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SMART CITIES: AN ANSWER TO SOCIAL AND ENVIRONMENT RISKS?

CATHERINE SABBAH

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SUMMARY:

The pace of technological change in the last 20 years has abounded. In some ways, we struggle to keep pace with these changes from a policy and practice perspective. This is perhaps nowhere more apparent than with the notion of "smart cities" and the use of "smart technology." Much has been written about the implications of the use smart technology has on cities and here journalist and Urban and Regional Policy Fellow, Catherine Sabbah, joins the discussion by exploring how smart technology can address new social and environment risks in Paris — drawing on lessons learned from her case studies of how New York City and Chicago have incorporated smart technology into managing security and urban planning. She found that while there is great opportunity to harness the power of this technology and the corresponding data gathered to inform policy planning, design, and implementation, two things set the United States apart from the Paris example — and in fact pose something that Paris can learn from these two cities. First, a strong partnership between universities and the public sector (city government for example) is essential for development, analysis, and evaluation. While partnerships with the private sector are naturally relevant here and play a role, universities are taking a lead on understanding the implication the use of smart technology has in policy planning and design. Second, and drawing on the first point, universities are helping the public sector understand how to use the technology that is not just in the interest of the commercial and helps to ensure that the interest of smart technology remains in the domain of and for the public. This paper will explore these themes and more.

About the Author
Catherine Sabbah is a French journalist specializing in urban policies, planning, and architecture. She is a staff writer for Les Echos, a French business newspaper and she also writes for L'architecture d'aujourd'hui, in addition to her blog, www.larepubliquedelarchitecture.fr.

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Is the city of today a place of security for its residents tomorrow? Cities attract people for their vibrancy, opportunity, and safety — here safety is central given the flow of individuals and families into the United States and European cities who seek shelter and refuge from war, starvation, and abusive political regimes. But these very cities that provide sanctuary for many are also full of new hazards.

In densely populated cities, emerging hazards include acute social and economic inequality, overcrowding, and crumbling infrastructure with a need for ever bigger infrastructure projects. With little investment on the horizon, shortages of affordable housing for growing populations and the reality of a changing climate is putting increased pressure on cities to both adapt and mitigate the effects of change. Put together, these risks threaten to extinguish a city with a single match.

Smart cities, operated with the help of "big data" and a series of new tools designed to improve public policies, could be an answer to these new threats. It is argued that the ability of a city to obtain and analyze huge amounts of real time data is a power in itself that can be harnessed for a social good. Moreover, it is also argued that smart city technology (i.e., sensors, cameras, etc.) can help to take the pulse of a city and use that information to create new public policies that are more efficient, more accurate, and easier to evaluate. Technology can be used to improve public information and therefore individual choices in areas of mobility, health, housing, education, and the environment. But we do not yet have concrete answers or know whether the desired outcome will be as glowing as the arguments suggests.

Everyone from researchers, inventors, and politicians have been heralding smart cities and as a result governance is being turned upside down, but perhaps too quickly. It seems that every municipality is dreaming of calling its city a "smart city" but this sometimes confuses the means with the ends. The challenge is that stakeholders confuse providing technological tools to define policies. Whereas, on the contrary, policies should be decided first and helped, if needed, by those new instruments.

Is the smart city really government surveillance in disguise? Will "sensors become censors" as sociologist Saskia Sassen asks?[1] When cities decide to implement smart city technology, when should leaders, residents, and consumers be informed? While city leaders know that a new era of data gathering and use has arrived, as my research suggests, they must still balance control of governance with the well-being of residents. Indeed, city leaders should avoid giving up the keys of the house to the private sector in order to guarantee a "right to the city," or at least, access to its public services for everyone.

With these challenges in mind, this paper stems from two articles written for the publication I work for in France that draws on two case studies of research I conducted while an Urban and Regional Policy Fellow in New York and Chicago. The two case studies comprised of the New York City Police Department's domain of awareness and Chicago's network of sensors. These case studies illustrate the type of risks cities are faced with when applying smart city technology. My objective with traveling to New York and Chicago was to better understand how these two cities were using smart technology to manage perceived risks and draw comparisons for what is happening in Paris while also exploring replicability in other cities.

But the overarching objective of my research into the Franco–American comparisons is to force politicians and the public alike to take a deeper look at the smart city technology and to reflect on how exactly this new method of city administration could be a revolution. Indeed a good one.

Paris and Chicago Approaches

Before my trip to Chicago in 2016, I was intrigued by the Array of Things system. Despite the fact the first sensors were installed in the summer of 2016, it seemed that few citizens were aware of the system. Within the University of Chicago, a team of researchers led by Charlie Catlett, a famous computer scientist at Argonne Laboratory,[2] had been working

1 Aparna Piramal Raje, "Redefining Notions of Urban Intelligene," June 29, 2015, Columbia University Global Thought, http://cgt.columbia.edu/news/sassen-redefining-notions-urban-intelligence/.

2 Urban Center for Computation and Data, "Charlie Catlett," http://www.urbanccd.org/charlie-1/.

for more than four years on this system which enabled the collection, the process, and the communication of urban space data. The idea was to analyze the data to help inform how to improve urban life.

At the time, the very idea of monitoring cities was not widespread and only entertained by a few researchers. In Chicago, the initiative is local. It is part of the digital strategy championed by Mayor Rahm Emanuel to try to improve public services. The Argonne National Laboratory, one of the most important federal research centers, is contributing $3.5 million to the initiative, clearly showing that it has potential. This type of initiative has spread ever since, with Chicago remaining the most accomplished example of its implementation. Eventually, it will be rolled across the whole city and will remain in place so that it can be improved based on the results. Remarkably, this initiative has not come from a startup but from a publicly-funded university laboratory. The system makes it possible, with only one sensor, to measure 22 different indicators: from the level of humidity in the air to the density of a crowd in real time. The novelty comes also from the fact that the researchers and engineers involved in the project are not urban planners or city experts but network and technology professionals interested in social issues. "I don't really use the word smart cities," Charlie Catlett insists, "because more often than not, the word is used to pretend that by using technology, we can fix problems that have got nothing to do with it."

> *"Even if the Array of Things system has the public interest in mind, the general public does not yet really see its relevance."*

Air quality measurements and other environmental indicators have long been available but this team of researchers was puzzled by the differences between neighborhoods of a same city, sometimes very close and yet with different air quality. "Why would asthma prevalence or academic achievement differ from one block to the next? Our approach goes further than just stating a fact. We want to uncover the causes to tackle them", Charlie Catlett adds. Collecting and processing data sums up in a few words this significant enterprise which is forcing numerous stakeholders, among them investors, to ask themselves why and how. "Before investing in public spaces or planning, cities now want and need to know and understand the impact of their actions on the economic development or the social environment. For instance, it might be useful to know the number of visitors a park attracts and during which hours to know which type of companies or trades could set up nearby and which to encourage or help. We use Google street a lot to see how the environment evolves but it only provides one image per year while our system can provide several a minute" Charlie Catlett adds. It can also create categories for pedestrians: Are they pushing a buggy, are they with children or walking their dogs? This would indicate a safe environment. By contrast, a majority of people outside at night and on their own could be telling a different story. The system goes further than simply quantifying data. Based on anonymous data, it can qualify a space.

Since June, weird-looking white objects created with the School of the Art Institute of Chicago have been placed across the city. Fixed to walls, posts, or on traffic lights, they look like a sort of resin hive containing 22 sensors. A camera points to the sky to take weather measurements while another faces the ground to count passerbys or cars and very likely in the future, identify the level of stagnant water to possibly prevent flooding.

Around 50 of these "machine-objects" were installed in 2016 and the city plans to install 500 more in the next two years. The originality of these sensors is that they contain machines that analyze data before it is sent. Pictures, for instance, are almost immediately destroyed which solves the problem of private life infringements. Alongside the city of Chicago and publicly-funded research labs, six companies have offered their engineers' time, a contribution worth hundreds of thousands of dollars. Microsoft, Cisco, Intel, Motorola Solutions, and Zebra Technology et Schneider Electric will benefit from the research results which will be, in any case, freely available on the city database.

Several of these companies wish to develop mobile applications that would give a direct and real-time access to the data from a smartphone, without having

to use public portals — City of Chicago Data portal or Plenar.io — which gives access to a whole series of data in real time. It will be possible for instance to know the CO2 in your local environment right where you are. Carrying a monitor around one's neck, like it is done in near dangerous radiation zones is not yet part of daily life, especially given that pollution alerts are communicated to the public via the media. Even if the Array of Things system has the public interest in mind, the general public does not yet really see its relevance from what Charlie Catlett says. More generally there seems to be a gap between what scientists consider as big steps, for example the sensors in Chicago, and what people think they already know. The interest of measuring the temperature or the gas content in the air does not always sounds necessary, given the fact that there are already — and have been for years — weather forecasts and pollution alerts. The accuracy of the data and the help it can bring to urban policies is not obvious even for the majority of mayors and politicians I met and interviewed.

Paris is Far Less Equipped

In comparison to this big-scale initiative, Paris seems to tinker. The French capital is well ranked in the different smart cities rankings because it promotes startups and has an effective communication strategy in place — the French tech knows how to attract attention. But access to data is not a priority nor something the public has asked for. In contrast with the city portal of Chicago, the Paris portal, Paris Open Data, provides databases on a range of topics, sometimes useful but that hardly evolves: school mapping, number of car parks, localization of shared bikes of cars. This information is also available on the platforms of the operators that run these services or on the Internet website of the city. Not a lot of real-time information and not much updating on the Paris portal. It provides photographs of the city, data analysis requires a film.

> *"Smart Paris focuses more on participatory and sustainable aspects than on digital technology."*

Since 2015, Paris has had a chief data officer, Jean-Philippe Clément, but he is not well-known and does not rank highly in the city's organizational chart. Similarly, the sustainable and smart city directorate set up in 2014 and led by Sabine Romon is working at the moment on running the city services and heating management in public buildings (quite a big deal admittedly). For Paris to become a smart city, about 40,000 civil servants need to learn to work together in a new environment. Yet, Smart Paris focuses more on participatory and sustainable aspects than on digital technology, even as a tool. The collection and analysis of data are not topics most readily discussed within the city which lags a bit behind in this area.

A large-scale experiment has nevertheless been carried out in 2016. In the context of an urban redevelopment program of several important Parisian squares, the Place de la Nation square, a circular space with a diameter of 250 meters in the east side of Paris was equipped with sensors affixed to urban properties and infrastructures. The idea was to measure urban traffic, the number of pedestrians, bikes, the frequency of texts exchange, noise, and air pollution. Eventually, the aim is to make the central garden of the square — currently a desert island in an ocean of cars — accessible by pedestrians. Reconnecting some islands, by stopping the traffic at different strategic points for a few days and measuring the reactions of car drivers and pedestrians will greatly help decision-making when the design of the Place de la Nation square is eventually modified. This constitutes a new approach, called tactical urbanism. "On the one hand, the project operates the Internet of Things by highlighting the role of sensors in the way cities will be run in the future, with the measurement, in real-time, of data that can be combined. On the other hand, the project promotes public-private partnerships, in this case with Cisco, but also with the ecosystem of Parisian startups that work with us on these data" explains Jean-Louis Missika, deputy of the Paris Mayor Anne Hidalgo, in charge of urbanism and innovation.

Four panels on the square show pedestrians the level of noise pollution at the time they walk through. Poles are covered with sensors and the data obtained are then analyzed using algorithms. About 20 cameras have been installed on the square. The U.S. startup

Placemeter supplied the image-analyzing software able to measure with precision the number of people, cyclists, and cars on a virtual zone drawn on the monitor. The software cannot identify anyone but can record the speed of motor and two-wheeled vehicles, pedestrians, and even the time people spent siting on benches. About 70 measurement points were chosen across the square. In addition to the analysis of traffic flow, 14 sonometers were installed together with 5 captors to assess air quality. Thermometers were also installed to measure the temperature. This data is collected via Wi-Fi and sent to servers locked in a cabinet located on the square. Small ultrasonic captors are located on glass collection containers and supply data on the filling level of these containers every four hours through the LoRa network dedicated to the Internet of Things. The collected information makes it is possible to optimize the collection rounds and reduce the number of trucks required. Another set of data can be collected thanks to the eTree, created by the German startup Green City Solutions. This eTree can filter pollutants and consists of a four meter-high vegetal wall of moss affixed to a bench. The integrated computer system is powered by solar panels and ensures the automated watering of the wall. It also supplies environmental data.

The data is first processed by computers located on the square, then sent to the datacenter for analysis. A myriad of startups take part in this program. Qucit is a startup from the city of Bordeaux that puts together optimization algorithms for fleets of bicycles; Breezometer is a Cloud platform analyzing pollution; Bruitparif monitors noise level in the Ile-de-France region; and OpenDataSoft owns the Big Data platform that stores all the data collected on the Place de la Nation Square. Paris must now review and think about its strategy toward the Internet of Things: "There is going to be more and more captors in the city. This means we will have to be able to map them, decide who install them and where. Then, we will have to think about what to do with the data collected. Should the data remain private or open and available on Parisdata, the city's Open Data platform?" Jean-Louis Missika asks himself. Currently, the data collected are sent to the different directorates of the city of Paris: from the transport directorate to the garden directorate, and they do not yet know exactly how to take ownership and manage the data. The city of Paris works with an ecosystem of startups and with larger companies but not with universities. "Researchers are not really involved. This is a weakness of the project. At the moment, no university has asked us if it could access the data collected to analyze it" regrets Sabine Romon. Maybe because Paris has a smaller budget compared to large U.S. cities who work in partnership with their universities — for example, MIT plays an important role in Boston and New York University and its Center for Urban Science and Progress and the University of Chicago in their respective cities — it mostly works with the private sector. Paris is home to hundreds of successful startups hosted in public incubators but which sometimes struggle to grow on the French market. These startups are very local, centered on the Paris urban environment and their applications or their conclusions are not always easily replicated elsewhere. Also, their focus is on information that is useful for consumers — car park use and ride-sharing — more than the collection of data that can be extrapolated and used to improve public policies.

Data Sciences: More than Useful, Sometimes Vital

"Data collection is by no mean a game," says Rayid Ghani. Rayid Ghani is the director of the Center for Data Science and Public Policy at the University of Chicago Harris School of Public Policy and the Computation Institute. Rayid is a reformed computer scientist and wannabe social scientist, but mostly just wants to increase the use of data-driven approaches in solving large public policy and social challenges. Among other areas, Rayid works with governments and nonprofits in policy areas such as health, criminal justice, education, public safety, economic development, and urban infrastructure. Rayid is also passionate about teaching practical data science and started the Eric and Wendy Schmidt Data Science for Social Good (DSSG) Fellowship at University of Chicago that trains computer scientists, statisticians, and social scientists from around the world to work on data science problems with social impact. For the past three years, DSSG has been seeking out and accepting applications from nonprofits and local governments around the country that have a social problem and the data available for data science fellows to work with. His team of researchers works on very concrete and real cases, in order to solve urban policies issues linked to transportation, health, education, and very often,

the police. They aim to help in the design of public policies by identifying social risks and exploring how policy can be designed to protect people. Ghani notes that city administrations are not always aware of the amount of data they already possess. Nor do they necessarily know how they can harmonize data from different agencies and data gathered at the city, state and federal level.

He notes the example of schools: he argues that school administrations can develop models to predict which students are going to succeed and which are not. DSSG fellows working with the Tulsa Public School system in Oklahoma, for example, developed a predictive model that provides information to teachers about which students are at risk of not finishing high school as early as the third grade. Although the amount of educational data at the third grade level is minimal, DSSG fellows used data from intermediate test scores, the amount of time students spent using educational software, and whether they attended after-school programming to build a predictive model with a dashboard that shows teachers which students need help the most. The DSSG model in Tulsa identifies 250 more students per year than the school system's prior strategy and seeks to ensure that 95 percent of the students identified as at-risk receive the help they need. It also includes a dashboard for teachers that not only shows whether a student needs additional help, but recommends specific strategies like summer school, learning apps, or more time with certain software — to help the student get on the right educational track.

> *"The system New York employs all the standard sources of intelligence, including thousands of cameras to feed a surveillance map of the City."*

Similar schemes are being used in health agencies, which typically meet with individuals at the point of needing care. Ghani and his team are imagining a system where health agencies have the data to assess who could become ill, when, why, what disease people will suffer from in one neighborhood as opposed to another one, in order to respond early and appropriately. "A lot is registered about people, where they were born, when they encounter a problem, an accident, when they get ill, but always after things have already happened. Using the past to predict a little bit of the future and adjust the administrations capacities of response would be a great step forward" notes Ghani.

New York: A City with No Conflicts (of Interest)

"We're not your mom-and-pop's Police Department anymore" New York Mayor Michael Bloomberg announced at a press conference in 2012. With Michael Jackson's Thriller music playing in the background and standing next to then Police Chief Raymond Kelly, Bloomberg enthusiastically described the new piercing eyes of New York Policy Department (NYPD). Created to fight terrorism, the Domain of Awareness (DAS) is the most important digital tool currently used by police throughout the United States. The system employs all the standard sources of intelligence, including thousands of cameras to feed a surveillance map of New York City. It can detect terrorist threats while at the same time provide real-time information on criminal activities using analyzing multiple data sources. I rode around in a police car while the police officers patrolled streets of South Manhattan to understand how the system worked.

On this afternoon of February, the police officer who drives the car smiles, "Rain is the best weapon against crime ..." We have been driving around the South of Manhattan for over two hours but nothing of note appears on the new dispatcher used by NYPD. The voice that in films reads incomprehensible codes on police car radios has been replaced by a green text appearing and scrolling on the black screen. For the layperson, the succession of calls to report illegal acts is impressive. More than ten calls every minute: assault, burglary, forced entry, domestic violence. Events deemed trivial that give Sergeant Richard Narog, the head of the innovation department at NYPD, the time to talk about the system introduced to "make work on the ground safer and more effective." The objective

is to qualify as many 911 emergency calls as possible and as quickly as possible so that policemen know what to expect and therefore face less danger when they intervene. During their interventions, NYPD policemen may encounter violence and weapons. The more they know about the person who called them — the neighborhood where the altercation took place, the background of the people involved — the better prepared they are to respond.

I am holding the terminal used by 20,000 policemen (35,000 eventually) since the system was introduced in 2013. It has the size and look of a mobile phone but is nothing like one. The terminal provides access to the central database fed by all the intervention reports of NYPD. When we test the system, an incident is reported in a block of apartments in Tribeca. The DAS informs us that there has been an assault in this block before and we suddenly receive all the details of what happened: who, when, how, the consequences, photos of the people involved, those that got arrested and the others, those who subsequently went to jail and those who are now out of jail. The DAS's software is also installed in all the police cars. Like an informer, it provides information on the location of each police officer at any given time, it tracks speeding, and who is taking lengthy breaks. It is amazing to identify slackers — officers love it. "DAS has replaced more than ten sources of information by one," Richard Narog adds. "Before, complaints, arrest reports, accidents or 911 emergency calls were not centralized."

> *"The Domain of Awareness system is a sort of hybrid project born of public-private partnership on a sensitive topic: public safety.."*

Back in the police department, I visit what is called the "war room," where several teams monitor big events such as visits by heads of states. Walls are covered with giant screens where you see what is happening in some neighborhoods that are controlled by thousands of cameras and sensors that can tell a gunshot from firework. Any noise heard is immediately sent to a company in California where human ears listen, day and night, and apparently never get it wrong.

It is in this room, when nothing happens, that engineers from Microsoft teach police officers how to work with the data. Among those is Denise Mac Donald who helped develop the software from scratch. DAS is indeed the result of a joint venture between the IT giant, NYPD, and the city of New York, a sort of hybrid project born of public-private partnership on a sensitive topic: public safety. It is constantly updated and improved. "At the start of the project, policemen told us what they needed," explains Denise Mc Donald who followed the birth of DAS. "Progressively, we have come up with systems they had no idea of. We made their use simpler and more ergonomic." The familiar computer tracking from the movies has become real. A telephone number entered into the system will set off an alarm if it is linked in some way to a suspect's number. The cameras attached to police cars or alongside roads can tail moving vehicles. DAS can spot the location of a car associated with a suspect and where it was weeks or months before. "We can read, every 30 seconds, the plates of the cars that are in front or behind a suspect's car. If a car gets hidden en-route, for instance in a van that precedes it, the system sees it disappear as it happens" Denise Mac Donald explains. If a package is left behind, the police can immediately go back in time to see who left it and where the person went.

Though my perception of space is a little bit different when I leave the war room, the system is not designed to track ordinary individuals. It is presented to me as a guarantee for better policing, more efficient and better controlled. They claim the crime rate has decreased by 6 percent since the outset of the program in 2013. However, the system has moved from one where police officers in charge of an investigation monitor an individual for a set period of time to a surveillance system where everyone is targeted and with no time limitation. This system provides back-up, if not, some argue, replaces the traditional police force.

The public-private partnership status of DAS is also questionable: without public funds, the police force would be unable to recruit more staff or pay for such a

system. With this type of partnership, other resources can be accessed, but what are the conditions? In total, the system cost $230 million. The website "Homeland Security Medium,"[3] which presents itself as a radical platform, justifies the system by comparing its cost to that of a terrorist attack. It estimates the cost of the Boston Marathon terror attacks to be $333 million when the "damages to the local economy, lost wages, damages to infrastructures and stores, the 9 millions spent on hospital care given to 70 people seriously injured and the psychological damages caused ..." are taken into account. "DAS and its technology is the cost American authorities are willing to pay for security and peace." NYC is upfront about DAS and benefits from this profitable partnership. When DAS is sold, of course without the NYC data, to other cities or countries, DAS administrators and NYPD — who spent $40 million on the system — get 30 percent of the profit. It has happened several times already, as Richard Narog and Jeff Meritt, the director of innovation at the city of New York.

Resistance is Gathering Pace

In place since 2012, the system used in New York, and to a lesser extent in other cities — has gradually started to cause reactions that are far from positive. This contrasts with the enthusiasm for the 21st century police displayed by then Mayor Bloomberg at the launch of DAS. This is a sensitive subject because terrorist threats are real and the work from the police force is acknowledged and respected. The use of images taken by private surveillance cameras has enabled the identification of the person behind the Boston marathon attacks and no one complained about this. But since the election of Donald Trump and his "law and order" policy, several cities have joined forces with the Community Control over Police Surveillance (CCOPS) to question these tools suspected of targeting black and Muslim people as well as illegal immigrants. Some of these surveillance systems have indeed been granted federal funds in exchange for sharing the collected data with the government. Around 60 cities, including New York City, Seattle, and Washington, DC, and counties have recently passed laws that end these practices or at least keep them in check. In New York, the Post Act (Public Oversized Surveillance Technology)[4] aims to make the work of the police more transparent. For instance, it requires a warrant for the use of some installations like the catch-all antenna called Sting Ray that listens to the conversations made on all the telephones located within its area. The context plays an important role: Five years after the start of the NYC system, people behind the text also question the funding of DAS "through federal funds and a partnership with a private corporation which does not seem normal at all for a question as sensitive as people's security. 99 percent of the data collected concerns the legal activities of law-abiding citizens. We would like to know where this information goes, whether it is stored and for how long" explains Michael Price, advisor for the Brennan Center's Liberty and National Security Program,[5] an organization that monitor public policies. The movement is recent but its advocates seem to be determined.

Urban Informatics, a New Field?

In Paris, the latest exhibition of the work of Haussmann has attracted a big crowd at the Pavillon de l'Arsenal museum. The name of one of the modern builders of the French Capital still attracts those interested in the construction of Paris. Yet, this time, the two curators, the architect Umberto Napolitano, and the engineer specialized in sustainable development, Franck Boutté, have not played the historians. Rather, they have taken the role of data scientists and they have counted. What have they counted? Pretty much everything that could give them some information on the spatial structuring of the city: length of walls, thickness of buildings, number of small islands, distance to the first metro station, built-up area by square meter. Unconcerned by the historical context, they have used data from the city database and the Paris Urban Planning Agency (APUR) to compare the urban and human functioning of Paris to this of other capitals. They have done so to find out the lessons to be learned from this sustainable city that Haussmann had imagined, well ahead of his time.

3 John Smith, "NYPD and MIcrosoft Collaborate to Create the Domain Awareness System (DAS)," Homeland Secutiy Medium, June 21, 2014.

4 Brennan Center for Justice, "The Public Oversight of Surveillance Technology (POST) Act: A Resource Page," June 12, 2017, https://www.brennancenter.org/analysis/public-oversight-police-technology-post-act-resource-page.

5 Jarrett Murphy, "Video: Time for More Transparency on NYPD Data Gathering," CityLimits.org, May 17, 2017, https://citylimits.org/2017/05/17/video-time-for-more-transparency-on-nypd-data-gathering/.

"The difference with predictive analysis is that instead of basing your work on some scenarios observed, made or described by the human brain, we can form many more scenarios based on thousands of hypothesizes. This results in more readable and precise trends" explains Rayid Ghani, Head of the Science Data for Social Good program of the University of Chicago. "What I like is to build an observatory, like one you would create in space, and take pictures of the city to see what's happening and what normally escapes the eyes" adds Gregory Dobler, researcher at the CUSP (Center for Urban Science and Progress). Astrophysicist by training, this engineer decided to leave the stars for a bit to put his knowledge at the service of cities and people.

Thanks to processes developed in this department of the University of New York, the city is photographed every ten seconds and emits signals that can be recognized via an analysis of changes based on millions of images. Cars, pedestrians, or boats movements can be seen by the human eyes but not the movements of gas or temperature or the level of hygrometry. Variation in the hygrometry level, once processed by software, can appear with the shape of clouds of color or curves. "It is also possible to spot which buildings pollute more and which should undertake energy saving work if toxic emissions take place" adds Gregory Dolber. These are just small examples but the most concrete cases he is working on.

> *"The objective of urban informatics is to help decision-making by enabling politicians to have a better understanding of the possible impacts of their choices."*

He is not the only one with an original background. CUSP has recruited urbanists but also specialists in hard sciences, mathematicians, and physicists. This department was set up in 2012 by Steeve Koonin to try and understand two major and rapid changes in society: digitalization and urbanization. Michael Bloomberg, mayor of New York City from 2002 to 2013, pioneered the idea to set up a campus dedicated to applied sciences to turn NYC the global capital for sciences and technology and boost its growth. Several universities and companies have responded to his call by partnering with the city to work on all the data available on the city. They effectively turned the city into a big classroom and a laboratory. "Our mission is make the analysis systems we developed based on real cases available to other cities to make them more productive, fairer, nicer places to live in and more sustainable" says Constantine Kontokosta, urban informatics teacher. With 23 students in its first year, 90 in its second, the CUSP is now turning down applications.

Can this type of research be seen as a new science? Its advocates do not hesitate to talk about "urban informatics" and seem very confident in the results of their studies aimed to initiate or influence urban policies. The declared objective is to help decision-making by enabling politicians to have a better understanding of the possible impacts of their choices. Predictive analysis is already largely used in retail, an area where behaviors are repetitive and therefore predictable. Some police departments also use them: Burglaries and assaults take place in certain places and at a certain times, most likely when houses and streets are empty. A refined analysis and reinforced surveillance in these locations have indeed led to a reduction in crime. What happens when predictive analysis is applied to a group formed of different individuals? Even if the same number of people boards a bus two days in a row, these crowds are never identical. Researchers nonetheless use anonymous crowds and their past behaviors to determine how crowds will behave in the future. Applied to the management of the building of a city, this method seems relentlessly efficient. It can circumvent the subjectivity of elected officials and eliminate corruption risks or agreements between friends. It would mean public policies do not need to be assessed — evaluations are rarely done in any case — as these policies would be perfectly designed in the first place. Yet, it would at the same time erase what makes a human decision human and therefore the quality, the courage and the innovation of a decision. A machine has no preferences or friends. But it does not have a vision either. Yet, this is precisely what we are asking of urban planners and mayors. "We're not

telling elected officials what they need to do; we give them as much information as possible so that they can choose what to do" specifies Rayid Ghani.

Urban Informatics in Five Lessons

The experts from CUSP have put out highly sensible recommendations:

1. **Collect data:** Before the launch of a traffic reduction informatics project, CUSP would start by collecting data. The transport department receives information flux — images in real-time from a network of cameras placed on major junctions around the five neighborhoods of New York City. CUSP researchers can install more sensors to obtain further data.

2. **Aggregate and organize:** The real strength of urban informatics is to know how to aggregate and combine the data obtained from several sources to extract more information. CUSP researchers could for instance create a way to combine traffic-related data with weather data and data on taxi activity. All this while finding a way to store all this information and making it available while respecting private life and maintaining security.

3. **Analysis and interpretation:** Once the collected data is put into categories, CUSP uses technologies such as machine learning and data mining as well as simulations to extract the pith and marrow of these aggregated data.

4. **Developing solutions:** It is based on these conclusions that the CUSP make recommendations to the city to make roads and junctions safer. Their recommendations span from changing the synchronization of traffic lights to modifying the infrastructure itself or the signage. Nothing really revolutionary apart from the fact that the recommendations are based on clear data and not just theoretical premises. These recommendations made for New York City are probably adaptable to other cities facing similar problems.

5. **The benefits of evaluations and monitoring:** The recommendations from CUSP could have immediate and long-term effects for NYC and other cities: shorter journeys to improve the comfort of road-users, time saved, speedier deliveries, all this leading to a boost in economic activity. Pollution could also be reduced because cars and buses would not be stuck in traffic. Alternative to road traffic could even see the light.

Conclusion

The search to understand "smart cities" is fast moving, especially since the start of this research. The trend is so quick that it seems that all cities have turned "smart," as they are all now thinking of how to employ artificial intelligence to design and manage public or urban policies. The reality is very different. Despite the fact that many cities are happy call themselves "smart," few have really thought of what this means and put together the means to achieve this transformation. Some cities are more advanced in the use of technology, whereas others take their time to find out why, in the first place, they should be using it.

It is right that U.S. and French cities (big and small) are engaging with the outsized issues of the digital economy and city administration. But as a French journalist, I found it surprising that in a country, which appears to me as one that takes pride in and fosters unfettered capitalism, nevertheless that had a much better grasp and understanding for why it is so important and in the interest of the public, for public administration to organize, manage and ultimately maintain control over the data collected through smart city data collection endeavors. U.S. cities are, in fact, much more ahead on this than in France.

Moreover, the collaboration between U.S. cities and large universities working on federal research programs funded by public and private sponsors is with no doubt the path to follow. The French, on the contrary, have put their trust in an ecosystem of startups companies that, while very flexible, innovative and well adept at "thinking outside of the box," are nevertheless too small to take on the task at hand. Here large universities have the infrastructure and reputation to obtain the large grants and scale up research to tackle the issues at hand in ways small startups simply do not. Yet the system in France is evolving.

One of the conclusions from the New York City and Chicago case studies, and many other cities I have been researching in my everyday work as a journalist where smart technology is used to develop urban

policies, is that the use of digital economy and big data is too often seen as a goal and not a means in the way some administrations would like to transform city government. This is especially true in France (and more so than in the United States). France lacks an evaluation framework for how "new policies" that are informed through smart technology can improve the "social good". Paris likes to announce its intentions to incorporate smart technology through grand city press releases, but there is then rarely, if ever, any follow-up by the city of Paris administration as to the results of the use of smart technology and whether stated goals have been achieved.

Finally, the data sciences for social good that are taught in many universities in the United States do not have an equivalent in France. This rest in part because big data is more linked here to math and not enough to cognitive or social sciences. It also has to do with the fact that in France, officials have not yet grappled with and understand how this flow of information could be used in a noncommercial way. France — Paris in particular — does indeed have something to learn from the United States.

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