament, isn't especially smart. As it stands now, it's a somewhat disorganized cluster of residential subdivisions, with 1,200 units built so far out of a proposed 4,000. They were constructed by your standard production home builders, such as Pulte and Stonebridge, and sit tightly spaced, a nod to one of the most developer-friendly ideas from New Urbanism: smaller lot size. There are areas with narrow streets abutting town greens, and other areas with cul de sacs. One street is lined with triplex McMansions—three connected housing units, each with its own street-facing front door, and three shockingly wide garages. There are also a number of apartment complexes; the slickest is called the Mastlight, named for the beacon that used to guide the Navy's blimps home. It had a prominently placed bike rack out front, with a single bike-share bike docked there, and a strategically

positioned row of red Adirondack chairs that seemed like a beacon to lure young, hip tenants.

As for all that street life shown in the renderings, not to mention the green-roofed office complexes? Those have yet to materialize. The day I visited was cold and rainy, but still, there isn't really anywhere for pedestrians to go. The only occupied storefront is a bank. Even the recreation center, a massive white bubble that's become a destination for area sports teams, lacks a concession stand. "You have to drive 2 miles out of there just to get a Gatorade," notes Jessica Trufant, a reporter for the local paper, *The Patriot Ledger*, who's been meticulously tracking the development's progress.

The Union Point I discovered on the ground doesn't have much in common with the glittering city depicted in the renderings, which maybe shouldn't come as a surprise. LStar, since its founding in 2007, has done a solid business building and managing typical, somewhat upscale, planned communities, McMansions adjacent to golf courses. Managing partner Corkum told *The Boston Globe* that the company had "extensive experience building 'charming New England villages'" in places that were not New England, mostly in the south and southwest. The implication was that they'd be great at building a New England village on a site that was actually in New England.

Initially, things went well. Early news stories were largely positive. Corkum charmed the community by setting up a miniature version of Fenway Park for local children and turned part of the property into a backlot where filmmakers shot the finish line scenes in *Patriots Day*, the 2017 Peter Berg-directed movie about the Boston Marathon bombings. But then, as Corkum told me, community residents he met with convinced him they didn't want just another subdivision. They wanted something more like a city. "They were pretty adamant about it," he said. So the local governments rewrote the enabling legislation to remove zoning restrictions and give LStar a more flexible timetable.

Soon thereafter, Corkum's vision for the site began, much like a blimp, to inflate: At a Weymouth town council meeting in August 2015, according to a report published in *Boston Business Journal*, Corkum touted a "100-acre 'Discovery District' dedicated for up to 2 million square feet of office space for life sciences, biotech, technology, pharmaceutical research and R&D companies." He claimed that LStar was in negotiations with four companies that wanted to relocate their headquarters to the development. He promised the "town center would include up to 1 million square feet of commercial development; 1,941 luxury apartments,



Corkum went on an elevator ride with his architect to the loftier precincts of urban planning, absorbed the latest buzzwords, and won over the public, at least initially.



Existing residential development at Union Point, including the Mastlight and the aircraft hangar (right)

townhomes and condominiums; and 150,000 square feet of retail.” He claimed that “LStar [was] in negotiations for a 10,000-seat professional soccer and lacrosse stadium.” He promised a hockey rink, a movie theater, and grocery store. “These are all real things on the shelf right now that are being considered,” Corkum said.

### Like the Emerald City

More than three years later, those things—unless you count the sports fields as a stadium—have yet to materialize. A few days before Thanksgiving, I met with Mayor Hedlund and his director of planning and community development, Robert J. Luongo. We sat at a long table in the mayor’s office in a handsome 1928 town hall, a replica of Boston’s Old State House. The office had been newly decorated for the holidays by the

local garden club, whose members showed up, mid-interview, to have their pictures taken with the mayor.

Hedlund, who took office in 2016, after LStar had arrived, refers to Corkum as a “visionary,” framing the word with air quotes. He doesn’t have an issue with the smart city concept per se, although, as Luongo observed, “It’s a little scary when you look at [the renderings]. It almost looks like the Emerald City.” It’s just that they expected something more straightforward from the development. “Weymouth lacks a real downtown,” Hedlund told me. “The hope was that this would be our downtown eventually. This will be an entertainment center for the town, a commercial center for the town. ... The problem is to have a smart city you actually have to have a city, and not just a bunch of tumbleweeds flying down the old airstrip.”

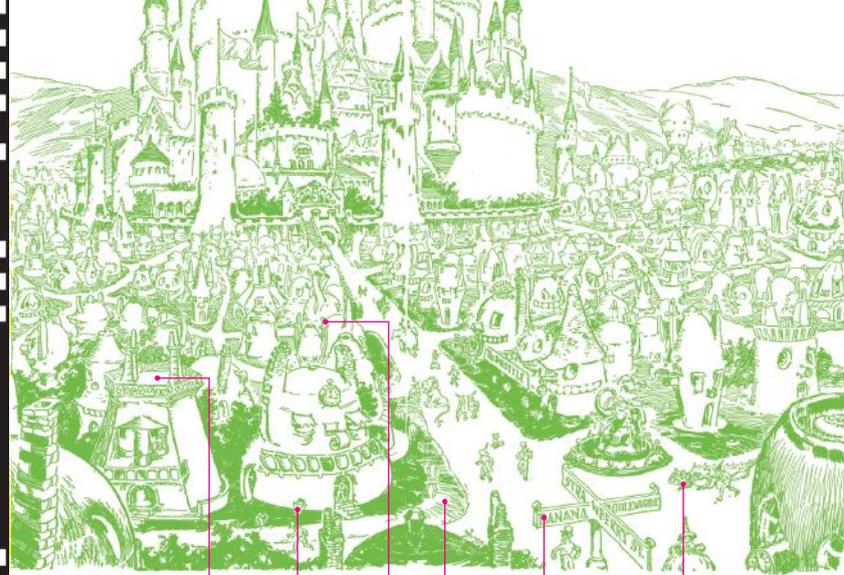
I asked whether the smart city vision had emerged from a planning process that included members of the surrounding communities or public officials like Hedlund. The mayor didn't think so. "It was more like Kyle would come here and wow us and take out the boards and overwhelm you," he said. "He latched on to this whole smart city concept," Hedlund continued. "There were all these high-tech elements. He talked about, in different presentations, heated sidewalks and autonomous vehicles picking up trash."

Which brings us to the water shutdown. The mayor's maneuver, which he hopes will help force LStar out of the project, didn't cut off the supply to those residents already living at the site. Rather, as Hedlund explained, LStar "had to bring in a dedicated water source. Long-term build out, we don't have enough supply. So in that long-term agreement we negotiated with them, they have a five-year timeline. ... They had a year to identify the source, feasibility. Another year to design it and another three years to actually build it. They're behind the time-line which gives me the ability to end the deal."

As a result, LStar no longer has a source of water to offer to subdevelopers who might want to buy into the project. There was also a similar arrangement with sewage: The town would handle it up to a point, and then the developer would have to supply its own infrastructure. LStar hasn't yet, nor did it seem interested in ordinary sewers, only smart ones. When asked about waste management, "Corkum would come in and say, 'We're going to put these pods all over the site that are like small waste pods that create energy,'" recalls Trufant, who identifies the overreach as an example of the larger problem: "There's self-driving cars out there, but not the basic things."

Compare that to how Manfredi outlined the project's infrastructure in his blog post: "The multinational professional services firm, Arup, has built a complementary and scalable infrastructure master plan to address Union Point's zero-carbon future and guide the stewardship of its natural water and energy resources. Solar collectors and heat pumps will be part of the power system. Storage batteries will save electric power for future uses, and streets will be designed for pedestrians and bicyclists, as well as our vehicular (autonomous) car future. At least 90% of the roofs without mechanical function, such as solar collection sites, will be green, planted to provide garden spaces that reduce heat-island effects and address storm water runoff, graywater re-use, and green wastewater treatment solutions."

Manfredi's message is clear: if you're serious about building a smart city, you're making a commitment



## Elements of a Smart City

### 1. Solar panels

The smart city is nothing if not green, and ideally net-zero or net-positive. Photovoltaic panels provide renewable energy, alongside wind turbines and other sources.

### 2. Trash bins

Fill-level sensors on smart trash and recycling cans transmit information to waste services in order to optimize collection routes.

### 3. Wi-Fi and 5G

Public Wi-Fi and superfast 5G networks enable connected devices to communicate and transmit data without a hitch.

### 4. Pavers

Smart pavers are equipped with a data transmitter and generate electricity from the kinetic energy of footsteps. Embedded lights allow road markings to change in a flash.

### 5. Streetlights

The Swiss army knife of smart city technology, a typical streetlight will incorporate devices such as surveillance cameras, sensors collecting data on traffic patterns, and gunshot detection systems that analyze audio signals to triangulate the location of gunfire and notify law enforcement.

### 6. Autonomous vehicles

The self-driving vehicle is the sine qua non of the smart city. Though there isn't anything particularly smart about an urban center jammed with cars—autonomous or not—many smart city projects have been quick to embrace autonomous vehicles. Mass transit, in the form of self-driving buses and shuttles, could help reduce congestion, carbon emissions, and human error-related collisions.

While the technology may seem like a *Jetsons*-esque fantasy, it is in fact becoming a reality. Since March 2018, commuters in Neuhausen am Rheinfall, Switzerland, have been able to travel on the electric-powered, self-driving Trapizio bus as part of an initiative launched by the Swiss Transit Lab. Last summer, Chinese tech company Baidu announced the production of its 100th 14-person autonomous minibus. (In October, Baidu signed a two-year agreement to test autonomous vehicles for the Ford Motor Co.) Meanwhile, the U.K. is investing approximately \$32 million in three trials with the promise of self-driving public transit by 2021. And Austin, Texas, is now home to what is being billed as the nation's "largest autonomous bus pilot program." This summer, the city tested six electric 15-passenger buses with plans for a second phase of trials that will include passengers.

—KATHARINE KEANE

to invest heavily in infrastructure. You're not just going to have a reliable water supply and effective waste treatment, but you're going to have the most sophisticated water distribution and waste treatment possible. In other words, the whole smart city concept is a sham unless there's infrastructure to support it. Or, as Hedlund frames it: "On one hand we've got Dubai here on the boards, and [then on the other] he's trying to get a water loop in for a fire hydrant or a curb cut in the right place. It's kind of funny."

### A Metaphorical Elevator Ride

Corkum insists that the requisite infrastructure deals had all been worked out, that the systems would have been in place within three or four years. He attributes the dissatisfaction of local officials to "naiveté" about how long these things take. Yet it's also clear that Corkum had never tackled a project of this complexity before. The term "smart city" wasn't even in his vocabulary until he began working with Elkus Manfredi (the firm declined to comment for this story). Of Howard Elkus, one of the firm's partners, now deceased, Corkum says, "Oh my god, he was like a second father." Corkum told me how Elkus had taken him on a metaphorical elevator ride to higher and higher levels and, over time, had introduced him to more and more exalted concepts, things like sustainability and the triple bottom line. With each ascent, the plan grew in its sophistication. "One day, someone on [Elkus'] team said, 'What you're doing is a smart city,'" Corkum recalls. "I had to look it up. I had no clue, and I got super excited. I said, 'Oh yeah. Technology!'"

And that was before Amazon entered the picture. In September 2017, a series of articles announced that Union Point, like 200 other cities, had joined the headquarters sweepstakes for the mega-retailer, proposing to build the company's \$5 billion home base. In an interview with *The Patriot Ledger*, Corkum said, "When you go down their list, everything they're asking for is here. A hundred acres, 8,000,000 square feet, mass transit, tech friendly and sustainable, that's Union Point."

The first news story featuring the futuristic Elkus Manfredi renderings appeared a few weeks later, when HuffPost trumpeted, "They're Building the Sustainable Urban Future Near Boston." From there, the rhetoric only escalated: There were announcements that a company called Optimus would be testing its self-driving cars at the complex (true) and that GE would become a partner to the development in the way that Cisco partnered with New Songdo in Korea (difficult to confirm). The most

impressive commitment, though, was from a Dutch robotics company called Prodrive that planned to build its U.S. manufacturing facility there on land donated by the developer (also true).

But within a year, the blimp had deflated. Corkum's version: The trouble began with the lender. LStar had to borrow tens of millions of dollars to execute a project more ambitious than any it had previously undertaken. Suddenly the bank balked. Corkum says his partners sided with the bank and said, "We should bail on as much of the vision as we have to make them happy." When Corkum refused, he says that they mounted a "smear campaign" in the form of the lawsuit.

That suit was filed in a North Carolina Superior Court in September by Steven Vining, formerly Corkum's business partner and now, since Corkum has been removed from his position, the "sole manager and member of LStar." It tells a different story. In a copy originally obtained by *The Patriot Ledger*, it's alleged that "Corkum not only mismanaged the project for which he was responsible but converted to his personal use or otherwise fraudulently obtained more than two million dollars of Plaintiff's money." The suit is a litany of bewilderingly unorthodox transactions and alleges, among other things, that "under Corkum's management, no budget or written business plan was ever prepared for the Union Point project," and also that Corkum's management of the project left LStar "\$70 million in debt." Corkum recently filed a counter suit, claiming that LStar executives defaulted on a \$2.5 million loan specifically to cause Corkum "financial ruin and damage to his reputation in the development industry."

All of which leaves South Weymouth in an unfortunate bind. "This town's clamoring for a branded hotel," Mayor Hedlund told me. "We know that a hotel isn't going to go in and plant their flag in a wasteland, but there are 23 liquor licenses up there. We're in the middle of a housing boom. We're in the middle of an economic boom. ... There have been inquiries made and lack of follow through. There are three potential developers now who have come to us and said, 'We've been trying to get in there for two years.' There was this disconnect. I don't know why, but there was. If in the middle of this boom you don't have one groundbreaking in all of 2018, there's a problem."

When I met him in November, Hedlund took some comfort from the fact that the site's one announced commercial tenant, Prodrive, was still planning to build its factory. That optimism proved fleeting. Soon after, Prodrive announced that it was pulling out, and then in early December, LStar was put on "notice of

default” by the Southfield Redevelopment Authority, the local board overseeing the project. According to *The Patriot Ledger*, the developer was accused of “failing to attract development, provide necessary infrastructure and meet its financial obligations.” LStar was given 30 days to respond to these considerable problems or have its agreement to develop the site terminated. (The 30-day period ended just after this article went to press.)

### A Serendipitous Turn

Adam Greenfield is a London-based urbanist and technology expert. In his 2013 book-length essay, “Against the Smart City,” published by Do projects, he dissected several leading examples of the form, critiquing Cisco’s role in New Songdo, where the company boasted of “intelligent road pricing” and advertisements that adjust in real time to better influence whoever happens to be watching. As Greenfield observed: “It’s as if someone took *Minority Report* as a shopping catalogue or a punch list rather than a vision of dystopia.”

I contacted Greenfield because I thought he might have a sense of whether it had become commonplace for developers of master-planned golf course communities to promote their projects as



smart cities. Is Corkum part of some larger trend? If he is, Greenfield didn’t know of it. But things took a serendipitous turn when Greenfield told me that, in fact, Corkum had contacted him last March, “out of the blue,” because he had written the book on smart cities. Corkum wanted Greenfield to “tiger team us, to tell us what’s wrong with our plan and how we might be able to do this better.”

Corkum flew him in, and Greenfield spent a few days inspecting Union Point and meeting with the concerned parties. As agreed, Greenfield wrote up a findings document, a detailed, granular critique that

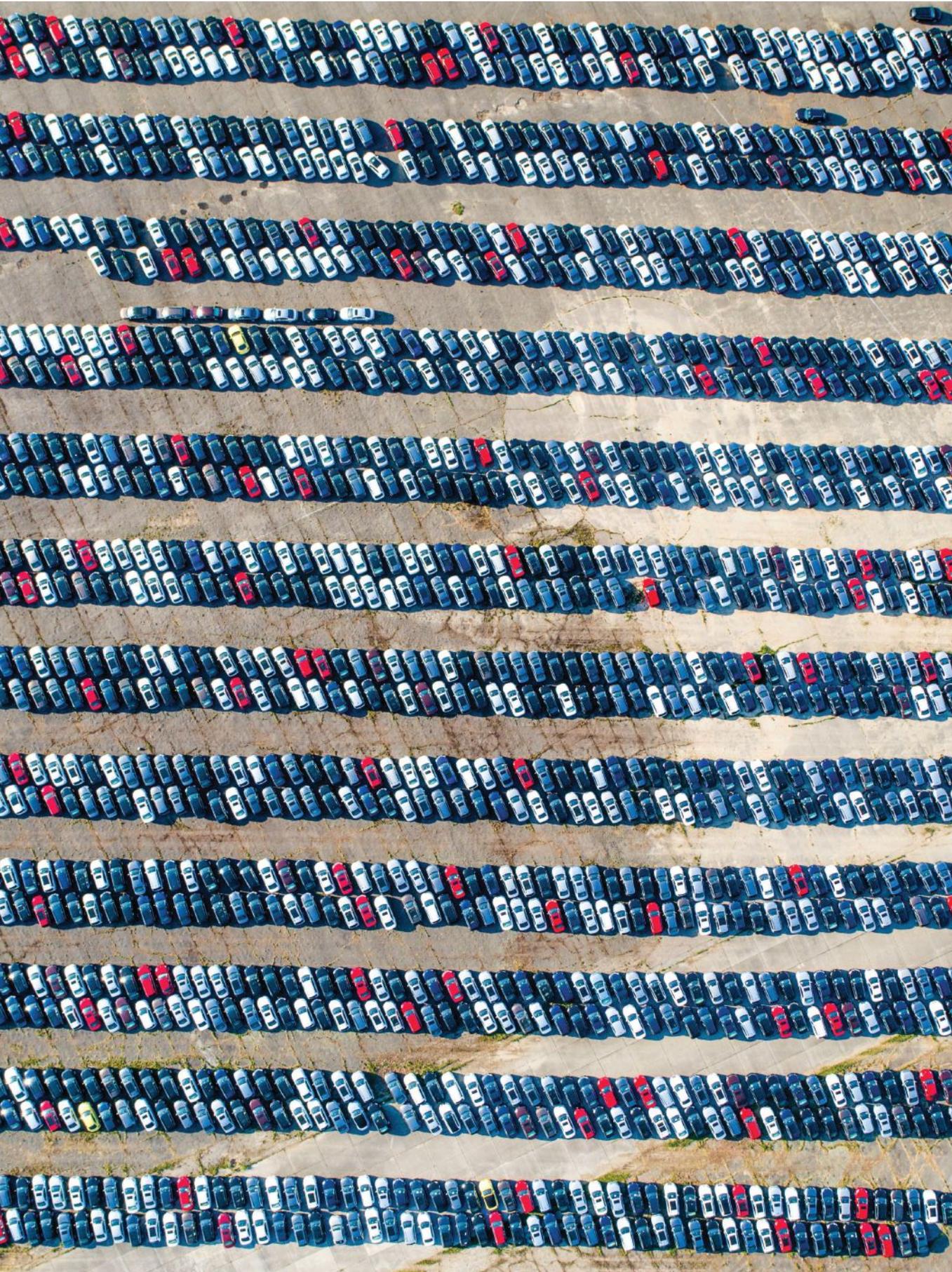
touched on numerous issues such as traffic—specifically how to prevent the site, when fully built out, to be overwhelmed by cars—and the lack of affordable housing. Greenfield sent the document off and didn’t hear anything for almost a month. Eventually he got a thank you email from Corkum, who said he was passing the findings along to one of his assistants. Greenfield read it and thought, “If he’s delegating everything to them, it’s the end of the engagement.” Which it was. Greenfield says he still hasn’t been paid.

If there’s a lesson to be learned, it’s that talking a good game is far easier than building a technologically advanced city, or any city for that matter. Corkum went on an elevator ride with his architect to the loftier precincts of urban planning, absorbed the latest buzzwords, and won over the public, at least initially. The smart city concept is endlessly captivating (“Oh yeah! Technology!”), but the realization of that vision remains stubbornly elusive.

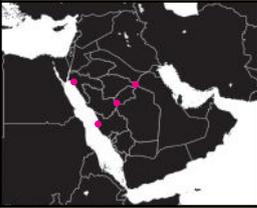
On my visit to Weymouth, I spent an hour driving around Union Point with Hedlund and Luongo. They made sure I noticed the empty storefronts and pointed out oddities like the pile of mammoth buoys that the still-extant Coast Guard base on the site had gathered for reconditioning. But the strangest thing they showed me was a sweeping field full of cars. As it turns out, the site’s one commercial tenant of any consequence is Volkswagen. Union Point, hypothetical smart city, is the current home to the automaker whose diesel cars were recalled because they were designed to cheat in emissions tests.

An LStar executive told *The Patriot Ledger* in 2017 that Volkswagen’s presence was “a temporary circumstance and short-term use of the land to add activity to the site.” But the VWs were still there when I visited. The failed smart city as refuge to cars equipped with computers programmed to lie—this requires a literary reference far more dystopian than the Emerald City. Greenfield had one at the ready: “It is the most [J.G.] Ballardian thing I’ve ever seen.”

Aerial view of Union Point’s residential lots and parking lot of decommissioned Volkswagens



What is a  
Smart City?



**Multiple  
Locations,  
Saudi Arabia**

# A Billboard of Progress

Saudi Arabia and other authoritarian states are using smart cities to transform their economies—with mixed results.



TEXT BY ELIZABETH EVITTS DICKINSON

Since the 1930s, Saudi Arabia has dominated the world's oil supply, but as crude prices began dropping in 2014 and budget deficits and unemployment rose in the kingdom, the young Crown Prince Mohammad bin Salman, or MbS as he's known, charted a brave new course for the country. In 2016, he unveiled Saudi Vision 2030, an 84-page document announcing a sweeping strategy to diversify private business, attract foreign investment, and support education and entrepreneurialism beyond the oil industry. Key to that vision: transforming hundreds of square miles of desert into smart megacities.

King Abdullah Financial  
District near Riyadh,  
Saudi Arabia

At the center of the new vision is Neom, a staggering 10,200-square-mile project that will rise along virgin coastline of the Red Sea. Estimated to cost \$500 billion, this “blank slate,” as the Saudi government describes it, calls for a “new generation of city” that runs its “opulent buildings” on solar and wind power, has streets supporting automated cars, and city services run by artificial intelligence and robots. No official master plan has been released—the first phase is scheduled to be completed by 2025—but a promotion video that aired in 2017 claimed that “this is the blank page you need to write humanity’s next chapter,” and depicted a progressive lifestyle, including leotard-clad women stretching into a yoga asana. The development would be an independent economic zone running under its own laws, taxes, and regulations, intended to attract a knowledge-based economy of international companies as well as tourists to its beaches.

Vision 2030 is, in fact, just the latest in a decades-long attempt to diversify and develop Saudi Arabia. In 2005, the kingdom went public with another smart city development, King Abdullah Economic City, a 65-square-mile project outside of Jeddah on the Red Sea coast that was master planned by a team led by Skidmore, Owings & Merrill (SOM). The King Abdullah Financial District (KAFD), located north of Riyadh, was announced a year later. The Danish architecture firm Henning Larsen did the master plan for that project, a highly sustainable financial hub with clusters of high-rise office and residential towers designed by the likes of SOM, Gensler, and Foster +

No official master plan has been released, but a promotion video that aired in 2017 claimed that “this is the blank page you need to write humanity’s next chapter.”

Partners. The 80-story PIF Tower by HOK, which is under construction and expected to earn LEED Gold, aims to be one of the most high-tech skyscrapers in the world, with a façade that includes high-performance enclosures incorporating solar shading and photovoltaic solar collection. KAFD will be connected by a new metro system, one of the many new public transit systems planned across the kingdom, with one station designed by Zaha Hadid Architects now under construction. Also announced in 2006: the Knowledge Economic City in Madinah, which included plans for four new neighborhoods with retail, office space, mosques, and over 1 million square feet of housing. In 2018, the project got a boost when a new high-speed railway opened, reducing travel time between Madinah and Makkah, the two holy cities.

But this initial round of smart city developments has largely failed to fulfill its initial promise. According

## A Provisional Who’s Who of Smart City Architects and Planners (Plus a Critic or Two)

**Maria Aiolova, ASSOC. AIA**  
CO-FOUNDER, TERREFORM ONE

An architect, educator, and urban designer who holds 18 technology patents, Aiolova co-founded Terreform One, a design research nonprofit in Brooklyn, N.Y. The group looks to technology, design, and synthetic biology to develop sustainable, localized solutions for transportation, infrastructure, waste treatment, food, water, energy, and other concerns.

**John Bachmann**  
VICE PRESIDENT, AECOM

Bachmann manages the master planning for Visakhapatnam, India—one of 100 such plans that the country has in the works. Vizag, as the effort is known, aims to create a sustainable smart city in a coastal region that is already home to 4 million residents, employing data-driven strategies that can be overlaid on existing infrastructure rather than building from the ground up.

**Alison Brooks**  
PRINCIPAL AND CREATIVE DIRECTOR,  
ALISON BROOKS ARCHITECTS

London-based Brooks uses cultural research to inform community-centric design. She believes that single-use buildings are a thing of the past, and advocates for architecture that can serve a variety of roles. For her Audi Urban Future Initiative research, Brooks explored the intersection of densification of cities and ride-sharing using connected devices.

**Dominique Davison, AIA**  
FOUNDING PRINCIPAL,  
DRAW ARCHITECTURE + URBAN DESIGN

Kansas City, Mo.-based Davison is a classically trained cellist, punk bass player, and architect who leads a team that employs data visualization, processing, and analysis to improve understanding of cities’ environmental impact. That research became PlanIT Impact, a startup that aims to increase planners’ ability to realize net-zero cities. The company’s software analyzes the impact that energy, water, and transportation have on building performance.

**Jan Gehl, HON. FAIA**  
CO-FOUNDER AND SENIOR ADVISER, GEHL

Based in Copenhagen, Denmark, the revered architect and urban planner helped transform that city into one that prioritizes pedestrians, cyclists, and public space. A critic of the current concept of smart cities, he has expressed concern that the strategies employed will not improve resident quality of life.

to press reports, as of April 2017 no financial institutions had agreed to lease space in the KAFD development. Construction and development on other projects has stalled. “We are aware that the economic cities of the last decade did not realize their potential,” the Vision 2030 states, and part of their plan calls for revivifying these district plans.

But that was before the murder of journalist Jamal Khashoggi. Plans to fund Vision 2030 were based, in part, on partially privatizing the state-held oil company Saudi Aramco, but the IPO has been delayed because of the political fallout from the killing. Advisers to Neom, like Norman Foster, HON. FAIA, have since backed out of the Neom project, while other Western CEOs, architects, and planners have also detached themselves from development projects in Saudi Arabia. “Neom is in doubt for sure,” one private sector consultant told *The Financial Times* in December. Even before the Khashoggi killing, in August, *The New York Times* had warned that MbS “will need to curb his economic ambitions.” What MbS calls, in the foreword to his 2030 report, “an ambitious yet achievable blueprint,” others now see as a pipe dream.

It is a reminder that even for a centralized or authoritarian government, which may not be faced with the internal political divisions or land-use issues that can plague projects elsewhere, the smart-city concept is not a magical elixir. Without good planning and the right political and business climate, these projects may very well fail, as so many others already have.

**Toni Griffin**  
FOUNDER, URBAN PLANNING FOR THE  
AMERICAN CITY

In addition to leading initiatives such as the Detroit Future City plan, Griffin is an urban planning professor at the Harvard Graduate School of Design. There, she founded the Just City Lab, which promotes integrating social justice into the planning of future cities. “We’re also interested in the distribution of non-material goods, such as power, rights, and decision-making. You have to think about representation, and accountability, empowerment, and trust,” she told *CityLab* last summer. “And those are ... not something you can sit at your desk and get quantitative data on. These [things] have to be measured qualitatively, which means using the experience of people on the ground as data points.” The lab’s Just City Index weighs planning against 12 resident-centric tenets, such as resiliency, democracy, and mobility.

**Rem Koolhaas, HON. FAIA**  
CO-FOUNDER, OMA

The Dutch architect has been a vocal critic of smart cities, notably in his 2014 presentation at the Brussels Smart City conference. “We are fed cute icons of urban life, integrated with harmless devices, cohering into pleasant diagrams in which citizens and business are surrounded by more and more circles of service that create bubbles of control. Why do smart cities offer only improvement? Where is the possibility of transgression?”

**Keiichi Matsuda**  
DESIGNER

A designer and filmmaker based in London, Matsuda explores the effects of augmented reality on the average citizen. In his 2016 film, *Hyper-Reality*, Matsuda presents a futuristic city where individuals utilize virtual interactive interfaces to engage with the physical environment.

**Margaret Newman, FAIA**  
PRINCIPAL, ARUP

As a principal in Arup’s New York office, Newman’s focus is on urban design, public space, and multimodal network development. Her prior experience as chief of staff to Janette Sadik-Khan at the New York City Department of Transportation and as executive director of the Municipal Art Society of New York have informed her focus on creating sustainable, integrated urban design that promotes economic growth, resiliency, and diversity.

**Zenon Radewych**  
PRINCIPAL, WZMH ARCHITECTS

Radewych is a principal at Toronto-based WZMH Architects. The firm’s development of an Intelligent Structural Panel, with plug-and-play infrastructure that allows wireless control of building systems made it the first architecture firm to participate in Microsoft’s global Internet of Things Insider Labs accelerator.

**Carlo Ratti**  
DIRECTOR, MIT SENSEABLE CITY LAB

Also the founder of Turin, Italy–based practice Carlo Ratti Associati, Ratti is a professor at the Massachusetts Institute of Technology, and the director of MIT’s Senseable Cities Lab, which investigates how layering technology and data on urban environments can create what it terms a “real-time city.”

**Adrian Smith, FAIA, and Gordon Gill, FAIA**  
FOUNDING PARTNERS, ADRIAN SMITH +  
GORDON GILL ARCHITECTURE

In addition to designing Masdar Headquarters outside Abu Dhabi, United Arab Emirates—which targeted being the world’s first energy-positive building—the duo’s Chicago-based practice has used smart city strategies in further master planning projects, such as the 28-building Astana Expo City 2017 complex in the Kazakhstan capital.

**Ben van Berkel, HON. FAIA**  
FOUNDER AND PRINCIPAL ARCHITECT,  
UNSTUDIO, UNSENSE STUDIO

Van Berkel is the founder and principal architect of Amsterdam-based architecture firm, UNStudio. It’s offshoot, UNSense—launched in March 2018—explores integrative for the built environment to improve the efficiency of cities, and the quality of life of their residents. The independent startup/innovation platform focuses primarily on sensor-based technologies for cities, individual buildings, and interiors “in order to humanize architecture,” according to the firm.

**James von Klemperer, FAIA**  
PRESIDENT AND DESIGN PRINCIPAL, KOHN  
PENDERSON FOX ASSOCIATES (KPF)

Von Klemperer led the team that created the master plan for New Songdo City, a 1,500-acre development in Incheon, South Korea, which combines classic urban amenities such as a 100-acre park with innovations such as a pneumatic waste collection system. The firm’s KPF Urban Interface uses data analytics to inform future city design.

What is a  
Smart City?



Quayside  
Toronto, Ontario

# A Question of Privacy

Government is partnering with Google sister company Sidewalk Labs to pilot smart city technology in Toronto. Residents have their doubts.



TEXT BY ALEX BOZIKOVIC

This smart city of the future first appeared in cutesy sketches. Drawn in a cheerful palette were a kayaker paddling in a harbor, a dad pulling a little one in a bike trailer, children running hand-in-hand through a carless streetscape. There were gondolas and pergolas, and underground robots carrying waste. And, vaguely, in the background, there were also buildings.

This was the vision for Quayside, a new waterfront neighborhood in Toronto conceived by “Sidewalk Toronto,” a partnership between a local public agency and Sidewalk Labs, a New York–based unit of Alphabet, Google’s parent company. “By leveraging technology and combining it with really smart, people-centric urban planning,” Sidewalk Labs CEO Dan Doctoroff said at the time, “we could have really dramatic impacts on quality of life.”

Sidewalk Toronto was launched in October 2017. A year and a few months later, the vision for Quayside remains only slightly less vague than those initial drawings. The 3 million-square-foot project promises to include many of the hallmarks of smart-city ventures: “dynamic streets” designed for autonomous vehicles, “radical-mixed-use” buildings featuring “power-over-Ethernet,” and a novel approach to retail and service space that prioritizes pop-ups over long-term leases. The project also promises to inspire meaningful innovations in construction and real estate practice. “We’re putting forward new technologies that have not been integrated before,” says Karim Khalifa, a mechanical engineer who is the director of buildings innovation for Sidewalk Labs. “The project includes prefabricated mass timber at a scale that has never been attempted.”

Perhaps most importantly, Quayside promises to generate endless streams of data—from buildings, road sensors, traffic signals, and other sources—with the promise that they will make the development more efficient, safe, and pleasant. Local resistance to the plan has mounted, however, as residents of various political stripes have raised a provocative series of questions. Who will control that data? What does a tech-inspired, Google-affiliated city mean, technologically, socially, economically, and politically? What, exactly, is Sidewalk trying to build?



A 2017 rendering of Quayside



### An Instigator, Not a Developer

Quayside is the first major project by Sidewalk Labs—a showpiece that the company hopes will define its reputation in the field of “urban innovation.” It’s one of the most prominent examples of the tech industry’s newfound ambition to disrupt urban planning. As Khalifa says, “We’re not a real estate developer. We’re not a contractor ... you could call us an instigator or a catalyst in this space.”

The company was founded under the leadership of Doctoroff, the former CEO of Bloomberg LP and a deputy mayor of New York under Michael Bloomberg. Staffed heavily by Bloomberg administration veterans, the firm was seeking a site to test new approaches to mobility, construction technology and, most contentiously, the use of data from traffic and building systems, as well as personal data. They found their venue in Toronto, a city of nearly 3 million that is Canada’s financial, cultural, and tech capital.

Their partner? Waterfront Toronto, a public agency controlled jointly by the city, the province of Ontario, and the federal government. The agency was created in 2001 to redevelop 2,000 acres of Toronto’s port lands on Lake Ontario, a former industrial zone just a mile east of the city center. Waterfront Toronto has made considerable progress, building quality parks and public space, collaborating with public agencies and developers to create new mixed-use projects, and improving the site’s flood protection. Two years ago, it broke ground on a nearly \$900 million project

to reshape the flood-prone Don River. Designed by Michael Van Valkenburgh Associates, the project will also create 200 acres of new parks along the river’s “renaturalized” mouth.

In 2017, when the agency released an RFP looking for a developer and “innovation partner,” almost no one noticed; my column in the *Globe and Mail* discussing this news made few ripples. But when it became clear that Sidewalk—or, as it was widely reported, Google—was the innovation partner, things suddenly heated up. This wasn’t simply a question of designing smart building automation systems or streetlamps, but something bigger and potentially more nebulous, even nefarious. Sidewalk, after all, has professed interest in the healthcare industry and even voting machines. Commentators, some of them wary of an American company imposing its will north of the border, painted the project as a fearsome corporate takeover or as a techno-utopia in the making. “Sidewalk Toronto is not a smart city,” wrote Jim Balsillie, a former chairman and co-CEO of Research In Motion (now BlackBerry) in an op-ed in the *Globe and Mail* published in October. “It is a colonizing experiment in surveillance capitalism attempting to bulldoze important urban, civic, and political issues.”

Waterfront Toronto was unprepared for this storm. The agency, then headed by urban designer and real estate developer Will Fleissig, can do little without the agreement of all its public masters, and it had always prized a methodical, consultative approach.



Quayside will rely on “radical zoning” that will mix a variety of uses, including short-term pop-up retail

Sidewalk Labs, with few local staff and limited political connections, also seemed unprepared for the blowback. The company’s initial message, with those sunny drawings, was vague but cheerful. “We want to mix technology and cutting-edge city planning, and bend the curve on quality of life in cities,” Doctoroff told me before the launch. He also said: “We’re humble. We know how to listen.”

Those qualities have certainly been put to the test. One problem was the deal’s unusual structure. The two partners began working together to create policy around “digital innovation,” and the resulting public outreach seemed to blur Waterfront’s public agenda with Sidewalk’s spin, raising questions about who exactly was driving the agenda. It didn’t help that the agreement called Sidewalk an “innovation partner” for much of the port lands beyond Quayside—750 acres—without spelling out exactly what this would mean. And then there was the question of data. How would information from Quayside be collected, how would it be stored and used, and who would have access to it and for what purposes? Would a resident’s movements, captured by cameras or geolocation data, truly remain private? And would Sidewalk be able to extract huge economic returns from its intimate knowledge of the community? Critics panned the initial public meetings for being unreasonably vague about these questions. One of Waterfront’s board members and two members of its digital strategy advisory panel have resigned in recent months, unhappy with Sidewalk’s handling of

data and privacy concerns and the way the public-private partnership was operating.

### A Vision in Timber

Meanwhile, Sidewalk has been working to translate its vision into actual development. The company has been reluctant to release designs in a coherent way, and in December, when it revealed specifics of its Quayside master plan for the first time, the drawings remained frustratingly vague. Designed by a team including Neil Kittredge, AIA, a partner and director of planning and urban design at Beyer Blinder Belle in New York; Toronto-based urban design consultancy Urban Strategies; and urban planner Ken Greenberg, ASSOC. AIA, the scheme is a mix of mid-rise and low-rise buildings between five and 30 stories tall. It’s meant to support 3,900 new jobs and house about 5,000 residents, 40 percent of them in some form of affordable housing. A pedestrian-only street runs through the middle of the block, and the site features a “water plaza” designed by emerging Toronto landscape architect firm Public Work that connects the development to the waterfront. “There is this really interesting geography of where the downtown meets the lake,” says Jesse Shapins, Sidewalk’s director of public realm. “And so from an urban design perspective, we’re looking to blend as much as possible the relationship between land, water, and buildings.”

As for the buildings themselves, they are what Sidewalk is calling “radical mixed-use,” with



residential, office, retail, and light industrial alongside each other in loft-like structures—a plan that would require significant zoning changes. Inside the buildings, one of the innovations will be the use of power-over-Ethernet, which Khalifa’s team is working on with consultancy Interface Engineering. This technology supplies low-voltage DC current through Ethernet cables, which can be run inside the cavity of an interior wall and then easily moved when there’s a change in tenancy or use. Early sketches of the project featured fourth-floor workshops alongside apartments; more recent iterations had separated residential and office spaces into different floors.

One thing that has remained consistent is Sidewalk’s commitment to mass timber. As Khalifa argues, cross-laminated timber panels and glue-laminated beams especially are less carbon-intensive than steel or concrete; they are lightweight and relatively easy to transport long distances; and they lend themselves to off-site panelization or prefabrication. He says that Sidewalk is planning to “invest in the supply chain” of mass timber in Ontario, to make it easier for the Quayside project and future development to rely on the material. The company has partnered with Michael Green Associates Architecture (MGA), whose principal Michael Green, AIA, has become a leading proponent of mass timber. In an interview last year, Green said that he has designed a “kit of parts” for the project that can be manipulated to “allow for the changing way we all want to live”—a

solution “that is, on the one hand, not complicated, but on the other hand it’s quite complicated when you try to get into structural and programmatic details.”

Who will work with that kit of parts, in addition to the architectural expression of the buildings themselves, remains undecided: Sidewalk executives haven’t yet revealed who the architects will be, but they have engaged Snøhetta and Heatherwick Studio to explore possibilities. “We’ve asked them to test the model, and see whether it can be used to create beautiful architecture,” says Andrew Winters, Sidewalk’s chief operating office for development. “And the answer is yes.”

Perhaps the most difficult part of the project revolves around fire safety and code compliance in wood buildings. In Ontario, as in most jurisdictions, in order to achieve an adequate fire rating for homes, the wood structure must be covered by drywall or other materials whose fire-separation capacity is well understood. Sidewalk is attempting to solve this issue, Winters says, with a fire-resistant finish that can be applied to the surface of the wood. Still, regulatory challenges remain: the local building code forbids wood structures taller than six stories, although two groundbreaking wood projects in the city (10 and 14 stories high) are currently seeking approval.

If Sidewalk does secure the necessary permits, its timber architecture could frame an unusual sort of public life. The company’s master plan for Quayside allots almost all of the 400,000-square-foot ground floor



to what it calls “stoa” spaces—semi-enclosed “flexible envelopes” where retailers or restaurateurs could build climate-controlled structures or set up kiosks that would lend themselves to pop-ups. Although short-term tenancies aren’t typically favored in a developer’s pro forma, they seem less and less risky financially as retail is increasingly disrupted by e-commerce. Shapins acknowledges this, and adds: “We want to drive a really integrated vibrant expanded public realm that moves between the buildings and the streets and the plazas.”

In order to support that objective in Toronto, with its bitterly cold winters and hot summers, Sidewalk is pursuing something called microclimate mitigation. Local architecture firm Partisans and engineering firm RWDI are working on a series of freestanding shelter structures and “raincoats” for the buildings—adjustable soft surfaces that make the extremes of wind and rain more tolerable.

There is a coherent urbanism here: mutable, mixed, and fine-grained. But the project’s most controversial aspect, at least from an urbanistic perspective, could be what it does with public streets. One of Sidewalk’s first specific proposals was for “dynamic streets,” which would feature a system of paver units containing sensors and lighting components. The lights would signify which lanes are available to pedestrians and vehicles and could be altered depending on the time of day or for special events. Sidewalk hopes to limit traffic by building an “urban consolidation center,” where packages would be received and routed to their

## The New Gold Rush

Given trillion-dollar projections for the smart city market, it should come as no surprise that the world’s largest tech companies see it as a major growth opportunity. Legacy players such as AT&T and Honeywell are in competition with giant upstarts such as Amazon and Alibaba, offering a host of products, systems, and services to governments, utilities, and other potential clients. Market research firm Compass Intelligence’s A-List in Smart Cities Index ranks the top companies in the space, those that provide solutions for “energy, transportation, real estate, management systems, device connectivity, data capture, video analytics, lighting, public safety, public health, crisis management, and automation.”

1. General Electric
2. Intel
3. AT&T
4. Microsoft
5. Amazon (AWS)
6. Honeywell
7. IBM
8. Google
9. Cisco
10. Dell
11. Ericsson
12. Qualcomm
13. Huawei
14. Verizon
15. Schneider Electric
16. Siemens AG
17. Nokia
18. Oracle
19. Apple
20. SAP
21. Johnson Controls
22. Hitachi
23. ABB
24. HPE
25. Deutsche Telekom (T-Mobile)
26. Nvidia
27. Samsung
28. SoftBank
29. Itron
30. Alibaba
31. Sprint
32. InterDigital/Chordant
33. Facebook
34. Baidu
35. Tencent Holdings
36. ST Engineering
37. OSIsoft
38. Alstom (by GE)
39. Eaton
40. DNV-GL

Even as the physical picture of Sidewalk's master plan has filled in, local residents haven't seemed to care much. A substantial and novel development project has been largely cast as a Trojan horse for "surveillance capitalism."

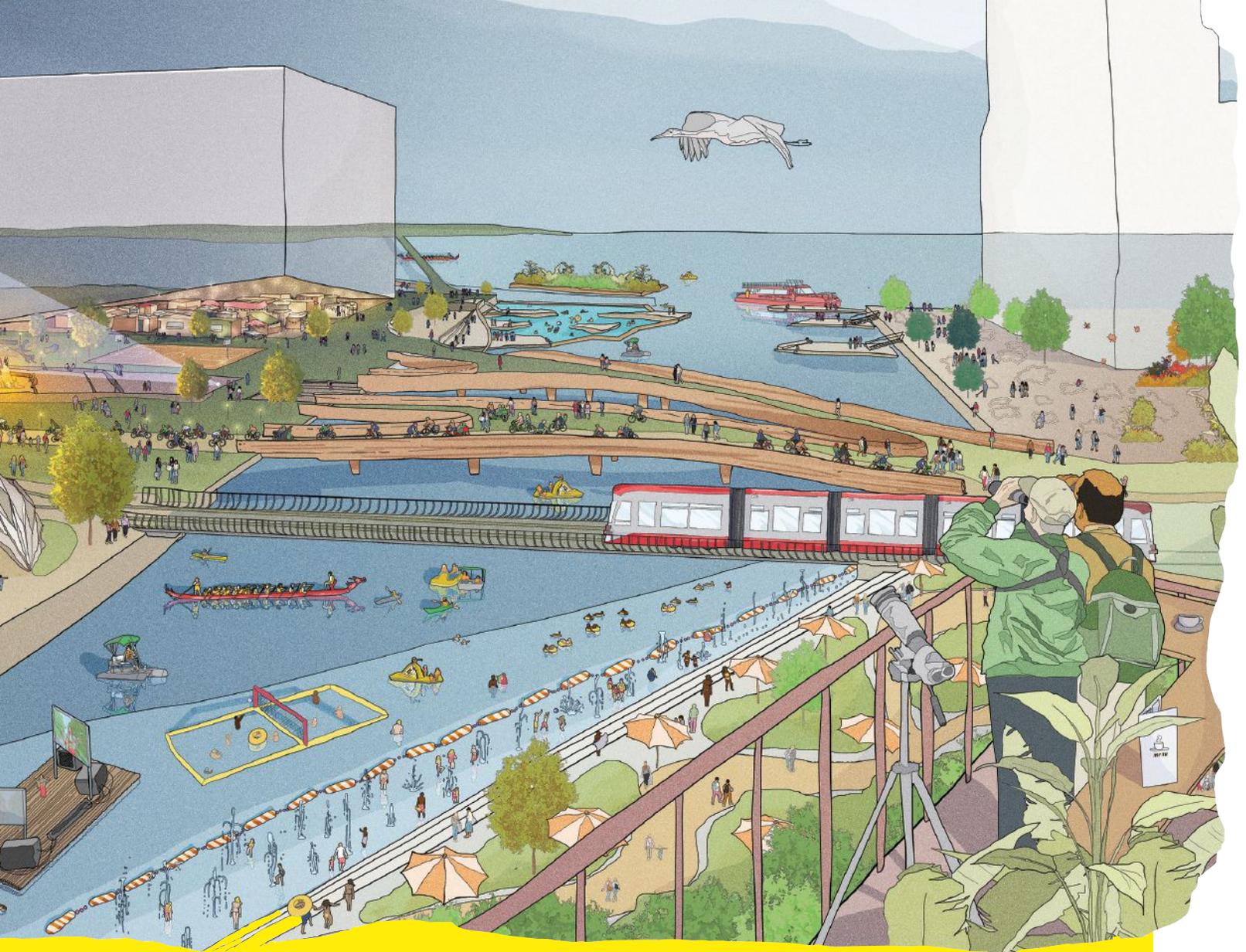
The project aspires to connect the city to the waterfront and turn it into a destination

destination through robots in underground tunnels, which would also be used to transport garbage in the opposite direction, eliminating the need for delivery or garbage trucks. And parking capacity would be shared between different buildings, with autonomous vehicles providing a valet service. "We are designing with an autonomous vehicle future in mind," says Rohit (Rit) Aggarwala, the company's head of urban systems. "There are huge implications for architecture. ... If you think about the curb pattern at a major airport, you have multiple curbs to handle pickups and drop-offs." Accordingly, the company is reimagining a major street—Queen's Quay—as a one-way, with a large pickup and drop-off zones that can be defined by street furniture that moves itself into position.

### **A Novel Development Ignored**

All these plans—the radical mixed-use idea, the wood towers, the dynamic streets—remain hypothetical. The





entire scheme still needs to be approved by Waterfront Toronto before city officials actually start to consider it, a process that won't formally begin until the middle of this year. In a city where development approvals can typically take four or five years, it seems unlikely that any aspect of the Sidewalk plan will take shape anytime soon.

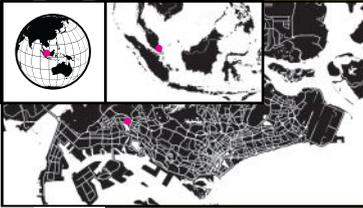
If it ever does. Most critics agree that Sidewalk's main goal is to gain access to data, as a resource to be mined and leveraged. Saadia Muzaffar, one of the advisers who stepped down from Waterfront Toronto's digital strategy board, complained in an open letter about the "blatant disregard for resident concerns about data and digital infrastructure." She wrote that public meetings were spent "talking about buildings made out of wood and the width of one-way streets" and other "things no one has ... expressed material concern for in this entire process."

That last point is an unfortunate reality of the

project. Even as the physical picture of Sidewalk's master plan has filled in, local residents haven't seemed to care much. A substantial and novel development project has been largely cast as a Trojan horse for "surveillance capitalism." It's hard to tell whether the government will—or even can—respond adequately to this challenge. After all, Sidewalk is trying to change so many things at once: privacy law, construction technology, retail strategy, logistics, mobility, the housing market. Its ambitions and its assumptions in each field aren't clear—even, I think, to Sidewalk itself. It will take years to assess how the project will actually take shape or who benefits.

Which ought to come as a lesson for Sidewalk: Tech might move at a lightning pace, but development moves much more slowly. In trying to combine the two, the company is learning just how hard it is to build a real-life community.

## What is a Smart City?



### Jurong Lake District, Singapore

# Future Proofing

For a new business district in Singapore, technology is a tool for achieving sustainability and resilience.

TEXT BY ELIZABETH EVITTS DICKINSON

As urban areas expand, the old central business district model becomes less, well, central. Many global cities are designing additional districts outside the city center as a means to attract emerging business and new residents. Madrid, for instance, hopes to entice companies leaving post-Brexit London to relocate to its Madrid New North project. Singapore, meanwhile, is planning a second central business district called the Jurong Lake District. An 890-acre mixed-use development located near the country's newly consolidated container port operations, it is primed to capitalize on a future Kuala Lumpur–Singapore high-speed rail system. The district calls for 20,000 new homes and room for up to 100,000 jobs in a dense and sustainable, 24/7 area that includes a revived national garden park along the water. According to the website for Singapore's Urban Redevelopment Authority, the project will “demonstrate how technology can enable a livable and sustainable urban environment,” using big data and sensors to create real-time feedback that will “enable facility managers to diagnose and fix problems in a timely way.”

Just don't call it a “smart” city, at least not to its architects. “I don't use that word actually, because I think it's too inflated,” says Kees Christiaanse, founder

and partner of Rotterdam-based KCAP. Christiaanse, along with Arup and other partners, helped plan the district with the redevelopment authority after winning the commission a few years ago. He prefers to think of the design, which was released to the public in 2017, as future-proofing the city. Future-proofing “means that you create a condition of public places and street patterns and building typologies that are resilient for change in the future and can accommodate unexpected events,” Christiaanse says.

One way to future-proof is to create flexible zoning. The Jurong Lake District is using a grid system—called “white zoning”—that is meant to give developers and businesses maximum leeway to change how a building functions as their needs evolve. Meanwhile, the infrastructure for subways, rail, roads, and other city services is “designed in such a way that it doesn't interfere with the street pattern and the plots of the neighborhood,” Christiaanse says. Residential neighborhoods won't be disrupted as infrastructure goes in, or in the future when it needs updating. The plan, for instance, puts the corridor and entrance for the future high-speed rail station along a park, so that city streets and residents won't be disturbed when construction starts.

As Christiaanse notes, many smart city concepts call for a large common service tunnel underground, where infrastructure bundles are mounted and tracks are installed for delivery vehicles and waste disposal. But with accelerated tech development the way it is, “it makes no sense to dimension a common service tunnel on, say, a pneumatic waste conveyance system, because after 10 years, there is going to be another system,” he says. “Common service tunnels are huge and not flexible.” Instead, “we created a small common service tunnel where most of the pipes can be accommodated, and then we created a layer on the streets where you can embed things for flexible infrastructure.”

The design of the Jurong Lake District also differs from most central business districts in that it doesn’t strive for a variegated skyline punctuated by pinnacles and towers. In Singapore, the footprint of new buildings must be offset by an equal amount of green surface, and this has spurred the development of new building typologies, such as “shelf buildings”—groups of towers connected by an elevated shelf, like an oversized skybridge, that provides green space, jogging tracks, or even a pool. (The most notable example may be Moshe Safdie, FAIA’s Marina Bay Sands hotel, which opened in 2010 near the existing central business district and made an appearance in the 2018 film *Crazy Rich Asians*.) In the new district, KCAP dictated that all the buildings be the exact maximum allowable height of 115 feet and include a flat green roof, in effect creating what Christiaanse calls “a floating garden.”

Other natural assets take a nod from Frederick Law Olmsted and his “emerald necklace” concept in Boston; here, a series of public spaces will be connected in a “Green Loop” of parks, bike paths, and greenways stitched throughout the district.

The redevelopment authority began the planning for the Jurong Lake District in 2008 around the existing metro system, but updated the plan when the high-speed rail became viable. “There is a little political turmoil between Malaysia and Singapore with the high-speed rail and the plans are getting delayed,” Christiaanse says. “That’s why our approach was to create a strategy of phasing in, where you do not create interdependencies too much,” he says. Construction hasn’t started yet on the district, but the redevelopment authority says that delays in the rail project won’t prevent it from proceeding. Which demonstrates how the development as a whole can keep moving forward, even if political bickering delays one aspect of it.

Turns out that a smart city, to be truly smart, needs to be based on thoughtful and strategic urban planning—an indispensable framework to accommodate the technology of the future.



Top: A rendering of the Jurong Lake District

Bottom: The proposed site in 2018

## Pullman Redux?

The failed company towns of the 19th and 20th centuries have long served as a cautionary tale against the paternalism of the manufacturing sector and utopian ideals of planned developments.

Consider Henry Ford’s 3,900-square-mile Fordlândia development in Aveiro, Brazil, which was constructed in the 1920s to house 10,000 workers to produce rubber for the Detroit-based company. After failing to both grow rubber trees and integrate with the local community, by 1934, the city was abandoned. Even earlier, in the 1880s, engineer George Pullman established his eponymous company town on Chicago’s South Side for the employees who manufactured his sleeping railcars. The town’s concept famously met its demise soon after an 1894 strike that left 34 people dead.

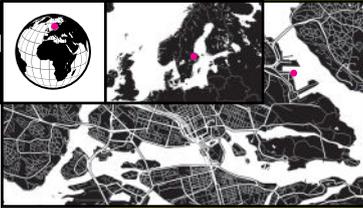
More than a century later, there’s a new twist on the company town: Instead of being an exclusive (and captive) place for a corporation’s employees to live, the new version is an information sponge built by a single company for the benefit of its database. The residents are employees in the sense that they contribute to the company’s bottom line—without actually working for the company itself.

Last year, billionaire philanthropist and Microsoft founder Bill Gates purchased 25,000 acres of land west of Phoenix with \$80 million from his Cascade Investment group. His vision: an 80,000-residence smart city that “embraces cutting-edge technology, designed around high-speed digital networks, data centers, new manufacturing technologies and distribution models, autonomous vehicles, and autonomous logistics hubs,” according to a statement from the project developers Belmont Partners.

One state away, near the Denver International Airport, Japanese electronics giant Panasonic is developing an almost 400-acre smart city. It will feature a solar-powered micro-grid, connected LED streetlighting, and an autonomous shuttle.

Given that the market for smart city technology and products is expected to exceed \$1 trillion within the next five years, it is no surprise that corporations, funds, and entrepreneurs are investing in such developments. But unlike company towns of the past, tech companies do not need to build and own the towns themselves. Instead, with their data-gathering capacities, all towns become company towns. —K.K.

What is a  
Smart City?



**Stockholm**  
**Royal Seaport**

# A Holistic Approach

Sensitive urbanism, smart technology, progressive architecture, and careful government stewardship make this 583-acre development in Stockholm a model for smart cities across the globe.





TEXT BY ELIZABETH EVITTS DICKINSON

Ah, Sweden. Amidst the over-promise and over-hype that has come to define so many smart-city developments, the Royal Seaport in Stockholm stands out as a project that's remained true to its word. Beginning in the early 2000s, the City of Stockholm envisioned transforming an industrial area outside the city center into a highly sustainable and tech-connected district with 12,000 new homes and 35,000 commercial and office spaces. By 2010, the Stockholm City Council had committed to making Royal Seaport an international example of sustainable urban planning, one that would also provide much needed housing for the city's growing population, which now numbers around 1.5 million. The development is taking shape around an infrastructure of information communications systems that will support smart homes and public transit access—a feature “just as

A rendering of the Royal Seaport development in Stockholm

important as having well-functioning roads, electricity, or water,” Staffan Lorentz, the head of development for Royal Seaport, said in a 2012 interview. Linking walking paths, bike lanes, rapid bus systems, and the metro using apps and wayfinding will help the district reduce its emissions. Ground broke on the project in 2011 with the goal of having the district complete—and running fossil fuel free—by 2030.

There’s a bit of irony in that carbon neutral goal, considering the 583-acre district—one of the largest urban development areas in Northern Europe—runs along a waterway historically used to transport coal to the city’s gasworks factories. In fact, one of the key architectural symbols of the district, designed by Herzog & de Meuron, pays homage to an original, round gasworks building. The 295-foot-tall tower, expected to open in 2022, features a variegated, v-shaped exterior and will house 317 apartments. “Its floor plan opens like the pages in a book to the surrounding city and landscape, maximizing sun exposure and offering a variety of views,” is how Jacques Herzog, HON. FAIA, described the project.

Sun exposure is critical during the dark Scandinavian winters, and the sensitivity to this design issue also helped the Danish firm Adept and the Stockholm-based Mandaworks earn the opportunity to master plan a key portion of Royal Seaport. The two firms won a 2015 design competition for a 43-acre section located near the city’s metro system. Known as Kolkajen-Ropsten, it reconnects the historic gasworks area to the waterfront through a new central axis leading to a shoreline park they call a “water arena.” “We proposed to build out a new island in the water that would turn the northeast facing shoreline to a south facing promenade” with housing and ground-level public retail, says Martin Laursen, founding partner of Adept, “so that the area would be more attractive in terms of daylight.”

Another key feature of their master plan is access to public transit and bike infrastructure (Royal Seaport is just 10 minutes from the city by bike). There will only be short-term parking in the area, with long-term parking for residents and workers in a nearby central garage. Not every apartment gets a place to park, according to Laursen: “You might have to share one spot between three or four apartments,” he says. “The new area aims to push future inhabitants to use other more sustainable forms of transportation than a private car.”

Adept and Mandaworks have spent three years finalizing the plan, and this year the city began conducting architecture competitions for plots. “We did a design book for the area for architects and

builders to follow,” Laursen says, which highlights the already established sustainability requirements for all of the buildings in Royal Seaport, such as encouraging green roofs and photovoltaics. The main corridor that connects the historic center to the water calls for closer blocks and higher buildings to help define the axis. Along the waterfront, however, where there is a park and a canal space, they lowered the scale to create “an Amsterdam feeling,” as Laursen describes it, with row houses and a mix of building materials. “It underlines a more intimate and calm public environment,” he says, and is meant to emulate an organic city grown over time, as opposed to one born overnight, by designing in a “diversity not only in ways of living, but also in ways of using a mix of materials in different urban spaces.”

To that end, historic preservation has also been important to the project. In Europe, smart city projects are more often than not retrofits requiring sensitivity to existing context. In addition to restoring some existing buildings, Laursen and his team made sure to maintain a portion of the historic pier that harkens back to the days of the “Shouting Stone.” “Before they had bridges connecting the islands, if you wanted the ferry, you would go out to a rock and shout for it to come get you,” Laursen says. “Even though we will build a lot of new buildings, the whole history of the site is well preserved.”

Part of Royal Seaport’s success so far derives from its political cohesion and commitment to vision. According to the district’s website, property developers must all participate in city-run seminars at early stages of planning, to determine their competence and experience in achieving the rigorous sustainability targets. The goals will be achieved using high-tech strategies for monitoring buildings as well as through low-tech means, such as government-sponsored forums on sustainable solutions and recurring mini trade fairs that introduce developers and technical suppliers to one another and encourage discussion around sustainable products, services, and ideas.

Today, a portion of Royal Seaport has come to life, with more than 2,500 housing units occupied, and another 5,100 soon to open. Construction on the infrastructure for the Kolkajen-Ropsten district will begin next year. Several research and design studies have already been conducted, including a post-occupancy survey with new residents to ensure that the promises of the development are being realized. “Real-time follow up on how well the apartments and the area performs in energy consumption or traffic is important,” Lorentz said. “We need to constantly follow up to see if we’re making the right decisions.”



*Top:* A rendering of Herzog & de Meuron's Gasklockan tower

*Bottom:* The Technical Building, designed by U.D. Urban Design and Anders Ohlin, which houses both an electrical substation as well as pumps for a fountain in Norra Djurgården



What is a  
Smart City?

# We're Working on It

In a roundtable with ARCHITECT, three smart city experts trade opinions and insights on what the buzzword really means, why the world's largest companies want a stake, and how architects can step up to the plate.



EDITED BY WANDA LAU

**How do you currently define a smart city? I say “currently” because the definition has evolved as technologies have come and gone, and as experiments have failed or succeeded.**

*Lam:* I think of smart cities as a process because it’s a change in local context and improvements in technology. It’s not an end state. You don’t suddenly declare yourself a smart city and then forget about it.

You’re starting out with a challenge, problem, or mission and thinking about what hardware, research, and processes are available in the toolkit. But it’s not led by technology and it’s not some sort of shiny object to just purchase and think you’re smart.

*Townsend:* There’s been effort over the years to formally define smart cities by the British Standards Institution, a variety of U.S.–based organizations, and some consulting companies like Arup. To me, it’s a movement that’s about using digital technology to solve the timeless problems of cities—the same problems that mayors in Ancient Rome had to solve: How do you collect the trash? How do you secure the streets? How do you address chariot congestion in the center of the city? Now it’s Ubers, but it’s still ride for hire.

We have solutions for urban problems but often they’re too costly or there’s political gridlock that prevents the solutions we have from being implemented. And sometimes these new digital tools provide shortcuts.

*Doherty:* Smart cities are about the collision of industries [that hopefully leads to] a domino effect. My company takes an approach of innovations as ingredients to create recipes that are unique for a particular part of the world because there is no big silver bullet. But when we start to take a look at the data-driven ways of [collecting and analyzing] static data as opposed to kinetic data, that’s where the value proposition is.

The state of data—the accuracy, its authenticity, and its trust—is variable. It’s all over the place, and the hardest part of our job is figuring out what’s the authenticated data so we can start using technologies to understand what happens when you digitize a process that has not been digitized in the past. The biggest challenge to the profession is to anticipate needs that don’t exist right now.

**Paul Doherty** is a registered architect, the chairman and CEO of the international company The Digit Group (TDG), an honorary senior fellow of the Design Futures Council, and a fellow of the International Facility Management Association. His past ventures include Revit Technology and Buzzsaw (both purchased by Autodesk), and TRIRIGA (purchased by IBM). TDG is currently involved in numerous smart city plans and real estate developments around the world.

**Debra Lam** is the managing director of Smart Cities and Inclusive Innovation for Georgia Tech, and founder of the Georgia Smart Communities Challenge. Previously, she served as Pittsburgh’s first chief of innovation and performance, where she crafted the city’s landmark strategic plan, the “Pittsburgh Roadmap for Inclusive Innovation,” and she was a policy and urban sustainability associate and senior consultant at Arup. She sits on the MetroLab Network and Neighborhood Nexus boards.

**Anthony Townsend** is the founder of Bits and Atoms, a smart cities strategy consultancy and planning studio, based in New York, that works with industry, government, and philanthropy on economic development, digital placemaking, and technology forecasting. He is also the author of *Smart Cities: Big Data, Civic Hackers and the Quest for a New Utopia* (W.W. Norton & Co., 2013). In 2001, he co-founded NYCwireless, a pioneer in the community and municipal wireless movement.

## What are the benefits of smart cities for the public—for the users?

*Townsend:* That’s still an open question. The whole movement began with a bunch of claims mostly coming from a handful of big IT companies: IBM and Cisco framed it early on about efficiency largely delivered through better infrastructure and better operations that upgraded 20th-century hardware in energy, water, traffic, and security.

There was a lot of virtue to that. There was a lot of waste in our existing physical systems and the way they’re operated, and a lot of opportunities to interconnect and apply systems thinking. But in many ways it was oversold: It was never going to solve the systemic problems we’re facing—climate change, migration, security, sustainability.

A different vision has bubbled up—from citizens, civil society, small business, and entrepreneurs—that’s about the way we live, and the things that have been created by those people have a lot more to do with convenience, transparency, living cleaner and healthier, and connecting the natural environment back into the urban world. What a smart city can deliver depends on what your goals are. And what your goals are depend on the politics and social makeup, who is in the city, who has power and what they’re trying to achieve.

We’re seeing this play out right now in clear terms in Toronto with Sidewalk Labs and Waterfront Toronto trying to develop what’s probably the most valuable piece of waterfront property in North America as a smart district using everything the Alphabet family brings in terms of its ability to sense, manipulate, and influence the physical world through the analysis and transformation of data. And they have done it in a way that did not reflect what the community wanted.

I would take issue with [Doherty’s] comment earlier that the mission now is to come up with ideas for what we can do. People in cities know what their problems are and have a fairly decent sense of how they can be solved. What they need from technologists are solutions to the problems they identify.

## Debra, you were instrumental to developing the “Pittsburgh Roadmap for Inclusive Innovation.” Who did you find were the most necessary stakeholders in this process of smart city planning?

*Lam:* First, it’s not just identifying those stakeholders: It’s how you continue to engage with them and how you build their trust so they become active owners of this process as much as you are. And that’s the difficulty. You can put together a town hall, sure, you can do an introduction, but how do you sustain that communications process? How do you take out barriers that prevent people from joining and from continuing that conversation?

Smart cities are a lot about the technology and the infrastructure. Many communities are cognizant of the big infrastructure plans from the ’50s and ’60s that, in terms of transportation, actually divided a lot of neighborhoods. So we’re coming back to the same communities with ambitious goals to transform them with a lot of technology, data, and infrastructure, knowing that they were harmed by some of these big modernization efforts in the past.

It’s important to go into those communities understanding that history and knowing you are always actively working to build and maintain that trust in order to be successful in engagement.

*Doherty:* When I mentioned the collision of industries before, it’s also about the collisions and conversations that can happen between government and its constituents. We’re finding that those conversations are either very short and canned, or they’re forced down people’s throats—in totalitarian governments in particular—which is a much different way of viewing what is a high-performing urban environment.

The storytelling mechanisms we’re looking to collide involve Hollywood—not to create Disney World or, god forbid, another Dubai that has no context or soul behind it—but something that can be part of the ingredients to create that recipe. Why do you want to be in a pop-up city that’s never existed before—to raise your family, get a better education, to get better healthcare? The people do know what they want, but you also don’t want to implement a technology for technology’s sake unless you know what the ramifications are.

## Why are companies like Google, or Alphabet, and IBM interested in the smart city?

*Doherty:* Google is a machine, like a locomotive that needs coal to work. Its main goal is to have private-public people’s information as its coal. The Sidewalk Labs opportunity is a good idea—to boomerang innovations that may happen elsewhere into district-sized solutions so people start to adopt and change behavior, and see the results that it would scale.

The opportunity to also be that data-capturing mechanism is something a private company thrives for. We have a moral and ethical issue here because if Toronto acquiesces and says, “This is good enough,” we’re going to have this public trust entity that Google is going to feed so that anyone can come in, petition, and create apps and other smart city solutions over a period of time.

That sounds good, but the reason prominent Canadian privacy figures are resigning from the task force is that, at its essence, Quayside is capturing the fuel for Google. I don’t know how an American company can come in and take Canadian private information and think it’s going to be able to get away with that.

And the solution is cloudy. It's a \$1.1 billion investment by Google into the Quayside project. Who else is going to absorb that \$1.1 billion if Waterfront Toronto says, "No," and Google says, "Well, tough luck"?

This is the double edge of smart cities: How much do we want to maintain the anonymous way of living and working? [What can we] get back from these tools that will measurably increase of quality of life?

"[W]hen we're talking about the power of data and what it can do with a community, it's important to go back to basics: Who is the recipient, who is the end user and the input factor of data, and what does that all mean?"

—DEBRA LAM, MANAGING DIRECTOR OF SMART CITIES AND INCLUSIVE INNOVATION, GEORGIA TECH

*Lam:* It's interesting how tech companies have evolved in this space as well. It was driven by sales at the beginning. You had a team of salespeople that were tracked in terms of their performance by the hardware and the software they needed to sell and push out.

And when you're driven that way, then you can't really think about the users' needs and appreciate the bigger factor that we're all outlined in. Where I think it is slowly and effectively making real purpose is to understand beyond just the sales of it: how technology can be that connector toward citizens because there is good in technology and it can be an empowering tool. It's a matter of changing the conversation and the dialogue so you're not driven by those types of metrics, but driven more by the impact that the technology can do in terms of transforming the lives of citizens.

And that's where we need to get into this next stage of smart city development.

*Townsend:* The online industry press tends to see [smart cities] in terms of clicks, eyeballs, and data. And there certainly is a lot of that at stake. But as an urban planner, you also have to look at it from the conventional land-grab aspect of it. What is the actual physical territory these companies are trying to claim?

Sidewalk in Toronto is a very good example where when we boil it down to what that project is really after: It's control of that land. If you look at Alphabet's broader financial portfolio, it's part of the diversification of that portfolio out of tech stocks, its own stocks, and other tech company stocks, and cash into real estate that it's been executing for the last 10 years. And Toronto is a nice, safe place to park a couple billion dollars in some waterfront real estate that isn't as susceptible to sea level rise as the other places along the coast that it's parked its money.

The distribution infrastructure Amazon Whole Foods is building out is a land grab. They're trying to establish a footprint that will allow them to essentially take out a large swath of the retail sector in the U.S. whenever they choose to execute that strategy as they have done online.

Uber's abrasive congestion pricing is basically a strategy to collude with local governments to set up a regulatory regime where it can afford to engage in a war of attrition with its competitors. It is the only one who has enough money to survive. And then it'll control what the price of the congestion is because it'll have the only vehicles on the road.

So all these companies are actually fighting. There's a lot of data, clicks, and abstract digital things floating around but they're really weapons in a war over urban territory. And we shouldn't forget that because that's where our skills and experiences as planners and architects and people in government are relevant even though we may not understand all the nuances of deep learning and data-sharing covenants.

*Lam:* [In Pittsburgh,] we implemented RFID tag sensors on our trash cans in a neighborhood thinking that it would be more efficient [for workers to] only pick up the trash when [the cans were] full rather than stop by stop, and therefore we could divert the sanitation workers to do other things in public works.

We thought that was an empowering way to look at data—we were informed by the trash fillage. What we didn't account for was the sanitation workers themselves. So if a sanitation worker takes pride in doing 50 trash cans each day, and [suddenly] you tell them to do less, then they weren't quite sure about what they saw as their job and what needed to be done. And this experience was meaningful because we thought we would be informed by the data. But we didn't account for the people that were involved at the heart of this project, how they would be affected by this project, and how to incorporate those needs.

Obviously there's a lot of talk about the privacy and security, and we can have individual [discussions] devoted to a lot of those issues and standards. But when we're talking about the power of data and what it can do with a community, it's important to go back to basics: Who is the recipient, who is the end user and the input factor of data, and what does that all mean?

### **What is an ideal scenario for data ownership and management? What should cities, communities, or facility managers be looking and asking for?**

*Townsend:* This is the one promising thing that has come out of Sidewalk in Toronto. The way Sidewalk has structured the conversation about data governance has not been ideal. But where it has gotten to is not that Sidewalk will keep all the data and license it, or



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share it or give it away under a corporate licensing structure or a traditional open data public sector model. The documents that Sidewalk has put out are a great start to a more nuanced data governance structure. It starts to break down what are the different levels of concern we should have: Who are the different stakeholders that overlap with these different types of data and different realms in which they're collected? How do we need to handle them? What are the risks associated with them?

Data trusts may not be the right way to govern it; there are other models, such as data collaboratives. The California Data Collaborative is hundreds of water utilities sharing their customer data in a closed yet open forum that allows them to tell stories with data about all the things that they've done to conserve water during this historic drought.

Cities will have to take a look at their founding documents and come up with a process that allows them to create a new foundation for managing information. I'm sure Debra has tons of stories about [how] every agency, every city, every level of government does it differently and none of them work together, and, as a result, we have huge inefficiencies. We have mistakes made, but we have lots of opportunities for innovation that are left on the table.

*Doherty:* New city charters should be built around these discussion points because there's not one universal answer that is a silver bullet that everyone should adopt. We focus as a business on three big areas: safety, security, and a measurable increase of quality of life. Can we create an environment that allows that city to take on its own personality, take on its own soul, and take on its own mythology so we can create urban environments that are [neither] *Blade Runner* [nor] utopia, but somewhere in between that [can] grow organically and actually create a safer, more secure, and higher quality of life around the world?

**Many members have withdrawn from the advisory board of Neom, in Saudi Arabia, due to the murder of *Washington Post* columnist Jamal Khashoggi. Meanwhile, Google employees are protesting the company's creation of Project Dragonfly, a censored internet for China. What are the ethical and moral obligations you must weigh when you consider working on smart cities in these countries? [Note: Doherty and his company, TDG, are currently a consultant to the Saudi Royal Court.]**

*Doherty:* What we're trying to aspire to deliver is to increase the human condition. If that is the overall goal, we have to weigh events and great challenges on a per project basis—you can't holistically damn an entire country and/or people when there is a direct need. So how do you start to balance [between] not rewarding

bad behavior [and focusing] on things that have meaning? Case in point is Saudi Arabia: We are focused on the Arab youth, the future of how that country starts to move forward with or without the current leadership.

The U.S. departments of State and Commerce have been great from a guidance aspect. In the case of China, we rely on our relationship with U.S. Ambassador Terry Branstad and his staff in Beijing along with the consulates in Shanghai and Guangzhou. Where we are constantly benchmarking ourselves against is, “Is this going to cause any issue from your perspective as the American government?” And we have to take two steps back and say, “What’s the perception, and what does it mean when we’re talking about such an aspirational way of looking at cities—which affects [everything] from supply chain to the inhabitants to the visitors to [how] it resonates globally?” It’s a responsibility. I’d be a liar to say we don’t stay up at night worried about this stuff because we don’t want to do the wrong thing [and] we know we do a lot of things right. So [we check in with our advisers] to understand what’s the real story, what’s the other side of the story, and then make choices to move forward or not.

In the case of Neom, it’s such a large project that any one event should not derail the overall aspiration for that project. I understand the immediate need of taking two steps back. Some people resigned, other people said we’re not going to participate at this moment with what we can deliver here, and I think that is a personal and/or a business choice that is needed for right now.

But if you’re playing the long game, we need to start rethinking why you would be an advisory board member to begin with. Is it that you have a skill set that is [useful] right now, or is [the project] something that actually has the aspiration in place so that the vision and mission become something that is looked upon rather than the immediate reaction to a political situation?

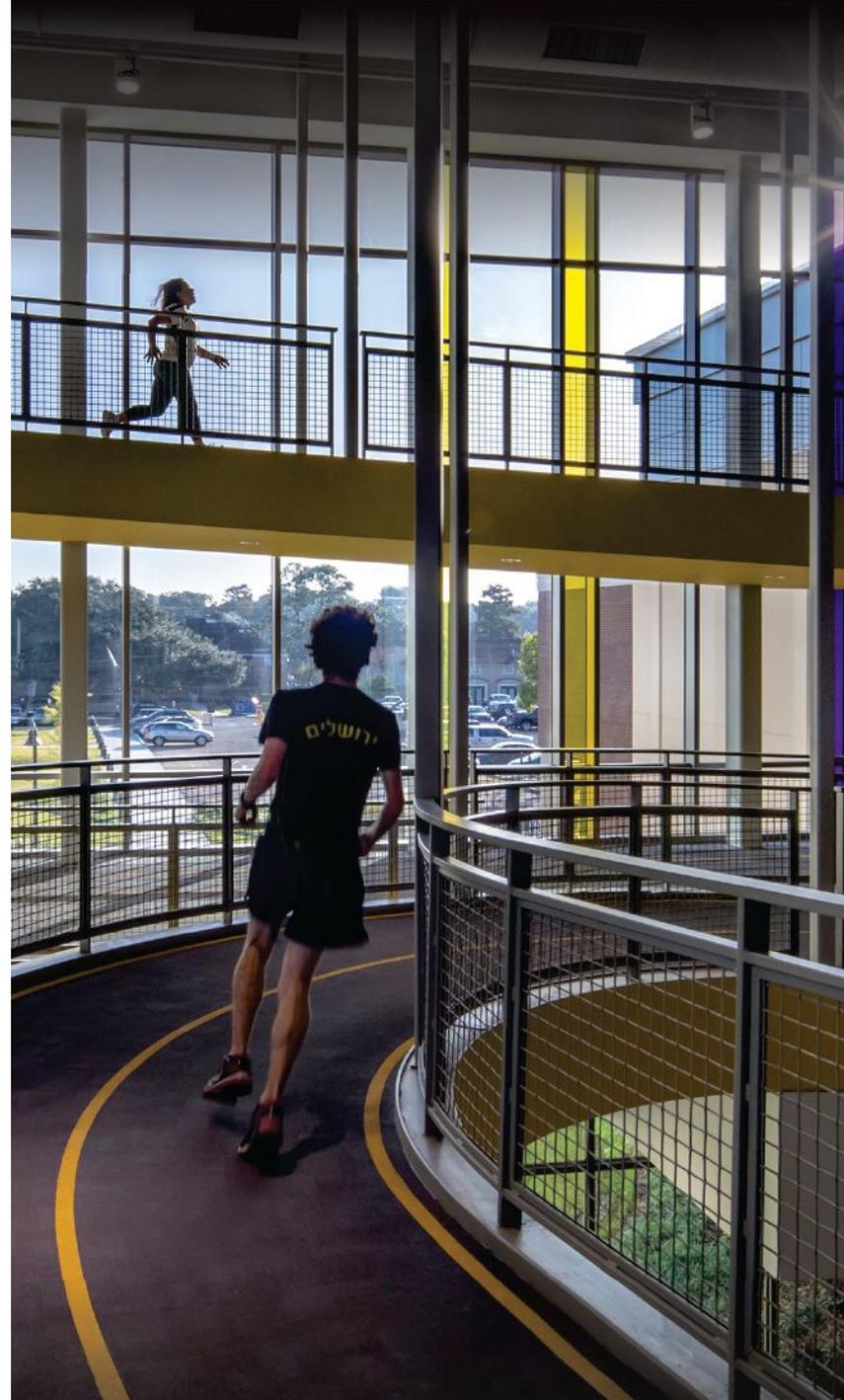
**What rules of thumb do you recommend in the approach to smart cities, and what often gets overlooked?**

*Lam:* I don’t think we figured it out yet, but I do think we are more cognizant of the problems that have arisen in the past and what damage could result. The biggest issue around smart cities right now [that also has] the biggest potential is around equity and [using the] agency [offered] with technology and data to address some of these critical equity issues with the community.

At Georgia Tech, we are looking at a smart community core where we’re trying to embed

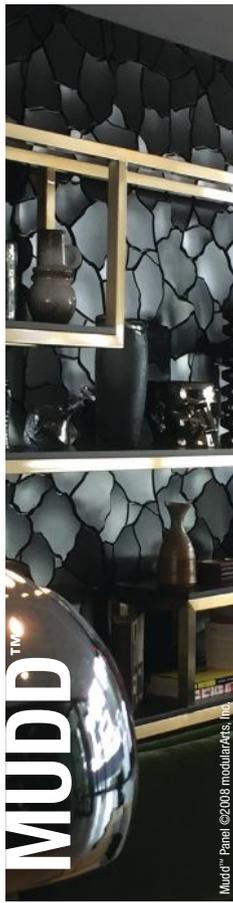
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students and researchers into some of these communities to look at these issues and unlock some of those challenges.

Once you have that research in place, [you have] essentially what I'm calling the building blocks of a smart city development. And [then] you can layer on additional tools and partnerships that strengthen the foundation of a smart community development. Smart cities are about long-term engagement—infrastructure that's multi-generations. It's certainly important to have wins to keep motivated, but you are trying to embed community change, and that's not something that's going to be done within a budget cycle or an election cycle.

*Townsend:* What I think is often overlooked is planning. There's only a handful of cities around the world that actually systematically plan for their smart city strategy. And even [among] those, it's a small effort inside the mayor's office that often results in more of a political document than a serious operational document.

[Smart cities require] drawing upon all of the departments in government. It's often drawing

"There's only a handful of cities around the world that actually systematically plan for their smart city strategy. And even [among] those, it's a small effort inside the mayor's office that often results in more of a political document than a serious operational document."

—ANTHONY TOWNSEND, FOUNDER, BITS AND ATOMS

substantially on the private sector. Ideally, it should draw upon NGOs both for problem identification, but also for implementation of big parts of the strategy.

It requires a lot of resources, work, time, and engagement. And it's not something that can be thrown together quickly by staff behind closed doors. And I think most cities fail to take that seriously.

Best practices are emerging and we've documented some of them. There are consultants that do this now, so cities have resources to draw upon when they need help. This idea of digital master planning or smart city planning might be here to stay in the same way, like 10 years ago, no one knew how to do a sustainability plan. Now, it's a bread-and-butter thing that cities do.

*Doherty:* I thought the point was well made that [smart cities] were [once] about selling product—routers and data centers and things like that. This is fast evolving into a much deeper meaning in the contextualization of what humans need, which then increases sales. If you can imagine the size of the projects we're working on, we're talking anywhere from a five- to 15-year build-out at billions of dollars.

When I'm talking about getting a kitchen inside of a home, I'm not talking about the sale of one refrigerator—I'm talking about 500,000 refrigerators. You start seeing why CNBC, Bloomberg, and *Forbes* are focused on our industry for the first time in a positive light, saying, "Wow, this is an economic driver because the world's population is moving into these urban environments." What are those urban environments like? And how can we start to see into the future so we can backtrack in a critical path to find out where we need to start spending our resources so we can deliver these urban environments?

What we're challenged with is how we can put our own viewpoint on this as we start to see the people wanting to have more.

In other words, stop taking a look at the city council and city departments as a place where you have to go for a building permit and hearings. Yes, that still has to happen, but I think the conversation is changing because they're also looking for help. And who are they going to? People like Cisco, Schneider Electric, IBM, and Huawei, who really don't have the instinctual knowledge of what we possess as built environment professionals. And then they have to come back to us.

Let's cut out the middle man and start having those conversations for real because this is the challenge of our lifetime. We need to have the academics and the consultants of the world also participate because we can all learn from each other. There is no one person doing smart cities—and that's "the only way" to do it.

By creating those environments of learning, we are now bringing in these collisions of groups—like the Wanda Groups, the Disneys, the Warner Brothers, the Sonys—because they have a conversation at this table as well. So this combination of how to pull together experts and deliver a project is no different than [that for executing] a single building [for] a typical AEC project. All we're doing is scaling that.

And I don't think there's any one profession better able to have that type of holistic view—but then also take a micro view to actually deliver things—than architecture.

This conversation has been condensed and edited for clarity.

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