

# SMART CITIES: INVESTING IN THE FUTURE



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## SMART CITIES: INVESTING IN THE FUTURE

- Cities need private investment to realise their smart city goals.
- Given the nature of smart city projects and their payback periods, traditional infrastructure financing models may not work well.
- Barriers to smart city creation and success will vary by market type; corruption may be an obstacle in emerging markets, whereas privacy may pose more of a problem in developed markets.
- The return on investment and the definition of success may differ based on perspective: societal v financial.

The term “smart cities” conjures visions of a future where digital technology monitors and connects everything from buildings to street lights to self-driving cars. It allows governments to provide better city services more efficiently, creating a more accessible, safer, cleaner and greener environment in the process. The city’s citizens are able to better utilise all the city has to offer, from the convenience of their smartphones. Most cities today are far from that vision but many are working towards it, both investing in smart infrastructure and creating ecosystems that allow urban innovation to flourish.

However, many cities, constrained by austerity, must look to the private sector to fund this development. Institutional investors, seeking yield and looking to meet their long-term liabilities, have long been touted as the ideal sources of funding for infrastructure, whether smart or not. So why isn’t that much-needed flood of investment happening?

This report will examine the investment landscape for smart cities, and investigate the related opportunities and risks for investors.

### ***Ways of investing in smart cities***

- The majority of private investment so far has been concentrated in the transport and mobility sectors.
- This investment is usually directly in tech start-ups or through venture capital funds.
- Cities can influence the pace and type of smart development by creating an environment—through regulation, subsidies, etc—that supports private-sector development.

There are three main ways technologies can be used to make cities smart, according to Ani Dasgupta, global director of the World Resources Institute’s Ross Center for Sustainable Cities. “One is simply to manage cities that have complex systems better. Ten years back when IBM started talking about smart cities, that’s what they meant because they were trying to figure out how technology could solve the management of cities,” he says. “The second is to provide new services that it wasn’t possible to provide without the technology, like the Ubers or smart bikes of the world, or making existing services

better, like using your mobile app to know when the train is coming. And the third is to actually make governance better, to make cities more responsive for citizens, to better hold people to account.”

Much private investment so far has been concentrated in the transport and mobility sectors, both in providing new services and improving the use of existing services. Anthony Townsend, founder of urban research consultancy Bits and Atoms and author of *SMART CITIES: Big Data, Civic Hackers and the Quest for A New Utopia*, sees three reasons why: “One, there was such a paucity of innovation for decades that recent innovations in transport such as electric vehicles, Uber and driverless cars are having a real impact. Also, it’s an area where public operators have had monopolies—either by fiat or *de facto*—for a long time and now there’s a real opportunity to come in and redefine the market. And finally, transportation has a much more direct translation to consumer markets that has made it easier for venture capitalists to understand how it works.”

However, this private investment is usually made by investing in tech start-ups directly or through venture capital funds; institutional investors may lack the mandate to invest directly or be limited to allocating only small amounts to venture capital. “Investing in a start-up is a different route than traditional infrastructure investment—it’s more like looking for the next unicorn,” according to Susan Wachter, professor of financial management, real estate and finance at the Wharton School and co-director of the Penn Institute for Urban Research, University of Pennsylvania.

While cities and citizens want cutting-edge technology, its very newness can be a risk. People have to be willing to accept the new technologies into their daily lives. If they don’t or if the technologies make them feel more isolated from their fellow citizens, it will lead to failure. Ms Wachter asks, “What technologies are going to take off? If these are long-term investments, we have to be concerned that new technology may outdate the investment. Will the technology be superseded before the investment pays off?” But even successful technology can run into problems when cities do not know how to regulate something new, as has happened with Uber in numerous cities, including New York and London, creating risk for investors.

Cities may have limited involvement in the actual selection and funding of smart city projects. Their influence instead can come through creating an environment—through regulation, subsidies, etc—that supports private-sector development. Carlo Ratti, director of the MIT Senseable City Lab and co-chair of the World Economic Forum’s Global Future Council on Cities and Urbanisation, says, “I do not see a smart city as a top-down planning exercise, but as an ecosystem. The role of government is primarily to foster innovation. It is like creating a garage culture at the urban scale.”

But cities can be strategic in how they do that. The city of London chose to open up the data from its transport network so that start-ups could create apps that help commuters use the system better, for example, telling them when the next bus will arrive. While this does not improve the bus service, it does allow for more efficient use. This ultimately cuts down on congestion and becomes a cost saving for the city, as there is no need to install digital displays at every bus stop. More efficient use encourages greater use, potentially benefiting investors.

## ***City-managed development***

- Many cities' inability to solicit private investment holds back smart city projects.
- Most cities do not have the technical or physical capacity to prepare projects for investment.

Despite their limited ability to fund smart city projects, cities remain the main drivers in the development of smart city systems that use digital technology to increase the transparency and governance of city services. "The first category—to make city systems work better, everything from transportation, water, sanitation, all those things that a city has to run—those are the investments that tend to come from the cities themselves, working with big core technology data companies like IBM, Cisco, Siemens and others," says Mr Dasgupta. "There is a lot of euphoria but I don't think as much investment."

Often cities are unable to solicit private investment on their own, as the long-term instruments that institutional investors require or the cities' liabilities are connected with the national government.

"We've done quite extensive analysis of the powers and responsibilities of mayors and, if you remove India from the equation, there is a pattern of mayors having control of many of the areas that have an impact on climate change—transport, energy and energy efficiency, waste, planning, economic development and so on," says James Alexander, director of the City Finance Programme and head of C40 Cities Finance Facility. "The downside is that finance is still one of the areas that national governments are holding, and there's a lot of authorisation and approval required. Around the world, certainly most cities have to get approval before taking a big financial commitment. And some cities are not permitted to at all."

City governments tend to rely on the financial models they have always used for traditional infrastructure, such as public-private partnerships (PPP) and private financing initiatives (PFI), or by issuing bonds (municipal revenue bonds, which are backed by the revenue stream of a specific project, or general obligation bonds that can be repaid through a variety of tax sources).<sup>2</sup>

Some cities have been successful with using these models for smart city development. "Stockholm, for the past 20 years, has taken one redevelopment district at a time and consistently ratcheted up the level of what they're trying to do in terms of integrating technology, doing it in the context of a long-range plan, and lining up public and private investment. And it's achieved some pretty spectacular results," says Dr Townsend. "Stockholm will likely soon be the first carbon neutral city on the planet. It has been successful because all three sectors of society—government, business and civil society—agreed on and hold each other to incredibly ambitious goals for carbon reduction. They are saying we're all going to take a large step together and put a lot of resources into it and not point fingers at each other when things go badly."

However, these traditional models are not always the best option for smart city projects. While a conventional infrastructure investment like a bridge will provide a clear revenue stream within a certain period, in the form of tolls, what happens when the investment is used for sensors to monitor

<sup>2</sup> Coalition for Urban Transitions, [http://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2018/01/NCE2017\\_CUT\\_GlobalReview\\_02012018.pdf](http://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2018/01/NCE2017_CUT_GlobalReview_02012018.pdf)

the condition of that bridge? When investments are not consumer or citizen-facing and instead are like business-to-business (B2B), but, in this case, are business-to-consumer (B2C), the metrics are different. How do you build a financing model based on money saved rather than money earned? This can be a difficult concept for investors to understand. Ms Wachter says, “What cities need now are new models. It’s going to require cities, investors and smart city tech providers to agree standards.”

Most cities do not have the technical or physical capacity to prepare projects for investment, much less to come up with new financing models, according to Mr Alexander. “Cities are feeling that they’re not getting any financing because they hear the banks are not interested in their projects. And at the same time, the finance sector is thinking that cities don’t have any projects because there are no projects that are ready for them to take on,” he says. “So there’s a kind of gulf, and the finance just is not flowing.”

## ***Creating better finance for a successful future***

- Projects where government and investors both have an ongoing shareholder role may increase the likelihood of success.
- Mature financial markets and well-established regulatory systems are critical to allowing innovation and investment to thrive.
- What constitutes success for a smart city project will vary, as what is “smart” will be different for different cities.

The best outcomes to develop and finance smart cities come from partnerships and co-ordination with mayors, national planning agencies, private-sector developers, investors (whether institutional or venture capital) and citizens. Projects where the government has an ongoing shareholding role within the project can align interests with the investor.<sup>3</sup>

But beyond financial alignment with the city, “investors need to look for win-win outcomes for the citizenry as well as for the funders,” says Ms Wachter. “I’m thinking specifically about India, where there is, of course, political risk but there is also so much gain to be had in terms of the huge need for infrastructure.” When citizens clearly see the benefits to themselves of a smart city project, for example, better services and job creation, they (and the politicians who represent them) are more willing to support its development and financing, lowering the overall risk to the investor.

Cities with younger populations already comfortable with technology will have an easier time convincing them of the benefits of smart city projects. Moreover, older cities, where developing new smart technologies is usually more expensive and time-intensive to incorporate into existing infrastructure, may find it harder to convince populations. There may even be a political element; cities in countries where the government plays a prominent role in all investment decisions can almost guarantee take-up of smart tech by requiring citizens to use it.

Mr Dasgupta cites three things cities must do to be successful and that institutional investors should look for when assessing smart city investments: “As inequality grows, cities need to figure out how

<sup>3</sup>McKinsey & Company, <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/navigating-risks-in-project-finance>

to use services like public transit to make things more equal. Second, cities need to be productive, meaning able to create jobs. If they are unable to create an environment where employers want to invest, that's not going to be successful. And ultimately, cities need to be environmentally successful, not just for themselves, but because the planet won't be successful if cities are not."

Some cities are creative in how they regulate in order to promote a more equal society. "The city of Sao Paulo came up with a system of regulating Uber by taxing the number of miles driven," Mr Dasgupta says. "But then they figured out a discount system, saying, 'if you have women drivers, we will give you so much discount and if you run it in the middle of the night when we don't have our public transport, we will give a discount, if you run it in remote areas of the city'...So that's a really creative way to ensure new technology helps the city meet multiple goals." By benefitting citizens—in this case, encouraging more private-sector transport in public transport deserts—these innovations generate additional support for the smart city investment and increase the likelihood of success and additional investment.

In terms of productivity, Mr Ratti says: "Different levels of government can nurture the regulatory frameworks that allow innovations to thrive. Considering the legal hurdles that continuously plague applications like Uber or Airbnb, this level of support is sorely needed." Investors who want a clear picture of the risks involved in an investment will be put off by an unpredictable regulatory environment.

Mr Dasgupta adds: "We did an exercise to see which cities are succeeding in attracting private capital and we found the maturity of national financial markets and the regulatory environment were very big predictors, no matter how gung-ho the city was."

The critical elements for a successful smart city project and, by extension, a successful investment, will vary by city, as what is "smart" will be different for different cities. And that should influence the funding structure. "For Miami, what's smart is to exist at all, so they are smartly putting together a resilience plan," says Ms Wachter. "The city plans to fund it through a general obligation bond and that makes perfect sense. Because, if Miami exists, it is resilient, not flooded out, Miami will be able to pay their general obligation taxes. So it does very much depend on conceptualising the specific smart city need with a smart city funding structure."

### ***Digital master plans: how to ensure success***

- Cities need digital master plans to guide their development.
- Once a city has a plan, there are different ways to successfully execute.

Investors should look for city governments that take a hands-on approach and have a clear plan, Dr Townsend believes. "I've been tracking the development of master plans starting around 2011-2012 when New York, London, Chicago, Dublin, San Francisco and Singapore all within 18 months of each other released long-range comprehensive technology plans. I call them digital master plans," he says. "They weren't sets of laws or programmes, they were guidelines, strategies and visions, and they all talk



about economic development, infrastructure and services, and some of the more ambitious ones even have more creative ideas about social media, transparency, open data, blockchain and other emerging technologies.”

Once a city has a plan, there are different ways to successfully execute. There is also the opportunity for one innovation to encourage the development of others. Mr Dasgupta believes “cities are doing better when they start by fixing a sector, ie, focusing on energy or transport, and then moving on to integration. Only once they have their architecture can they try to work across sectors. Very few cities are there, but those that have that type of organisation are seeing much better investments because it’s a predictable environment.”

One example is the founding in 2000 of Transport for London (TfL), a local government body responsible for the transport system in Greater London. Its services are provided by wholly owned subsidiary companies such as London Underground, by private-sector franchisees (eg, other rail services, trams and most buses) and by licensees (eg, taxis and river services).

“The government of London is a great example of a city where the city government doesn’t actually have a tremendous amount of resources or authority,” Dr Townsend says. “So the approach they have to take is to identify the priorities, convene a conversation, build a network of stakeholders who will actually implement this and try to mobilise those efforts to implement the plan. And I think it’s been effective for the city and investors.”

## ***Moving towards a new model***

- Cities must look at different financing models to get private investors involved.
- Urban think-tanks are working to help cities understand their financing options and bridge the gap with investors.
- As smart cities digitise, there will be more performance data to make investments easier to monitor.

London’s outsourcing and licensing approach is indicative of what many cities are now doing—and shows where investors can get involved. “Looking at the business models cities are using and are able to use, I think increasingly cities see themselves not as owners and operators of services but as people who deliver, for example, a mobility service,” Mr Alexander says. “A city doesn’t necessarily need to own a bus in order to deliver a mobility service but it does need to be the one that is contracting and figuring out the financial model.”

Dr Townsend sees clear opportunities for institutional investors. “I can see pension funds getting into the business of funding companies that operate self-driving taxi fleets, because they would have an incredibly predictable revenue stream,” he says. “They are just throwing data off about their operations, and you can measure it with precision. It’ll be like farming but instead of taking satellite pictures of fields, they’ll be taking snapshots of the movements of geriatric crowds to engineer the prices and reimbursements from the government.”



But most cities are still in the process of figuring out the financial models needed to provide the services their citizens need and a clear return to investors. “We’re helping Mexico City with an electric bus programme—figuring out the business models, working out the specific solutions,” says Mr Alexander. “There’s a lot of variation around the world in PPP rules or regulations, the legal boundaries around which the contracts can be entered into, and this is where it becomes quite new and challenging.”

Cities need a better understanding of how financial instruments and models—like guarantees to de-risk projects, bonds to raise debt financing from pension funds, or PPPs to capture land value<sup>4</sup>—can suit different project stages, market and governance conditions, and investors. The growth of secondary markets and improved liquidity in infrastructure finance would also encourage more investment from institutional investors.<sup>5</sup>

Urban think-tanks and organisations like Mr Alexander’s C40 are working to help cities understand their financing options and bridge the gap with investors. “This is like the land grant colleges in the US, which were so important for putting into place the modern agricultural processes that allowed the US to take off as an agricultural nation,” says Ms Wachter. “The same thing is happening now with urban think-tanks, which are gathering data for informed holistic smart city investment.”

She adds, “What’s terrific about the digitisation revolution is that it lends itself to a holistic perspective. The more smart cities set up the infrastructure to get smarter, the more PPP contracts, procurement practices, etc, will be standardised. And as smart cities digitise everything, there will be more performance data to make PPP investments easier to monitor.”

For institutional investors wanting to successfully invest in smart cities, help navigating this complex and rapidly changing investment landscape is key. Combining global best practice with local knowledge, especially in emerging markets, is extremely important to manage risk, whether investing in city-led smart city projects or in the companies providing smart city technologies. But the scale of investment needed, the game-changing nature of this technology for cities and their citizens, and the potential for long-term, often inflation-linked, returns make smart cities worthy of investor consideration.

<sup>4</sup>The City Fix, <http://thecityfix.com/blog/development-finance-institutions-have-a-role-to-play-in-creating-sustainable-cities-giulia-christianson-ani-dasgupta/>

<sup>5</sup>Coalition for Urban Transitions, [http://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2018/01/NCE2017\\_CUT\\_GlobalReview\\_02012018.pdf](http://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2018/01/NCE2017_CUT_GlobalReview_02012018.pdf)

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