SMARTER CITIES, GREENER LIFESTYLE

In the face of unprecedented urbanization, the pressure is on to make our cities smarter and easier to live in. Professors Spiro Pollalis and Carlo Ratti explore why smarter is a good thing.

TEXT CLAIRE PRENTICE
PHOTOS GERASIMOS KOILAKOS/INVISION/MVPHOTOS AURORE VALADE, MIT, **AND** GETTY IMAGES

Picture yourself exiting the subway to find the exact number of folding electric cars needed by you and your fellow commuters waiting to take you to your next destinations. Or picture a computer software program which enables you to bring a shop's catalogue to life in your own living room, or which directs you to the nearest available taxi during a sudden downpour of rain.

Far from being science fiction, these are just a few of the technological innovations being developed around the world in a bid to make our cities smarter, more sustainable places to live.

PRESSURES OF URBANIZATION

According to the United Nations, by 2030 five billion people will be living in cities – up from 3.6 billion in 2010. Cities currently cover 2 percent of the surface of the planet, yet they already host more than half of the world's population and account for 75 percent of energy consumption and 80 percent of manmade carbon dioxide emissions.

In the face of unprecedented levels of urbanization, we have no option but to make our cities smarter; if we don't, they will grind to a halt. And with wireless communications, there's nowhere that can't become a smart city, provided the money and the will are there. →

75%

CITIES ACCOUNT FOR 75 PERCENT OF GLOBAL ENERGY CONSUMPTION.

In Professor Spiro Pollalis' view, New York City is America's most efficient city due to its density.

Spiro Pollalis is Professor of Design Technology and Management at the Harvard Graduate School of Design (HGSD). Professor Pollalis is the chief planner for the new smart city DHA City Karachi and the concept designer of the information infrastructure in the new administrative city, Songdo, in South Korea. The HGSD aims to provide solutions to pressing global issues such as rapid urbanization and the scarcity of resources.

"The best part of the bridge is the sense of flying when I cross it," says Professor Spiro Pollalis about the pedestiran bridge over Kifissias Avenue in Athens, Greece, that he designed.

WHAT IS SMART?

So what exactly is a smart city? "A smart city has intelligence so we waste fewer resources, we gain time, and we improve the quality of life," says **Spiro Pollalis**, Professor of Design, Technology and Management at the Harvard Graduate School of Design. Smart cities use information technology and digital data to operate more efficiently, with a focus on transport systems, energy, and water supplies.

BRIGHT BUILDINGS

Alex Herceg leads the Efficient Building Systems service at Lux Research, an independent research and advisory firm providing strategic advice and ongoing intelligence for emerging technologies. Here is what he has to say about building intelligence: "A building is like a United Nations delegation: everyone has the same topics on their mind but they need a translator. It's the same within a building: a lighting system has its own language and so too does the heating system. In the future we will see all the different systems communicating with each other in a sophisticated way. We are moving down the path to high performance buildings, but there's still a long way to go. We need to see more innovation in sensors and controls for existing buildings. It's not about making you live differently, but about making your environment function more smoothly, comfortably, and efficiently."

When the term was first coined, it was used to describe gleaming new urban centers in the middle of the desert or on greenfield sites, built from the top down, according to a master plan. But increasingly, smart city is a term being applied to the retrofitting of existing urban centers, growing organically smarter from the bottom up through a variety of innovations.

Professor **Carlo Ratti**, Director of the SENSEable City Laboratory at the Massachusetts Institute of Technology (MIT), compares a smart city, or sensible city, as he prefers to call them, to a Formula One racing car. In the past, success on the circuit was dependent on the skill of the driver and the car's mechanics, but over the past two decades "the car was transformed into a computer that was monitored in real time by thousands of sensors, becoming 'intelligent' and better able to respond to the conditions of the

The Dutch capital has set up the Amsterdam Smart City initiative, a good example of an existing city getting smarter.

race." In a similar way, over the past decade, digital technologies have begun to blanket our cities, forming the backbone of a large, intelligent infrastructure.

At the heart of smart cities are intelligent buildings. These are buildings which contain systems which talk to each other and are able to sense and respond to different factors, such as changes in the weather and in levels of occupancy.

TECHNOLOGY AS LIBERATION

But are smarter cities inherently more livable cities? "In the end all of this is not about technology," says Ratti. "It's about how technology can help us live in a different, more flexible way. Five or ten years ago we were chained to a desk or computer and couldn't move. This is about how can we use this liberating power of technology to live or work in a better way."

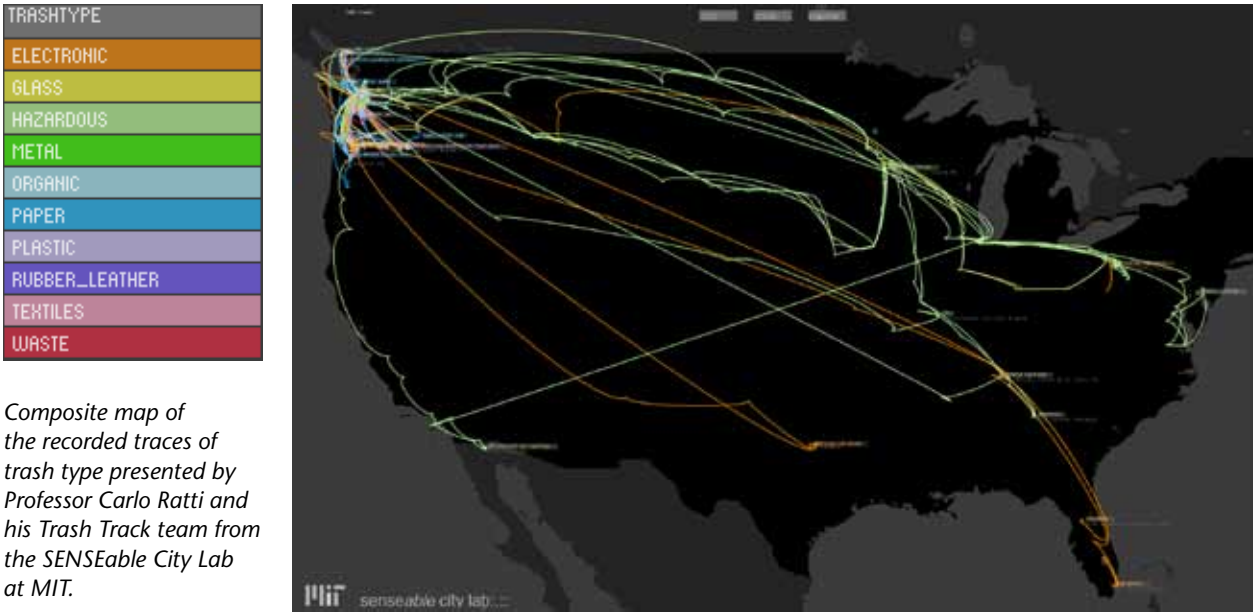
TOP DOWN OR BOTTOM UP

Pollalis believes the only way to create a truly smart city is from the top down: provide the infrastructure and the operating environment to enable the applications to enhance quality of life.

He was the concept designer of the information infrastructure in the new administrative city Songdo, in South Korea. It was dubbed the "happy city" before the foundations had been laid, by Koreans who assumed the people living and working in the eco-friendly, high-tech community would be happier. Opened in 2012, and expected to house half a million people by 2030, political wrangling led to the EUR 15 billion project being scaled down.

Other high-profile new smart cities include Masdar in Abu Dhabi, which is built on a huge podium, with the smart infrastructure underneath, including magnetic lanes for self-driving cars. All the big top-down smart city projects have run into difficulties – political, financial or simply a lack of people wanting to live in them – which is perhaps not surprisingly given their ground-breaking nature. →

An architect and engineer by training, Professor **Carlo Ratti** practices in Italy and teaches at the Massachusetts Institute of Technology, where he directs the SENSEable City Lab. His projects range from a digital water pavilion in which all the walls are "made from" running water, providing a flexible, multi-functional space, to tracking the volume and frequency of phone calls made between different parts of the world to produce a better understanding of the production and flow of information between global networks of cities. His work has been exhibited worldwide at venues including the Venice Biennale, the Science Museum in London, and the Museum of Modern Art in New York.



Composite map of the recorded traces of trash type presented by Professor Carlo Ratti and his Trash Track team from the SENSEable City Lab at MIT.

Advocates hail centrally planned smart cities as the future, but others, including Ratti, insist a bottom-up approach is more sustainable. Amsterdam, Singapore, and Portland are frequently held up as good examples of existing cities getting smarter. The Dutch capital has set up the Amsterdam Smart City initiative, essentially a platform whereby companies, authorities, research institutions, and ordinary citizens can come together to test and develop innovative products and services.

CHANGING BEHAVIOR

Ratti and his team at MIT have conducted a number of studies aimed at mapping the pulse of a city in order to gain unique information about how a city behaves. "We can then use this information to change the city – through planning or through the response of citizens to this information," he explains. In one project, Ratti's team tagged 3,000 items of garbage thrown out by 500 residents in Seattle and tracked each item to its final resting place. At the end of the project, one of the participants said seeing where the items he threw out ended up had had a profound impact on his behavior, convincing him to cut down on the amount of solid waste his household produced.

TOO SMART

Few people would object to innovations which save them time and money, but is there a danger that our cities become too smart, relying too heavily on technology? The 2012 Olympics brought huge fears for Londoners of the possibility of a cyber-terrorist attack which could have brought the whole city to a halt. Meanwhile in New York City, in Pollalis's view America's most efficient city due to its density, large swathes of the urban metropolis were left without power for weeks and in some cases months after Hurricane Sandy hit in October 2012.

Pollalis believes that none of the risks are insurmountable, provided the technology is "used prudently, has been extensively tested, and is well designed, with a proper back-up system."

VISIONS OF TOMORROW

So what will the future look like? "From the physical point of view it will not be too different from today. As at the time of Romans 2000 years ago, we still need and will need horizontal planes for living, facades to protect us from the outdoor environment, and so on," says Ratti. "But the activities that humans will carry out in those cities – the way of navigating the city, meeting, working, accessing knowledge – will be tremendously different." ■

SMART PICKS FROM AROUND THE WORLD

As far afield as Edinburgh, New York, and Winnipeg, smart information boards at bus and subway stops give travelers real-time updates on when the next bus or train is due. Research shows these boards encourage people to use public transport, cutting down on congestion and air pollution. Other innovations include a device which integrates with your smartphone so that you can switch on the heating or air conditioning in your home as you begin your commute, thereby reducing energy wastage and ensuring your home is just the right temperature for your return. In Portland, Oregon, developers are working on a simple sensor that would send data to a command center and then update an application on your smartphone, directing drivers to the nearest available parking space which would have been saved for them.