NEW YORK UNIVERSITY: THE SURPRISING ROLE OF SCIENCE IN SMART CITIES

Masoud Ghandehari, Associate Professor, New York University, Center for Urban Science and Progress, provides examples of why cities are such great places to carry out research – especially when you look at things through a different lens, including unusual combinations of data sources.

New York University (NYU) is of the city and part of the city because there was no room to build a campus. Instead it's a collection of buildings on different streets and students roam between them.

When real estate prices went up in the 1980s, NYU also became very rich, so it spent money on hiring people, which was a great investment. It has had 36 Nobel Prize winners. Also, it chose urban studies as one of its major areas and is one of the leaders, or even the leader in this field.

So when we consider the role of innovation and technology in the rising population and increasing urbanization, there's going to be a lot of business to be done there if you do it right. There is a lot of positive change one can make over the next 35 years to make things better than they are now. That increase in population and the shift to urbanization are definitely things to be concerned about.

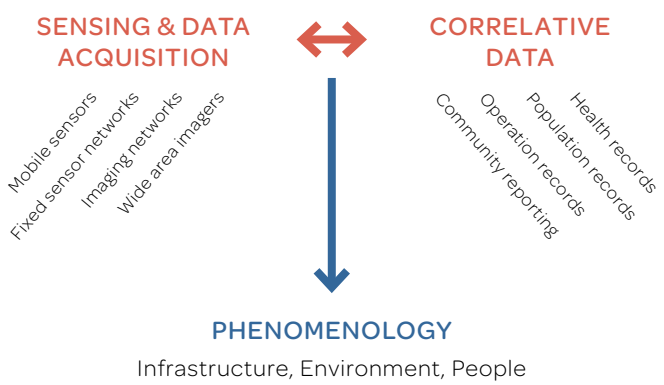
NYU's story

At the center where I work, we have students and we work with people locally, such as in agencies. Our model for teaching what to do about cities is to think about how you acquire information, such as from those agencies and sensors and other technologies, and how you put them together to understand more.

It's not just a question of logistics, but an amazing opportunity to learn about people, places and the environment, in terms of sociology, psychology and whatever it is that people do. Cities are great to study because of the proximity of people and the sheer number of interactions. It's about moving from data and data analysis to identifying phenomena and their causes.

Figure 1 represents a very complicated set of sources for acquiring and sensing data – they are all ongoing projects

FIGURE 1: FROM DATA TO PHENOMENOLOGY



Source: New York University, Center for Urban Science and Progress

by students, working directly with agencies, which provide data to a data center managed, very rigorously, by the university, in these following areas.

Exposure and health outcomes – if you want to quantify exposure, you can use a pollution map of NYC. The critical thing to remember here about pollution is its effect on people. Classically, research on pollution was done by measuring density of pollution, with super algorithms and density of sensors and so on, but really the question is what, within the exposed population, does each person experience?

This is a new project funded by a foundation that is tracking 10,000 New Yorkers over 10 years, collecting details from their health records and looking at where they are, at what time, the decisions they make and what they do. This is what I mean about what an amazing lab cities can be for learning about things we could not do otherwise.

Service and resilience – the 311 number is for non-emergencies to report problems, for example, to multi-agencies. Over five years, we found there had been almost 300,000 calls about sewer back-ups. We want to look at patterns, at the part that extreme rain played, for example, and which parts flooded and which didn't. But equally importantly, we want to know who calls and who doesn't? Who claims ownership of the problem and acts?

Safety – we are researching this issue by collaborating with a major insurance company. The aim is to reduce the number of deaths caused by accidents. The thing here is that we know there are a lot of close calls – a lot of near misses. We need information about them too, such as analysis of conflict in traffic flows, to deduce things like is there is something about the geometry of a certain junction which makes an intersection particularly dangerous? For this, the data is drawn from the street camera network.

Neighborhood quality – we've been modeling daily the waste from 253 community areas over 10 years, correlated with residential population density. There are yearly cycles, so seasonal frequencies, but overall it works out to about 2.5 pounds (just over a kilogram) of garbage per person, per day. There are extreme events that cause erratic changes, that are not very easily predictable, but there are also these low frequency level declines, which we can think about from the point of view of the impact of policies or other changes over 10 years.

A lot of speakers have mentioned the importance of the richness of information – and what we mean by phenomenology is precisely that. What is it in these few megabytes of data that can tell us so much? This is not a lot of data, even if it is daily for 10 years. There is a lot of work to be done here.

Energy performance and compliance – another case of obtaining information you would not normally be able to get. In this case, refrigerants causing damage to the ozone layer – we need to eliminate CFCs [chlorofluorocarbon]. In NYC we have a system where every single building has an ID and is mapped. We know exactly where it is, when it was built and so on. In this very interesting study, we looked at the city's West Side by remote monitoring using a hyper-spectral, low-energy camera to see gases. An amazing amount of refrigerant leakages were detected – including HCFCs [Hydrochlorofluorocarbons], which both the UN and the US are anxious to achieve zero percent by 2020. The city wanted them phased out by 2015, but this is when the study was done.

Technologies definitely have a place in smart cities, there is no doubt about that. This is an example of a student working in a national lab as well as with a company. It's also a good example of how technology developed for defense and military applications apply.

The human element

Finally, we need to develop human resources. There are around 3 million students under 12 in NYC. Imagine if these kids understood the significance of learning about the environment in a new way that they hadn't experience before. They would feel a different relationship with it. New Yorkers spend a lot of time on the subway, which is a horrible experience, and we wish someone would do something about it. And the really noisy streets – they are deafening – although the pollution is getting better.

Regarding human resource development at government level, government employees can gain much by interacting. So in the mayor's office, there is a lot of interaction. I look forward to something that delivers great value to both. One thing that really works for us is having total similarity of process for astrophysicists, computer scientists, analysts of various kinds, sociologists and psychologists of various kinds. That is what makes this work with government and industry, the same processes so we can work together.

We need to get citizens involved to do something about it, not just from the point of view of providing a data pipeline, but from the point of view of understanding what is going on. Now that's what I'd call human resource development.