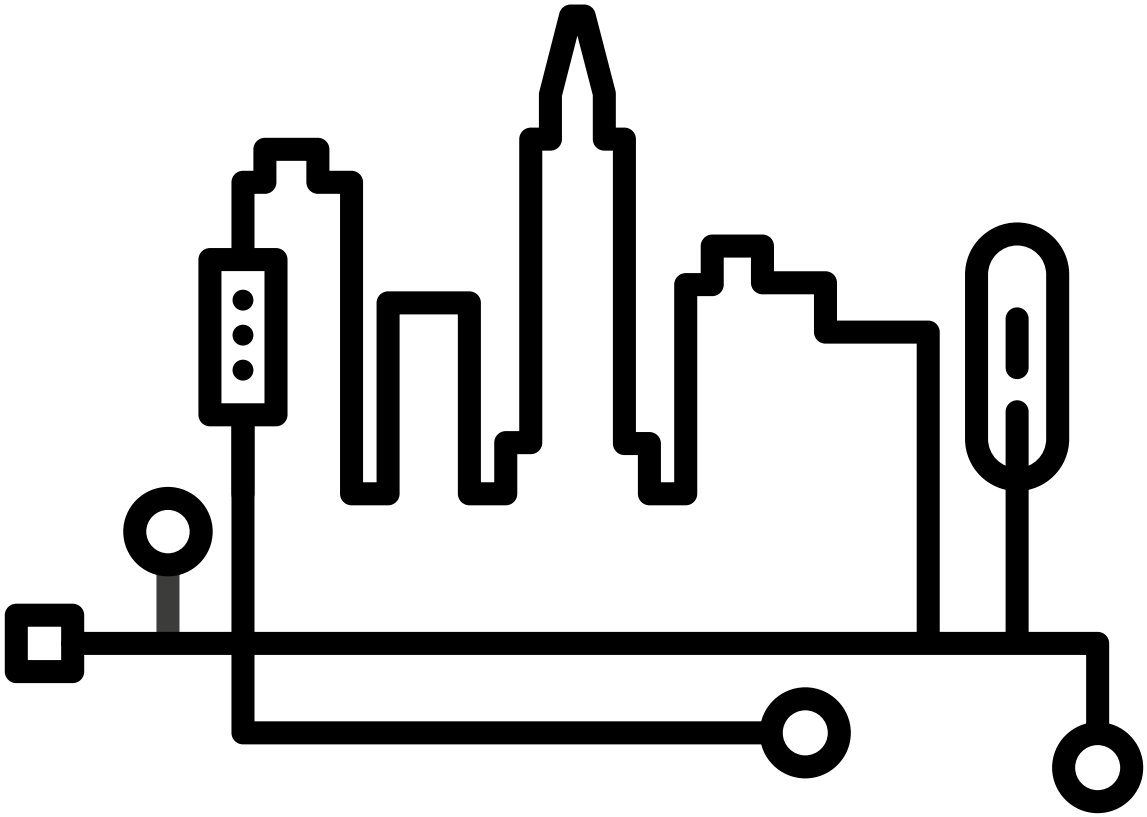
Fundación Innovación Bankinter

FTF Future Trends Forum

30 English version

Disruptive cities



Disruptive cities

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The opinions expressed in this report are those of the author. They do not reflect the opinions of the experts that participated in the Future Trends Forum conference.

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Thank you so much
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James Fallows
Corresponal
de The Atlantic.

Foreword. James Fallows

This conference took place in a time of concern and insecurity about national governance and international cooperation. A generation earlier--after the fall of the Soviet empire, with the increasing integration of Europe, and following the the emergence of democratic governments across Asia, Latin America, and parts of Africa--a widespread assumption held that international standards would promote increasing cooperation. Similarly, national, regional, and local practices were expected to follow suit.

But over the past decade, international cooperation has eroded on many fronts – trade, environmental standards and cooperation, arms control, justice, and approaches to migration and refugees. National politics across the democratic world have become cynical and "populist" at best, racist and divisive at worst.

In these circumstances, regions and cities may offer the best hopes for pursuing the ideals of sustainability, equal opportunity, and inclusive prosperity that western democratic capitalism has aspired to over the past half-century. In the 1930s, during a time of crisis in U.S. national government, the renowned Supreme Court justice Louis Brandeis said that American states could serve as the "laboratories of democracy," which in practice meant economic and political reform. The premise of this conference and its resulting papers were that cities and regions can and should be the modern laboratories for the democratic improvements of this era: environmental sustainability, urban design that promotes business growth and also physical health, family happiness, and vital communities.

The great divides of recent decades have been presented as "East versus West," "North versus South," an emerging "Asian model" versus a concept of liberal democratic-capitalism developed in Europe and North America. For the years ahead, the instructive contrast may be crisis-ridden national politics around the world, versus healthier and more inventive local and regional alternatives. The papers in this volume explore where these local examples might lead.

Introduction

In 1908, the renowned Catalan architect Antoni Gaudí was hired to design a skyscraper in New York. Had the Hotel Attraction been built, its height of 360 meters would have made it the tallest building at the time. In his design, Gaudí included a mooring mast for Zeppelins, which were supposed to revolutionize mobility at the time. This was not merely a modernist eccentricity. The Empire State Building, which was built in 1931 and continues to be one of the city's most emblematic structures, also boasted a collapsible gangplank on its spire to help passengers exit from airships. It was said to have only been used on two occasions; the technical difficulties and danger of docking and, above all, the emergence of the airplane just a few years later rendered this idea obsolete.

The projection of future trends and their related scenarios is a good exercise in preparing for the world of tomorrow. However, it is not always fruitful. In the first decades of the 20th century, it seemed evident that air transport would change everything. That was the case, but the Zeppelin did not drive the revolution. This is one of the problems caused by predictions: though they occasionally capture the core idea of change, they may miss the mark when it comes to details that are ultimately defining characteristics of said change.

This report does not seek to prophesy the characteristics of cities in coming years. Instead, this report employs objective data to describe the present day. It analyzes the (largely technological) trends and processes that are impacting the present and, finally, this report details a series of challenges that will need to be addressed in the years to come.

The ideas compiled herein arose from the Future Trends Forum, held in Lisbon from May 31 to June 1 of this year. The Bankinter Innovation Foundation organized the event, in which 38 premier experts participated. They came from a wide range of fields, such as engineering, science, law, consulting, business, architecture and medicine, among others. During the two-day event, entitled Disruptive Cities, participants were organized into forums and working groups to debate the key changes facing cities. They sought to provide perspectives that would help inform the transition towards the cities of the future.

The debates stemmed from an irrefutable premise: technology, ever-present in society, has also made an impact on cities. Digital platforms are changing urban mobility; they allow us to rent vehicles, which are generally electric, by the minute. It is a fact that sensors are becoming more common in cities. Trash cans that send a notification when they are full, smart illumination, traffic management through vehicle count… these sensors are becoming part of daily life in many cities. Renewable energy is becoming increasingly efficient and more prominent in the urban energy mix. It is also changing infrastructure needs. Thanks to big data, local governments can now collect significant information on the needs and habits of citizens and are therefore able to make decisions that are much more informed. In this digital context, our voice as citizens has greater weight and influence. Now more than ever, we can easily and immediately communicate our priorities, and we have new tools that allow us to engage in the issues that surround us.

The organizational innovations in cities that are brought about by technology rest upon a foundation set by other trends. Humanity is gravitating towards cities, and the world population will continue to rise, leading to greater urban populations. Aging populations in many western countries stand in stark contrast to the youth in Africa and Asia, where many new mega cities (containing more than ten million inhabitants) are expected to be built. These continents will also be a source of new migrant flows. This is all occurring within an international context in which environmental protection has become, out of necessity, increasingly important for governments and in which cities, as they gain national importance, become more visible and politically influential.

What is the future of cities? What challenges will they face in coming years? What do we need to take into account when it is our turn to make decisions that will shape the urban landscape of the future? These questions were implicitly and explicitly posed during the debates and working groups at the Future Trends Forum in Lisbon. This report seeks to structure the ideas shared by participants.

The first part of the document sets the scene: the current state of cities and the principle changes that they are undergoing. In the second part, we add technology to the equation in order to describe the pillars of smart cities, which are already emerging due to the presence of technology in urban affairs. The third part of this report

examines the disruptive trends that technology, itself, is introducing; these trends can change urban dynamics and even the appearance of cities. The fourth section includes the significant challenges identified by experts that cities will face in the future. Finally, we offer a rulebook with thoughts and suggestions for building future cities.

Some of the changes that cities will face in coming years are evident. Just as Gaudí and many other architects predicted that the transportation revolution would arrive by air, it seems undeniable that cities in wealthy countries will become increasingly smart and, as we continue down this road, these cities will drive us to use resources more efficiently. It is also reasonable to anticipate that the large-scale rollout of autonomous vehicles, which is expected to occur within two to three decades, together with the boom in digital platforms will radically change urban mobility.

Will the self-driving cars of today become the Zeppelins of tomorrow? Maybe. But, just in case, it is worth stopping and thinking about what cities will become in light of the many technological advances that we have already seen this century. Those who participated in the Future Trends Forum in Lisbon were committed to doing just that: examining the facts in order to predict problems and find solutions. Some of their conclusions can be found in the following pages.

What is the future of cities? What challenges will they face in coming years?

An Increasingly Urbanized World: The Baseline

1.0

Foreword

Chris Luebkeman

If we could go back in time and sit on a bench in a city square to chat with a citizen of the largest city in the world five thousand years ago, we would observe many of the same patterns of life and behaviors that would observe in any city today: families and friends embracing and meandering, items being sold, transactions being made, elders observing, and rulers ruling. At that time, the 'civilized' world was centered around the Nile and Euphrates Rivers and humans had not yet initiated the explosive expansion and occupation of the planet. The physical attributes of that city would be radically different than what we find today; but the needs and desires of the human occupants would be eerily, or wonderfully, similar.

Urbanization seems to be an unstoppable trend. Yet, how we urbanize depends upon a myriad of contextual factors including, among many, the bioclimatic zone, availability of natural resources, construction techniques, access to transportation, social structures and cultural norms. This has resulted in the widely varying manifestation of what we understand as a city. And, it is the City that is both our problem and solution. A problem because, our consumptive growth has brought us to the point where we are today facing the greatest challenge which is nothing more than a battle for the survival of our species: How can we achieve the Sustainable Development Goals while urbanizing and staying within the planetary limits to provide that which we need to survivie? How can we satisfy the desires of our citizens without sacrificing the needs of our natural planetary systems to rejuvenate and to provide the safe operating space for humans?

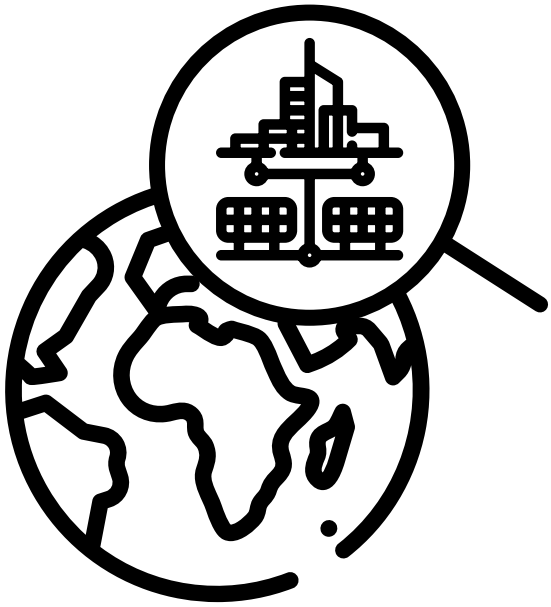
And the city is our solution. We have the knowledge and technologies at our fingertips to increase the efficiency and effectiveness of urban systems by magnitudes, to empower far more integrated and inclusive neighborhoods and regenerate our natural systems for generations to come. We have the implementable solutions. It is us to all of us to ensure that citizens are at the center of our decision making as we craft the places and spaces for all of us to nut just survive, but to thrive.

An Urbanizing Earth

1.1

The first permanent human settlements are believed to have been created at least ten thousand years ago. As they became more intricate they came to be called cities. Though they served as a symbol of power and development for successive civilizations, they have not always had a nice reputation – many simply saw them as dens of inequity. However, they still stand today as magnets for humans everywhere.

Increased trade and, ultimately, industrialization in recent centuries has resulted in cities taking on ever-increasing importance. Yet, the golden age of cities was the second half of the twentieth century. This was a period in which the global population tripled and rural-urban migration became far more pronounced.



According to the UN, just over half of humanity (54,5%) lives in cities today. It is not just the urban population that is growing; the quantity of megacities (10 million inhabitants or more) across the globe is rising as well. In 1950, there were only two in the entire world: New York and Tokyo. By 1995, there were 12, seven of which were in Asia. As of 2015, there were 27 megacities, 15 being Asian. In the last two decades, the number of cities with between five and ten million inhabitants has risen from 19 to 32.

According to the UN the most urbanized regions of the world are North America (82% urban population), Latin America and the Caribbean (81%), Europe (74%) and Oceania (68%). Africa (43%) is the least urbanized region. Despite Asia's low urbanization level (near 50%), the region is home to 54% of the world's urban population.

The rise of the service sector and, above all, changes in some developing countries (especially China and India) have led to dramatic urban population growth. This explains why the bulk of megacities have burgeoned in Asia and Africa. However, Europe, which is highly specialized in the service sector, has gone from not having a single megacity to boasting four (London, Paris, Moscow and Istanbul) within the span of 20 years.

There are no signs of stopping: it is estimated that by 2050, the urban population will account for roughly 70% of humanity. If this pace remains unchanged, 85% of the world population (9 billion people) will live in cities by 2100, which, according to the OECD, will be the limit: the rural minority would not be able to produce enough food to feed the urban population. 90% of the 2.5 billion new, urban inhabitants will live in Asia and Africa. India, China and Nigeria alone will account for 35%.

Growth will also lead to more megacities. It is anticipated that by 2030 the total number of megacities will reach at least 41. Asia will continue to drive the trend with seven of the ten largest cities across the world to be found on that continent. The burden that the creation of all of the infrastructure for these new urban citizens will place upon our planet is daunting.

Anita Roth
Head of Policy Research at Airbnb.

+INFO

"Every week, cities across the world acquire three million new inhabitants," said Anita Roth, Head of Policy Research at Airbnb. "This leads to significant logistical challenges. Necessary infrastructure is not always created, nor is it always located where it is needed. 75% of the infrastructure that will be needed in 2050 has yet to

be built." Natalia de Estevan-Úbeda also believes that cities are confronted with a significant challenge. She is an independent consultant and advisor on R&D and innovation related to transportation at the European Commission. She was formerly the Head of International ITS Policy and Strategy at Transport for London. "Lots of time and effort are needed to change cities. That is why we need a good road map. We need to constantly ask ourselves if the model that we are working towards is the right one."

Natalia de Estevan -Úbeda
Independent consultant, Advisor to the European Commission.

+INFO

The aforementioned experts, as well as those cited below, participated in the Bankinter Innovation Foundation Future Trends Forum (FTF), organized in Lisbon in June 2018. The FTF seeks to foster debate among leading experts in their respective fields regarding how cities are changing, the challenges posed by the disruptions that they face and what we should expect from cities in the future.

How will cities accommodate this new population? There are only two ways that cities can grow: horizontally and vertically. Big cities in China and the Persian Gulf states have constructed the majority of skyscrapers in recent years. According to a study published in the MIT Technology Review, it is estimated that roughly 41,000 skyscrapers will be built by 2050, and they will be 50% taller than those that we see today. Urbanization as well as new-housing projection for future urban populations will be, without a doubt, one of the greatest challenges that populations will face in the future.

"The infrastructure that will be needed in 2050 has yet to be built."

Not All Cities Are Equal

1.2

Increasing urbanization is an unstoppable trend. Though the prevalence of asphalt and glass is spreading across the world, this expansion is not uniform. On the contrary, every city is a world unto itself. Oslo and Mogadishu have very little in common, to take it to an extreme. Nor can one really compare Milan to Palermo, even though they are found within the same country. Every city is so unique that there is no agreed upon definition. However, experts can agree on two key characteristics. First, cities are agglomerations of populations of a certain density; and Second, agriculture is not predominant. How large does a population need to be in order to be classified as a city? The number differs by the source. The Conference on European Statisticians held in Prague in 1966 proposed the minimum population of 10,000 inhabitants (2,000 if agriculture employs 25% of the population or less). No agreement was reached.

Peter Hirshberg
Principal in the Maker City Project.

+INFO

UN-Habitat, the United Nations agency for human settlements, defines a "small city" as having between 100,000 and 500,000 inhabitants. The OECD establishes 50,000 as the minimum number of inhabitants needed for a location to be considered an urban area. At the same time, each country has its own benchmark for determining if a given population qualifies. For example, according to the US Census Bureau, an urban population consists of at least 2,500 inhabitants. Size matters: large cities generate more wealth than smaller ones. This typically leads officials to allocate more public funds to cities with greater populations. Many western countries have succeeded to an extent in establishing mechanisms to ensure that small and medium-sized populations are not deprived of funding.

Olga Gil
Principal in the Maker City Project.

+INFO

Yet there is more. According to Peter Hirshberg, the fact that big cities offer the best salaries is more detrimental to remaining cities than it initially seems. "The networking effect can be devastating, especially if big cities prevent small cities from having the best talent." Hirshberg is the president of The City Innovate Foundation, which was the result of a partnership among the City of San Francisco, the University of California at Berkeley and MIT. In the same vein, Olga Gil, an expert in smart cities and regulation at the Complutense University of Madrid, notes that "at the end of the day, cities compete with each other."

Víctor Sáez
IT Director at Barrio La Pinada.

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On the other hand, Víctor Sáez, Head of IT at Barrio La Pinada (La Pinada District) believes that there is a new variable that could cushion the blow: digital nomads. People that work remotely, even from foreign countries, can get involved in the communities where they live.

Khoo Teng Chye
Executive Director of the Centre for Liveable Cities.

+INFO

Be that as it may, social inequalities exist, even within the same city. "One of the greatest challenges facing cities is inclusive construction, but the reality is that there are serious integration problems. Can technology help with this?" asks Khoo Teng Chye, Executive Director for the Centre of Livable Cities, an organization within the Ministry of National Development in Singapore. "We have to do everything in our power to ensure that technology alleviates and does not exacerbate those differences," warns John de Yonge, who is a Director at EYQ, a think tank within the consulting firm EY. John leads the areas of urbanism, innovation and natural resources.

John de Yonge
Insights Director-EYQ.

+INFO

Chris Luebkeman, Director for Global Foresight at Arup, fears that growing social disparities at the heart of cities may result in a sort of tribalism and in hatred towards those who are different. "Before, going to the city meant leaving the tribe. Now the opposite is true: there's no better place to protest and condemn the people we don't like."

Chris Luebkeman
Director for Global Foresight at Arup.

+INFO

That growing social disparities at the heart of cities may result in a sort of tribalism

Chris Luebkeman

How will life change in cities?

12:44min

Older, Younger: A Population Profile

1.3

"In order to understand life in cities, we need to understand population pyramids." Luebkeman is firm when it comes to taking the age factor into account in the appearance, design and organization of cities. The data is very clear. Europe is getting older at a dizzying rate and this is expected to continue in coming decades. According to the Eurostat Report *Population structure and ageing,* "consistently low birth rates and higher life expectancy are transforming the shape of the EU-28's age pyramid."

There will be increasingly fewer people of working age and more retirees, due to the progressive retirement of baby boomers. "This will, in turn, lead to an increased burden on those of working age to provide for the social expenditure required by the ageing population for a range of related services." Currently, the average age in the EU is 42.6, and it is rising. According to estimates, the EU population will continue to rise gradually until 2050 (528 million inhabitants), when it will begin to fall.

The US is not in the same situation: a higher birth rate, when compared to Europe, offsets the aging of a significant portion of the population and leads to natural population growth. There are more young people, due in part to immigration, and this is expected to continue for years to come.

And, Africa is the polar opposite: the continent has the youngest population on the planet, which ensures that it will grow at a swift pace. In fact, half of the world's population growth until 2050 (roughly 1.25 billion people) is expected to occur in Africa. Asia will be second, contributing 900 million new inhabitants by 2050.

The massive contrast between Asia and Africa, and Europe (as well as North America to a lesser extent) is palpable. The appropriate management of migration flows will be key in ensuring the survival of the system. However, there are more factors to discuss. "An aging population will make having smart cities increasingly important, cities that can manage emerging technologies," says Jaime Rodríguez, General Manager of Blablacar in Spain, Portugal and Germany.

Jaime Rodríguez
General Manager Spain, Portugal and Germany, at BlaBlaCar.

+INFO

William Haseltine

How to make healthcare more efficient?

16:08min

This observation is tied to the healthcare system, which will face enormous stress as the population ages. "Why is the health care system so inefficiently organized? How are we going to tackle the swiftly approaching demographic changes?" asks William Haseltine, Chairman and President of Access Health International. "The current healthcare system does not work; it will not be able to withstand the ageing population. Information technologies will allow us to develop high quality and distributed health care. We need to design communities in which young people care for the elderly, like in Hong Kong," states Haseltine, who in 2001 was listed by Time magazine as one of the 25 most influential business people in the world.

William Haseltine
Chairman and President at Access Health International.

+INFO

"An aging urban population poses challenges and opportunities for the government and the private sector," asserts Jody Holtzman, Founder and Senior Managing Partner at Longevity Venture Advisors LLC. "But this issue needs to be addressed head on to ensure that the future design of cities effectively benefits from this process."

Jody Holtzman
Senior Managing Partner at Longevity Venture Advisors LLC.

+INFO

Health is without a doubt one of the main challenges of adapting to an older society. "In addition, to the modification of transportation modes; we also need to promote socialization for the elderly and physical exercise to improve the population's physical and mental health, says Bruno Fernández-Ruiz, Co-Founder and CTO at Nexar Inc.

There are more dynamics related to demographics that cities must grasp in order to address the needs of inhabitants. Philip Lader, Senior Advisor to Morgan Stanley, highlights the growth of the "infra-class of single-parent families." Even though they have become more visible in western societies, these families seem to be placed at a disadvantage by public policy and housing policy.

Cities contain 54.5% of the global population and occupy 2% of the Earth's surface.

Philip Lader
Senior Advisor of Morgan Stanley.

+INFO

Climate Makes It Onto The Agenda

1.4

Cities contain 54.5% of the global population and occupy 2% of the Earth's surface. They also represent between 60% and 80% of the world's energy consumption, are responsible for 70% of greenhouse gas emissions and generate 70% of the world's waste. According to data from UN-Habitat data, between 1950 and 2005, the level of urbanization increased from 29% to 49%, while global carbon emissions from fossil fuel burning increased by more than 500%.

Bruno Fernández-Ruiz
Co-Founder & CTO at Nexar Inc.

+INFO

Any initiative that seeks to reduce our environmental impact must take account of everything that occurs in cities; all the more so given that urbanization will continue to increase in coming decades. Echoing the advice from UN-Habitat, the Department of Buildings of the City of Chicago launched the Green Permit Program in 2005, in which developers and owners received incentives for installing solar panels and/or green roofs. The program resulted in an easing of urban temperatures, better rainwater use and a boost to green businesses.

Respecting the environment means reducing the risks that cities face. In their most recent annual report on

urbanization and development UN-Habit warns, "Heavy precipitation and extreme weather events can disrupt the basic fabric and functioning of cities with widespread implications for the economy, infrastructure and inhabitants. " The report highlights that 87% of the disasters reported in 2014 by the International Red Cross were climate related, displacing geological disasters (earthquakes, volcanic eruptions, etc.) for the twentieth consecutive year.

The greater incidence of climatic disasters in cities also plays into inequality. Developing countries simply do not have the same resources that developed countries have to prevent damage from floods, hurricanes or fires. Nor do they have the resources to cope with the disasters themselves or the aftermath.

Either due to the sheer number of disasters or greater societal awareness, concern for the environment has grown in recent years and has even reached the top of the international agenda. The historic 2015 Paris Agreement that sought to reduce CO2 emissions, which the US unfortunately abandoned under the Trump Administration, is a good example of the international community's efforts to prioritize the environment. The 17 United Nations Sustainable Development Goals, six of which concern the environment, also serve as an example. Every goal is relevant to life in our cities, but Goal 11: Sustainable Cities and Communities, is inextricably linked to the contents of this report.

If this sudden interest in respecting the environment does not wane, it will bring significant transformation. James Fallows, a journalist and correspondent for the US magazine The Atlantic, predicts that "if concern for the climate leads a combination of commercial, ethnic, strategic and economic changes – as well as other types of change – to be suddenly added to the equation, then cities will feel significant added pressure."

James Fallows
National Correspondent for The Atlantic.

+INFO

In addition to reducing waste and consuming green energy, it is critical that we be more efficient whenever possible.

Chris Johnson
Managing Principal and Creative, Director for Gensler's Middle East Region.

+INFO

Chris Johnson, who is an architect and the Middle East Managing Principal at Gensler, notes the growing urban trend in using recycled materials. The push for electric vehicles should also be understood as a step towards reducing urban energy consumption and combating pollution, which is another scourge of cities and especially threatens the health of urban dwellers.

In addition to reducing waste and consuming green energy, it is critical that we be more efficient whenever possible. "Water can be a disruptive threat due to excess (floods) as well as scarcity (drought). We need to treat water like the precious resource that it is" urges Alberto Bernal, the Smart Cities and Territories Global Director at Indra.

The objective of cities is to be ever more sustainable. However, that adjective must be earned.

Alberto Bernal
Smart Cities and Territories Global Director at Indra.

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The pillars of Smart Cities

2.0

Foreword

Natalia Estevan-Úbeda

We are perhaps witnessing one of the most fascinating challenges cities around the world are faced with: how to design the future city in a way that caters both for socially sustainable benefits and one which anticipates individually tailored services for customers who are offered an incredible amount of choice for that A to B journey. What may be good for you may not be good for the city as a whole, so how do we do it?

I believe that part of the answer to this challenge is systemic thinking more than ever. Smart mobility as an isolated topic will only give us short-lived tech excitement. Whilst technology and data science advances are indeed driving change, it is the change in behaviour the one which is shaping mobility. This phenomena does not only apply to increasing levels of demand and expectations by customers, but also to the way Mobility is delivered with new partnerships and unlikely alliances delivering exciting new business models.

The digital era has delivered a world where the data your movements generate has got more value than ever before and, a world which appears to be going at two different speeds. The speed of technology and the speed of the public sector, traditionally the providers of mobility, is perhaps as uneven as they can get. The social divide that the digital world is causing needs to be addressed in the agenda of those planning for smart mobility services.

I believe these to be fundamental challenges of the Smart Cities of the future, perhaps less headline grabbing than fancy tech and flying cars, but far more complex to solve.

The Pillars of a Smart City offers an insightful view in the way these changes are taking place and the thinking behind.

The digital era has delivered a world where the data your movements generate has got more value than ever before and, a world which appears to be going at two different speeds.

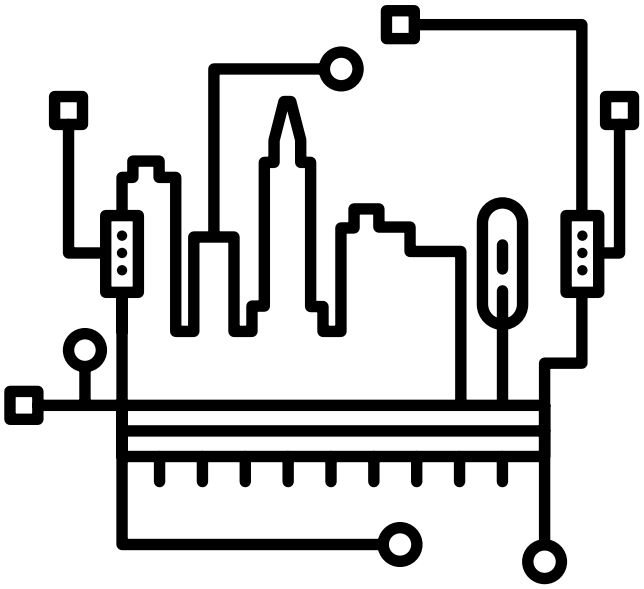
There is no universally agreed upon definition for the term smart city. The United Nations, specifically UN-Habitat, and the European Union agree that the defining characteristic of smart cities is that they use information and communication technologies (ICT) to confront urban challenges and seek to improve the lives of their inhabitants and promote their development.

In this report, we present the five pillars that comprise a smart city. The first pillar consists of the technology that makes everything else possible (the Internet, electronics, sensors, etc.). The second pillar, which is perhaps the most obvious in the eyes of inhabitants, concerns the new forms of mobility that are emerging as a result of these technologies. The third pillar relates to how public utilities are formulated, designed and implemented within this new context. The fourth pillar encompasses the new infrastructure that smart cities require, while the fifth pillar concerns sustainability and respect for the environment, which are inherent to the raison d'être of the cities of the future.

Technology That Drives Change

2.1

You may be reading this report from your smartphone. This action, which is so common and devoid of mystery, was completely inconceivable just 10 years ago, when the first smartphones appeared. It would have been technologically impossible no more than 25 years ago, when the Internet was still a playground for geeks and academics. Even though modems began to pop up in homes, no one knew exactly what to do in cyberspace.



This was due in part to the fact that the infrastructure was not even remotely prepared for what was to come – dial-up Internet access was the only option. Browsing was painfully slow and web content was as primitive as it was insignificant. Companies were quick to realize that the Web would form the basis of many large business, yet very few cracked the code. The turn of the century saw the burst of the dot-com bubble, which restructured the industry; the excitement over the new technology cooled.

Today we can experience the scope of the revolution that gave us the Internet. In a matter of seconds and at an absurdly low price, we can share any thought or file that can be digitized. We can also buy and sell products, complete administrative tasks and even attend university classes remotely, among many other actions.

Even though modems began to pop up in homes, no one knew exactly what to do in cyberspace.

In a matter of seconds and at an absurdly low price, we can share any thought or file that can be digitized.

"New technologies are, without a doubt, one of the great forces of change that we have seen in cities," asserts Chris Johnson, the Middle East Managing Principal at the architecture, urbanism and design firm Gensler. "Change often occurs faster than we can process it –in business, our personal lives and even the appearance of cities."

It would be impossible to talk about smart cities without mentioning the Internet and information and communication technologies. Advances in computing and electronics in recent years have revolutionized every field and sector, even the urban. Digital tools allow us to quantify, measure and analyze massive amounts of data quickly, precisely and neatly. Cities that can afford the investment are equipping themselves with multiple sensors that aid in improving the efficiency of public policy and, above all, lead to informed decision-making

More efficient resource management, detailed and actionable knowledge of traffic flows that allows us to detect inhabitants' behavior patters so that we can design initiatives that make their lives easier – these are just some of the applications of the digitalization of cities.

Advances in computing and electronics in recent years have revolutionized every field and sector, even the urban.

However, parking lots, traffic lights and trash cans are not the only aspects of the city that provide useful data. Inhabitants are the most valuable source of information; in the past 25 years, our smart phones have been the other significant innovation that we have witnessed in our everyday lives. The first smartphones appeared only a decade ago, yet almost every inhabitant possesses a window onto the sea of information that is the Internet.

We are constantly generating data that is not on useful for businesses but also for public authorities. The UN, for example has connected to various WiFi antennae in cities affected by earthquakes in order to quickly determine where help needs to be sent. Within a less exciting context, many local governments across the world allow residents to report issues with urban infrastructure and other problems by taking pictures with their phones.

No mayor or public authority should underestimate contributions from the citizenry. According to data collected by We Are Social & Hootsuite, more than half of the world population has access to the Internet. This figure will continue to grow, even though in the next few years it is anticipated that the large majority of new Internet connections will come from inanimate objects. The Internet of Things (IoT) has already begun to test the limits of broadband, resembling the stress placed on phone lines in the 1990s. However, in the present context, it is estimated that tens of billions of new devices will connect to the Internet.

Hyperconnectivity is a reality; the challenge lies in correctly processing data and translating it into knowledge that generates good ideas. Jesús de la Quintana, Head of Emerging Initiatives and Urban Solutions at Tecnalia, believes that "we should not see technology as a solution, but rather as a tool that helps us make things happen. The key to technology is how we use it as well as the many benefits that it generates for cities."

Redefining Mobility

2.2

Mobility is one of the aspects of urban life that has been most affected by the profound changes in technology in recent years. We are now accustomed to seeing hybrid and electric cars on the street, where charging stations have begun to sprout up. We are still in the early stage of the transition to green vehicles, but municipal governments' increasingly strict enforcement of low emission levels will accelerate this process, at least in cities.

The private sector, in contrast, is investing heavily in autonomous vehicles. Even though we will have to wait decades for a massive rollout, experts say that autonomous vehicles will change the urban landscape. There will be no need for them to remain parked, so they will free up space and reduce traffic. A single vehicle can take an

entire family to work or school and then pick them up later. In fact, flying vehicles are currently being developed; the Airbus Vahana Drone Concept is the size of a Smart car but has eight pivoting rotors. These types of vehicles may be a solution to long intercity travel.

Mobility is one of the aspects of urban life that has been most affected by the profound changes in technology in recent years.

"Transportation has always driven economic and social change. IT and transportation technologies will change how cities look," states Marco Pedrazzo, Head of Business Development at the architecture firm Carlo Ratti Associati. "The time it takes to get to the office will become working and leisure time; the space set aside for parking lots will be freed up for other uses."

Natalia de Estevan -Úbeda

Transportation challenges in cities

16:52min

But before we look toward the future, let's focus on the present. In less than five years, dozens of European, North American and Asian cities have become filled with small cars, scooters and, most recently, skateboards –all boasting electric motors – that silently traverse the city to later be parked anywhere, in anticipation of their next user. It seems that shared mobility is here to stay.

Bicycle-sharing systems have also become increasingly common. Some bicycles even have electric motors; users can rent and return the vehicles at designated stations, which tend to be near metro stops. Of course inhabitants still turn to the usual forms of public transportation: commuter rail, trams, buses etc. Taxis and ridesharing apps, their fierce competitors of the former that recently emerged in tandem with new technologies, are worth adding to the list.

Marco Pedrazzo
Business Development at Carlo Ratti Associati.

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The alternatives have multiplied. The growing availability of urban microcars, the large majority of which are operated by private companies, and their low cost – when compared to the purchase price and cost of maintenance – are leading an increasing amount of people to leave their cars at home. Municipal government promote them for two reasons: they help reduce traffic in cities, and because they are electric, they help reduce air pollution, which is on the agenda of every local government. According to a UN-Habitat report, "Singapore, Hong Kong and Tokyo are examples of cities where the costs of car ownership and use have been set high and planning strategies have emphasized development patterns oriented to transit, walking and cycling."

According to Jaime Rodríguez, General Manager of Blablacar in Spain, Portugal and Germany, "We've built our cities around cars, but the way that we relate to them is changing dramatically." He believes that cities are adopting increasingly harsh stance against private vehicles, barring them from circulating within historic districts, for example. "New forms of shared mobility allow us to shape an entirely different space. This revolution will extend from the real estate market to the electrification of cities; it will even impact how cities smell, feel or sound."

Rodríguez points to the fact that almost everyone has a smartphone (81% of Spaniards, according to the most recent Google Consumer Barometer Report) as one key driver of significant transformation. They are the devices that allow users to access any shared mobility service,

such as electric car, scooter and, most recently, skateboard rental.

Cities still have one significant problem to fix: the streamlining of intercity travel. The increased economic weight of large cities attracts a growing numbers of workers, many of whom live in neighboring cities. They need to commute every day. "Waking up at 4:00 am to go to work and returning home at is the reality of many American workers. We need to address this," states Rick Jacobs, Chief Executive Officer of Accelerator for America, which is a nonprofit organization dedicated to supporting the best ideas geared toward improving life in cities.

Rick Jacobs
CEO at Accelerator for America.

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The growing availability of urban microcars, the large majority of which are operated by private companies, and their low cost – when compared to the purchase price and cost of maintenance – are leading an increasing amount of people to leave their cars at home.

The Environment Makes It Into The Agenda

2.3

The mobility revolution in big cities is grounded upon one of the main pillars of smart cities: sustainability. Reducing their energy footprint is still a pending matter for those cities that want to be more sustainable. But there's more: reducing water consumption, generating less waste, reducing greenhouse gas emissions...

The United Nations Sustainable Development Goals refer to this issue very clearly. Goal number 11, sustainable cities and communities, is committed to "making cities and human settlements safe, resilient and sustainable" by 2030, as well as "reducing the adverse per capita environmental impact of cities, including by paying special attention to air quality, municipal and other waste management."

In its report about smart cities, *Hacia la ciudad 4.0*, KPMG identifies four key areas where environmental and energy resources management should be focused. They are the following:

1.- **Efficient resource management.** For example, smart systems to turn public lights on and off.

2.- **Waste management.** his task is becoming more efficient due to the installation of sensors in trash cans that signal once the container is full. Garbage collection trucks, therefore, save fuel because they no longer have to follow routes. Instead, they only leave the garage when necessary. The report also describes experiments with the management of pneumatic refuse collection, which consists of "a collection system that receives trash placed in deposits on the street or in the drainpipes of buildings. The system carries waste through pneumatic tubes to a collection station."

3.- **Smart water management.** Smart sensors and devices can contribute relevant data "on sanitation levels, network pressure, fire hydrants, flow meters and monitoring of water quality parameters."

4.- **Air quality control.** Air quality can be monitored through smart sensors located throughout the city.

Addressing climate change and fighting for a sustainable environment involves a commitment to adopting renewable energy. While cities are responsible for more than 70% or the world's energy consumption, the consequences of our

actions in urban environments will be decisive for the planet as a whole.

One of the greatest challenges that cities face, according to criteria from our expert panel at the Future Trends Forum, is precisely energy sustainability and its transition: giving up nuclear energy in support of renewable energy. They also state that the pollution caused by transportation is a problem that has yet to be solved. "We need to develop an aggressive electrification agenda, focusing on commercial transport, such as vans and trucks", they conclude.

This transition is not only related to the preservation of the planet but rather becomes necessary due to more mundane reasons. "We need to be vigilant regarding urban air deterioration. An increase in the number of airborne toxic particles would have a direct impact on our health and well-being" declares Chris Luebkeman, Director for Global Foresight at Arup.

Marco Pedrazzo, Head of Business Development at the architectural firm Carlo Ratti Associati, says that "all the elements that make up a city are important, but we should emphasize environmental protection even more because our future depends on it".

Reducing their energy footprint is still a pending matter for cities.

Infrastructure That Is Up To the Challenge (Upgrades and Adaptation)

2.4

Every public administrator wants data on how a city functions, residents' behavior and needs and the effects (either intentional or unintentional) of implemented policies. That information can be used in very valuable analysis to perfect initiatives or take them down if they don't work; data allows for a significant increase in public resources efficiency. Upkeep and development of new infrastructure, urban planning, provision of services, health, education, safety, environment...big data can help across all governmental areas.

Information and communications technologies are enabling us to collect huge amounts of data for analysis. All the data your local governments possesses regarding your neighbors (land registry, census, ER visits...) takes on a new meaning when it can be viewed structurally. By cross-referencing data from different sources we could know, for instance, in which district we should build the new municipal sports center; we would just have to compare their population pyramids, proximity to similar facilities in each district and the most common sports in the area.

Peter Hirshberg is a member of the Future Trends Forum and Chairman of the City Innovate Foundation, founded by the City of San Francisco, UC Berkeley, and MIT. During the forum, he described in detail how, after analyzing massive amounts of data from cell phones in Singapore and using it to build a model of city-state mobility, City Innovate determined that if taxis were shared, half of them could be eliminated, and this, in turn, would help reduce traffic in the megacity of Singapore. He also shared MIT findings on what the minimum taxi fleet in Manhattan could be (if residents shared rides) so that they could all reach their usual destinations. The findings specified which routes would be the most efficient. One of their conclusions was that just 60% of the taxis that currently operate could meet demand on the island.

Not only does the power of data help plan better public policy: it can also help accelerate socioeconomic

Information and communications technologies are enabling us to collect huge amounts of data for analysis.

Peter Hirshberg

Infrastructures and networks in the data city

15:49min

change. According to UN-Habitat, "in some cases, urban economies are able to leapfrog stages of development by deploying new technologies in the initial construction of infrastructure." Hong Kong and Singapore are two prime examples of how infrastructure digitalization has helped cities achieve higher levels of wellbeing for residents.

In addition to improving the efficiency of government actions, digitalizing public utilities also creates a window of opportunity for residents to get involved, and above all, it accelerates bureaucracy. Some countries are taking this process very seriously. In Estonia, for example, absolutely all administrative procedures can be completed online.

Digitalizing citizen's data poses the following security dilemma: can authorities guarantee citizens' privacy, making sure that their data will be kept away from prying eyes? On the other hand, the increasing demand for transparency puts pressure on local government to provide residents with the data and, more importantly, the analysis and conclusions that are drawn about them from the data. "We need a transparent information system for health care," says William Haseltine, President and Chairman of Access International USA, in discussing his area of expertise: health. According to Haseltine, that is the only way we will be able to build a network that allows us to raise efficiency and distribution capacity.

One of the defining characteristics of smart cities is the use of information and communications technologies (ICT) and the Internet of Things (IoT) to tackle urban challenges. UN-Habitat points out that "data is essential for enacting evidence-based policies and for effectively managing and investing in urban infrastructure." The public policy revolution has only begun.

Not only does the power of data help plan better public policy: it can also help accelerate socioeconomic change.


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Processes and Trends That Will Change Everything

3.0

Foreword

John De Yonge

Global megatrends, which are transforming business and society at an accelerating pace, converge in cities. As the world urbanizes, these convergences increasingly shape our lives. Drawing on EY's report, Megatrends shaping 2018 and beyond, we can highlight a few of the key megatrends whose interactions are driving change:

- Remapping urbanization. Societal challenges such as climate change, aging and chronic disease will demand different approaches to urban planning—both where and how we build. Ridesharing and autonomous vehicles call into question urban density, parking garages and road networks.
- Future of work. Work is being reinvented by robots, AI, gig work, generational shifts and collaboration technologies—diminishing the need for traditional office space while creating new social dynamics.
- Super consumer. People will augment themselves with AI to create smarter, more powerful digital extensions of themselves across all aspects of living. Businesses and cities alike will be challenged to deliver the richer, trusted and frictionless interactions that these super consumers expect.
- Molecular economy. A new manufacturing revolution is bringing clean, efficient and distributed production processes to cities. Digital technologies, new materials and 3D printing will create new forms of residential construction and urban infrastructure

The future of cities is not more of the same.

The data is very clear: more than half of the world population lives in cities. In addition, everything indicates a significant portion of the demographic growth in this century will occur in cities. The increasing arrival of people to cities poses significant challenges for the growth of cities and gives them even greater importance. Cities will respond to these challenges in different ways. Every city is unique: smaller cities live in the shadows of larger ones, and power dynamics are unique in each city.

John De Yonge

Which trends are going to shape cities?

9:38min

Population growth is not the only demographic change that we will see in coming years: we must also take into account an aging population (which is very concentrated in Europe and, to a lesser extent, in North America) and immigration. Nor can we forget the importance of respecting the environment and the fight against climate change, crucial elements for the future of cities. Future cities will either be sustainable or they will perish.

Ownership vs Use, MaaS

3.1

We all carry devices with an Internet connection. Smartphones are also chock-full of sensors – an accelerometer, a gyroscope, a thermometer or a fingerprint reader, among others – as well as tools like GPS geolocation or cameras. These tools allow us to know in real time the location of the nearest vehicle in a car sharing platform. They enable us to unlock these vehicles remotely and report damages if we find any.

The capabilities of smartphones, together with a more-than-adequate Internet speed, have given rise to a new form of acquiring goods: the so-called platform economy. Mobility provides the most visible examples: carsharing (where many customers use the same fleet of vehicles), carpooling (where users share someone's car), and bikesharing – the formula has been successfully carried over to scooters and skateboards, the last one to join the party. The main advantage for users is that they pay by the minute, and given that the modes of transportation are electric, they can be parked almost anywhere.

The overwhelming success of these models in recent years has sparked debate surrounding the very idea of ownership. Is owning a car worthwhile when you can just use one whenever you need it? Is a vehicle that remains parked, on average, 95% of the time a reasonable investment (factoring in the purchase price, maintenance, insurance, etc.) when you can just use one whenever you need it and only pay for the amount of time that you used it? Until recently, there were not any viable alternatives, but since the proliferation of these fleets of shared vehicles, which are especially effective in big city centers, the landscape has changed considerably.

Is owning a car worthwhile when you can just use one whenever you need it?

"Now we see greater value in having the ability to enjoy a good, as opposed to owning it. And this feeling is on the rise. We are transitioning away from the idea of property as a trophy to placing more value in the experience," asserts Chris Luebkeman, an American geologist, engineer and architect as well as the Director for Global Foresight at Arup. "There's a significant generational difference: my car has always been my trophy, whereas my son just cares about having access to a big car when he travels with friends and a small one to get around the city."

Chris Johnson, Middle East Managing Principal for the architecture, urban planning and design firm Gensler, also sees the dichotomy between the obsession over experiences and ownership as one of the significant changes that will impact the future in the short- and

medium-term. "For many reasons, younger generations focus more on what they do, as opposed to what they have."

Mobility as a Service (MaaS) is increasingly entrenched in the downtowns of the world's main cities, and it seems that businesses will not just sit back with their arms folded. The automobile industry is doubling down: more brands join carsharing platforms every year. This could be due in part to another factor that may place use before ownership: autonomous vehicles. Imagine that, instead of parking your shared vehicle near your destination, the vehicle drops you off and then leaves for its next passenger. The combination of shared mobility and automated driving systems has the ability to put an end to the need for purchasing a vehicle once and for all. Do I need a car if I can just use one when necessary? Will I appreciate owning it if I do not even drive it? If you are going to read or work in the vehicle, you will not care who owns it, in the same way that – to an extent – you are not concerned about the interior of the taxis that you take.

If this concept of mobility and property were to succeed, the number of cars on the street would drop drastically; we will all need far fewer cars if many people can use the same car throughout the day. The appearance of cities would change considerably. Not only would there be more space on the street but also a drastic drop in the need for parking lots.

This future is possible. There is already a growing supply of vehicles in shared mobility systems. If competition drives down the prices of these services, it will be increasingly difficult for the urban dweller to justify buying a car.

"There is no need to fight for ownership. We can focus on ensuring equitable access to goods based on talent, skills and need," states Tan Chin Nam, former Head of the Media Development Authority of Singapore and trustee of the Bankinter Innovation Foundation.

There is already a growing supply of vehicles in shared mobility systems.

The Internet Gave Us Immediacy: 24/7 Service

3.2

Digitalization has profoundly changed our habits. We can now settle our bar bets simply by using our smartphones to look up the fact in question; instant messaging applications allow us to modify plans just minutes before the stipulated time, whereas in the pre-mobile-phone era, common courtesy and technological constraints required us to give at least one day's notice.

The Internet has conditioned us to expect immediacy in both our social and commercial interactions. We regularly purchase products and services on the fly, at home or waiting for the bus. If a vendor does not have the product when we want it, we have no problem taking our business elsewhere. Of course, we demand that service providers respond quickly. Millennials and, above all, Generation Z (born after the year 2000, during the height of the digital era) take this behavior to the extreme.

Businesses have taken up the gauntlet. Companies, especially those in the consumer goods sector, have become obsessed with improving their customer service and catering to the consumer. They are very aware that an unhappy customer on social media could trigger a corporate crisis. Big data is helping companies create products that are tailored to consumers. According to a PWC report on business opportunities in the United Kingdom, one of the country's main economic drivers between 2017 and 2030 will stem from the growth in customization of consumer products. The report emphasizes that artificial intelligence will be a key growth factor to the extent that it will improve quality, lead to more personalized growth and reduce long-term product cost.

Chris Luebkeman, Director for Global Foresight at Arup refers to hyperdemand when discussing new behavior trends brought about by digitalization. "We want to have everything right when we want it. This trend will go on to erase the limits of time and space," he explains, against the backdrop of the growing presence of delivery drones and at-home 3D printers that we can use to print products after purchasing their designs. "Another important trend will be the virtualization of some aspects of life.

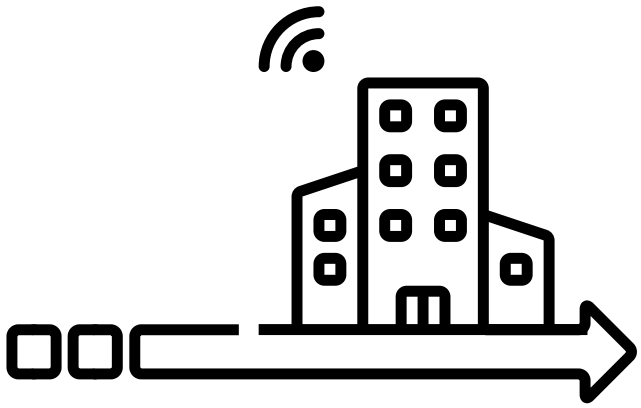
The public sector has not simply watched the immediacy revolution from the sidelines. Institutions face the same demands for hyper-personalized service and rapid response times as do private companies. Local governments strive to develop apps to interact with residents while the Administration scrambles to become digital to varying degrees of success.

The abundant supply of data on citizens allows for informed decision-making. At the same time, the fact that all this information as well as the data generated by local governments is digitized creates more pressure on the public sector to provide services at a speed that will always be compared to that of large, multinational technology companies.

Natalia de Esteban-Úbeda, an independent consultant, Advisor to the European Commission on transport R&D and innovation and former Head of Innovation and Transport for London, believes that, in expecting service 24/7, perhaps we are asking too much from the public sector. "Is it possible that technology is leading us to form unrealistic expectations?"

Immediacy is not necessarily good. "We want instant access to information, knowledge and awareness about what other people are doing. Yet what we need, because we don't have it, is time to think and reflect on ourselves," explains Luebkeman.

The abundant supply of data on citizens allows for informed decision-making.



New Construction Methods: 3D Printing Homes, Collaborative City Design

3.3

"How we relate to housing reflects societal values at each point in history," states Anita Roth, Head of Policy Research at Airbnb. According to the urban planner, a city's first impression depends on the decisions that it makes in terms of public housing and land use. "Space is important, which is why we need to use it efficiently. Soon we will be talking about 3D printing houses in the United States," Roth predicts.

Recent advances in this technology indicate that Roth may not be far off. It's been a long time since the early days when 3D printers only used plastic. Metal, food and even concrete can now flow through these marvels of additive manufacturing.

3D printing of homes is already a reality. There are many studios in Europe that can build single-family concrete homes in a matter of hours. BeMore, a startup from Valencia, sells them for roughly €50,000. The firm prints the client's personalized design at the building site in about 24 hours. As is common in almost every technological field, China is leading the charge. Four years ago, a 3D printer that can build ten, 200-square-meter houses in just one day was unveiled. The company, WinSu, has even overcome the height obstacles – prefabricated homes tend to be one-story structures – by building a

five-story building.

These buildings are not merely attractive due to their technological novelty. The very nature of 3D printing (layer-wise construction) requires the use of unconventional materials. They need to be easy to manipulate and must pass seamlessly through the printer's extruders. Cement is typically mixed with other materials, such as fiber glass, to make the mixture more solid.

3D printing of homes is already a reality.

The mixture is very sturdy, and an excessive amount of concrete is not needed to build a wall. Instead, the wall is hollow, resembling frieze. These qualities allow builders to save materials and, therefore, pollute less. The air chambers within the walls help provide insulation, which leads to a lower energy bill for heating or cooling the home. Lastly, when it comes time to install plumbing, wiring, beams, doors, windows and other elements, the total cost of materials is less than that of conventional homes; printed homes are a more affordable option.

Construction research extends far beyond 3D printing of homes. For example, translucent concrete (mixed with optical fibers) helps to illuminate and heat homes, while thanks to synthetic biology, self-healing concrete is used for building in zones with a high level of seismic activity. According to Chris Johnson, Middle East Managing Principal at the architecture, urban planning and design form Gensler, "recycled materials in construction and design is one of that large future trends that we will see in the medium and long term.

A British firm has launched the WikiHouse, an open-source construction project built with large, uniform pieces that resemble giant Lego blocks (or a large IKEA product). However, the main selling point is that owners can improve and change the design of their homes choosing that which best meets their needs.

According to Rick Jacobs, Accelerator for America CEO, "any business related to designing parts used in city construction will be successful." Accelerator for America is a nonprofit geared toward supporting the best ideas for improving life in cities. He sees a bright professional future for architects, civil engineers and materials engineers because infrastructure renovation and the growth of cities are on the rise.

The emergence of new technologies and the greater involvement of people in their environments are creating new experiences in collaborative urban design. The involvement of the public sector, private companies and citizens can help develop a form of urban planning that meets the needs of urban dwellers better.

Reinventing Public Space: A Greater Focus on the Pedestrian, Less Traffic

3.4

It is well documented that Barcelona, a city where people have continuously lived for at least 7,000 years, became a distinguished city around the 7th century BC. Over the course of history, its appearance has changed countless times. The last large-scale aesthetic improvements took place at the end of the 19th century; Illdefons Cerdà, through the aptly named plan Cerdà, reorganized the city after the ramparts had been recently removed. Large, square city blocks with 45-degree, chamfered corners were built to fill the space between the historic district and Gràcia, Sants and Sant Andreu neighborhoods.
Some say that the illustrious urban planner anticipated that cars, which existed more in theory than in practice at the time, would eventually dominate the road. Others believe that his decisions were simply based in aesthetics. The city's design fits perfectly with the needs of motor vehicles to such an extent that it served as a model for the redesign of many other cities.

Barcelona's design fits perfectly with the needs of motor vehicles.

Urban design is the physical manifestation of the present moment in history. During the 20th century, cities were so invested in automobiles that they widened streets and built roads and parking lots. Perhaps now it is time to rethink this model in the 21st century. We have already seen how large and medium-sized cities have begun to prohibit the circulation of motor vehicles in increasingly large sections of cities. Local governments are coming up with ways to incentivize the use of alternative forms of transportation, such as bicycles and the metro. The purpose is twofold: reduce pollution and traffic as well as improve the health and wellbeing of citizens (less pollution more exercise).

The rise of more alternative forms of transportation and the emergence of Mobility as a Service (MaaS) have led many urban planners to suspect that, with time, we will see increasingly fewer cars on the street. The autonomous car, which is expected to emerge on a large scale by 2040 or 2050, could exacerbate this trend, taking even more cars off the road. Carlo Ratti, an architect and urban planner believes that the autonomous car is one of the few factors that could change the urban appearance as we know it.

These changes are on the way. They cannot be avoided: local governments must make decisions that include this technology and integrate it into urban planning. It is estimated that in cities like Madrid, private vehicles account for less than 30% of transit but occupy 80% of the space in cities.

"As autonomous vehicles and other freeing forms of transport gain traction, cities will have at their disposal large amounts of land that had previously been reserved for street and parking lots. What are we going to do with all that space?" asks Accelerator for America CEO, Rick Jacobs. This topic sparked many of the debates at the Future Trends Forum in Lisbon. One of the experts' conclusions was that we need to take advantage of the current situation in order to humanize public space. "Much of the space that is occupied by traffic will no longer be required to serve that purpose in the future. It can be turned into green space and other public areas, which is already occurring in some Japanese cities," advised one working group.

The return to nature usually comes to mind very quickly when we begin to imagine how we will use the space currently monopolized by cars. According to Chris Luebkeman from Arup, "one the greatest challenges is the re-ruralization of city centers." "Urban gardens, urban agriculture – citizens want to get organic, fresh food from sources that they trust." Setting aside land for these purposes would be one way to reconcile ourselves with cities.

Rick Jacobs

The future of employment

In cities like Madrid, private vehicles account for less than 30% of transit but occupy 80% of the space in cities.

The People Demand Their Own Space: The New Urban Social Contract

3.5

Smart cities, aided by technology, are on the rise across the globe. They are emerging, slowly but surely, at the same time that many new trends and processes are being developed, which are helping to change the urban landscape. We have yet to discuss the most important influence on the urban landscape: people.

We already know that more people are living in cities. Established neighbors are welcoming new arrivals in unique ways, leading to relatively high levels of integration of newcomers into community life. As we have already mentioned, we are also hyperconnected, which is theoretically an additional tool that allows us to connect with our neighbors as well as institutions.

However, one of humanity's main concerns in this day and age is the need to create the feeling of community, allowing inhabitants to sincerely interact with each other and, to the extent possible, engage in what is happening around them. "People dedicate time to building their communities because socialization is one of the key elements of our lives," states the architect Chris Johnson.

John Rossant

Governance and partnership models in smart cities

12:41min

"Some countries have a Ministry of Happiness." The Middle East Managing Principal for the architecture, urban planning and design firm Gensler explains that we are changing how we manage our time without even realizing it. "The line between work and play is becoming increasingly blurred, especially among younger people." You not only text friends at work but also write work emails at birthday parties. "People work, learn, socialize and consume everywhere.".

This trend is so strong that the very concept of the office is changing. An increasing number of people are becoming self-employed, either out of interest or necessity. Freelancers and entrepreneurs have built a new type of office that is less stifling and promotes creativity, and many companies are trying to replicate it. According to Richard Kivel, a professor at MIT, "connectivity and shared workspaces have done away with the solitary cubicle; fluid communities enable greater connection among people, which, at the same time, stimulates new ideas." Kivel is also the Head of IT at GrayBella Capital, a health and biotechnology investment fund.

Richard Kivel
Managing Director
GrayBella Capital.

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One of the advantages of the times in which we live is that technology can make citizens' input more important. Many forms of cooperation among neighbors, from consumer cooperatives to numerous organizations, are taking advantage of hyperconnectivity to move forward. In many cases, even government institutions are creating new communication channels so that residents can voice their concerns and ideas. Due to the digitalization of society, we as consumers have come to demand that suppliers of goods and services take responsibility and change their behavior. It makes sense that, as citizens, we want to participate more actively in our surroundings. That is the new urban social contract.

What course will the construction of new cities take? Johnson declares, "As cities respond to today's and tomorrow's challenges, there's hope that our solutions lead us to an inclusive, responsible and ecological place where we can make our dreams come true.

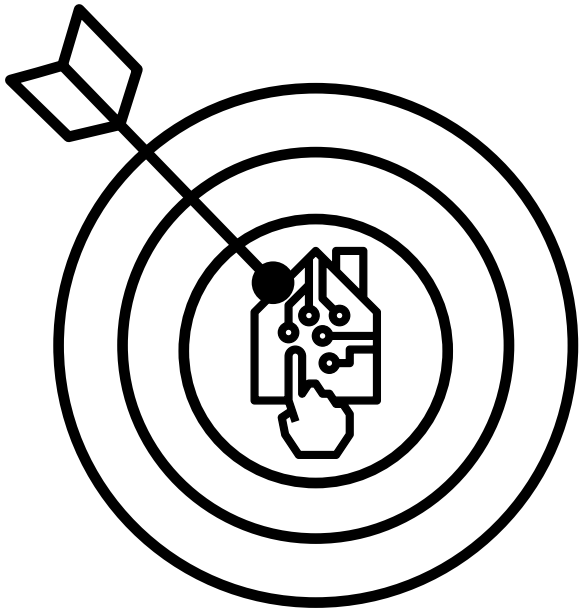

Challenges faced by cities
General discussion

The Primary Challenges Facing Disruptive Cities

4.0

We have already addressed the current state of cities, the pillars of a smart city and the emerging processes and trends in the urban landscape that can impact the future of cities. In order to shape the cities of tomorrow, we must now examine the challenges that come with reconciling these trends with reality.

New forms of mobility (shared mobility, autonomous and electric vehicles, etc.) must be adapted to current infrastructure and equipment, which is not always easy. One of the key factors in this process of adaptation – as well as in all new situations brought about by technology – will be regulation, which ensures that everything falls into place. Public sector institutions, in collaboration with the other players involved, must develop this regulation because inclusive governance is more likely to succeed when faced with the many challenges that are arising. Perhaps the greatest challenge is the fight against inequality: if it were to increase, all hope for a cohesive society may be lost. Lastly, given cities' increasing dependence on technology, it is worth devoting resources to cybersecurity to prevent major problems in the future.



New forms of mobility must be adapted to current infrastructures and equipment.

Managing the Transition to New Forms of Mobility

4.1

Shared mobility and electric vehicles have arrived and will only continue to grow in popularity. The transportation sector has spent years preparing for the arrival of the autonomous vehicles, which is expected to completely revolutionize the very notion of transportation. We may have to add more variables to the equation: flying vehicles (currently being developed at Boeing and Uber) and Elon Musk's Hyperloop, a type of supersonic train that is gradually passing from a mere concept to the experimental phase.

We already feel some of the effects of this change today. In the short term, shared mobility is putting a new pressure on street and parking lots. These spaces now accommodate the fleets of pay per use vehicles that companies have embraced as well as privately owned vehicles. At the same time, the rise of bicycle sharing has driven the construction of bike lanes in cities that did not have them in the past. However, traffic congestion has risen 30% in recent years in New York despite the presence of Uber and Lyft; metro and bus use continues to fall in Los Angeles even though new lines are added to these services. These trends were discussed in one of the debates during the Future Trends Forum. The conclusion: technology cannot induce change on its own.

If we look into the near future, we are expecting changes that are more profound than prior transformations. Fortunately, they will not all happen at once, and we are already aware of them. Yet we must plan very well so that we may respond adequately to the wide array of transportation choices. A well-calibrated response will ensure that they function in a coordinated and smooth manner. For example, we must think about the role of freight transport in this new landscape. According to Natalia de Esteban-Úbeda, independent consultant, Advisor to the European Commission on transport R&D and former Head of Innovation at Transport for London, if delivery trucks were to adopt electric motors, they could possibly make their routes at night because they would no longer make noise. This would eliminate daytime traffic, but we would need to put incentives, regulations and taxes in place to ensure that it functions. "The automation of driving will change the appearance of our cities. But who will fund the transition and necessary infrastructure?" Esteban-Úbeda asks.

Without a doubt, we will need to build more charging stations and encourage owners to charge their vehicles at home. What is going to happen when self-driving cars start to circulate? Twenty years are expected to pass before we see widespread use of these vehicles. Not only do these vehicles communicate with each other but also with urban infrastructure; they need real-time information on traffic, accidents and other data. In a practical sense, beacons and other smart devices need to be installed in order to communicate with the cars.

Autonomous and manual vehicles must coexist. Beyond examining the legal ramifications of these cars, we need to think about where they will travel in cities. One option is that they use special lanes, like buses or taxis, at least until we feel that we can trust them. Some US highways have lanes where drivers have to pay to go faster than normal traffic; some have suggested that self-driving cars could use those lanes.

We will need to build more charging stations and encourage owners to charge their vehicles at home.

The autonomous vehicle may be the solution to significant mobility problems. Charles Bolden asks, "How can we develop transport models and methods for the disabled and increasingly elderly populations?" He is the President of the Bolden Consulting Group and a former Administrator of NASA. When autonomous vehicles are completely developed, they will be able to transport the aforementioned populations as well as children, even without adult supervision. According to industry experts, this is classified as "level 5" development: the vehicles are able to make their own decisions and are completely autonomous, even in uncontrolled environments. Passengers will just have to sit and wait to arrive at their destination. Who will let them know when they arrive at their destination?

Intercity transportation is another challenge that needs to be addressed; the daily, round-trip commute from surrounding cities to large cities creates traffic around the world. The key to reducing traffic appears to lie in improving current systems and exploring new transportation formulas, such as car sharing or – in the future – flying cars.

There are many changes to come. If all relevant actors are included in the decision-making process, then the integration of these new forms of transportation will be managed successfully.

Paola Subacchi

Governance solutions for smart cities

07:46min

Smart Regulation

4.2

Shanghai is a pillar of the Chinese economy and one of the largest cities on Earth. The mega city is typically known for its formidable manufacturing industry, whose products depart from the largest port in the world. However, the growing number of skyscrapers punctuating the skyline is testament to the growing importance of Shanghai's technology and finance industries. Shanghai has wholeheartedly adopted digital platforms and is home to a strong middle class that is perpetually glued to their smartphones. Many of the sidewalks in central districts of this megacity of 25 million inhabitants are impossible to travel. Tens of thousands of shared bicycles scattered throughout the city wait for users to unlock them with their smartphones and, in doing so, make foot traffic quite difficult.

The success of the bicycles' pay-per-use formula has led companies to literally flood large cities in China with these dockless vehicles. They have gained so much popularity that some companies, such as Ofo or Mobike, operate across half of the globe. In cities outside of China, the popularity of these bicycles has yet to reach the point where they need to be removed so pedestrians can use sidewalks. However, there are many nuances to this calm-congestion spectrum. Electric scooters have expanded recently as well, and their peculiar nature has led many users to ride on sidewalks as opposed to bike lanes, where cyclists (should) travel.

Natalia de Esteban-Úbeda explains, "Embracing new technologies is great, but we need to think about regulation. Dockless bicycles are a clear example. We've gone great lengths to adopt them in cities like London, but, occasionally, what is good for the consumer isn't always good for the city. We want cheaper and more comfortable services, but we don't like it when these bicycles fill our sidewalks or make it impossible to get to the metro." Touching upon another aspect of mobility, she warns that it will not be easy to strike a balance between autonomous vehicles (once they hit the streets) and traditional forms of transportation. "It is more difficult to make new forms of transportation fit within our systems than it is to substitute traditional vehicles for autonomous ones. Ghost vehicles, unoccupied autonomous vehicles, will pose a

problem. They may be a challenge from a regulatory and taxation perspective. We need to think of regulation as a tool that will help, as opposed to hinder, the implementation of technology."

The main change brought about by technology is the presence of new private actors. They do not have licenses because the services that they provide do not require licenses a priori and they are having a significant impact on the urban environment. According to Khoo Teng Chye, we have reached the point where intervention is required to establish order. He is the Executive Director for the Centre for Liveable Cities, an organization within the Ministry of National Development in Singapore. "We must begin to manage the changes that Uber, for example, is making to the taxi business in India, the rampant overpopulation of dockless bicycles in Singapore or AirBnb's impact on many neighborhoods in Barcelona. The main concern is how the businesses can function without endangering the city's ecosystem. The government's response to this challenge, the regulatory measures that are taken, may be one of the key issues related to the future of cities."

Evan Wolff is Managing Director at the security consulting and risk management firm The Chertoff Group as well as Cybersecurity and Homeland Security Partner at the law firm Crowell and Moring LLP. He believes that we "must think about how to respond to new technologies that can affect cities, such as the applications used in the platform economy, which do not have the same limitations and regulations as traditional services."

The rise of technology, both physical and virtual, in city life requires new strategies and significant flexibility to prevent technological innovations frombecoming problems.

Cooperation from All Stakeholders to Design the City of the Future

4.3

Even though technology is the source of many significant challenges facing cities, it is also true that, fortunately, technology offers solutions to manage the situation. "We have reason to discuss new forms of governance. First, digital tools are providing citizens with new possibilities" explains John Rossant, Founder and Chairman of The New Cities Foundation and Founder and Chief Curator of LA CoMotion, a large annual event about future mobility that takes place in Los Angeles. "Crowdcitizenship, crowdurbanism – there are new formulas that allow citizens to actively participate in decisions about budgetary spending. In Madrid, for example, this is already taking place: citizens have a say regarding almost 300 million euros of investments. People are practically desperate to be heard," states Rossant. Evan Wolff, Managing Director at The Chertoff Group, agrees, "We need better balance among public institutions, private companies and individuals with respect to everything that is related to cities.

Technology is advantageous for many people, but it also has social and environmental costs. The key is observing how new business models – that emerge around technology and are backed by big venture capital – act in a way that does not harm the city's ecosystem," states Khoo Teng Chye, Executive Director for the Centre for Liveable Cities, an organization within the government of Singapore. The government response may be one of the key issues related to the future of cities."

The main concern is how the businesses can function without endangering the city's ecosystem.

There are new formulas that allow citizens to actively participate in decisions about budgetary spending.

If we want this to work, the public and private sectors need to work together.

Khoo supports the concept of dynamic urban governance; Singapore put this model into practice following independence from China in 1965. At the time, the population of Singapore was roughly 2 million inhabitants, the majority of which lived in huts and suffered poor sanitary conditions. Today, the city has 5.6 million inhabitants and serves as a model for sustainability and smart-infrastructure development. This radical transformation from a third-world to a first-world city was possible due to long-term planning, which, according to some experts, contributed to the authoritarian nature of initial administrations. "If we want this to work, the public and private sectors need to work together," Khoo states.

One of the common conclusions of the Future Trends Forum working groups was that long-term planning needs to be respected by successive administrations. "How much leeway does a mayor have in terms of ordering the use of drones, autonomous vehicles or flying vehicles? I have worked for three mayors from different parts of the political spectrum and I have seen measures being implemented, removed and implemented again. This is a serious error when dealing with issues of this magnitude. You need political stability in order to implement good measures," Natalia de Esteban-Úbeda advises. According to Jens Schulte-Bockum, Chief Operating Officer (COO) at MTN Group, reaching a consensus will become even more difficult. "Many political measures, such as subsidized housing, are based on value judgments. It will be very difficult to reach solid agreements that last in the long term; economic hardships don't make it any easier."

Without the cooperation of all parties involved in urban development (including inhabitants) and in the absence of a long-term vision, we will struggle to address the numerous transformations in our cities.

Gentrification and Housing Access: Squaring the Circle to Build Communities

4.4

Hundreds of millions of people will move to cities, mostly in developing economies, in coming decades. At the same time, larger cities will continue to attract inhabitants from smaller urban areas who are searching for better opportunities. These migrations will change (and have already begun to change) certain neighborhoods and will require new ones to be built.

According to Anita Roth, Head of Policy Research at AirBnb, cities are expected to need between 200 million and 1 billion new housing units by 2050. The UN predicts that by that time the world population will reach 9.7 billion people. Airbnb positions itself as a solution: a more efficient use of our current housing to prevent the need for more construction..

Gentrification is well known in cities across the world, starting in the center and spreading outward as time progresses. Can technology help us manage this process? Roth believes that "Gentrification occurs because people are constantly searching for better and cheaper places to live. I don't believe that there is just one solution to this problem. One solution is building more homes that people would want to live in." Other experts that participated in the Future Trends Forum, such as Khoo Teng Chye, believe that Airbnb is pushing residents out of the urban centers of cities like Barcelona, Paris or Amsterdam because it is more profitable than traditional rental agreements.

"Gentrification is making more difficult for middle class families to buy homes in cities, and that's a problem", emphasizes Charles Bolden, President of The Bolden Consulting Group LLC. In contrast, Jens Schulte-Bockum believes that "large-scale demographic trends and significant trends in the distribution of wealth can lead to a radical shift in urban social development." He is Chief Operating Officer (COO) at MTN Group and a Bankinter Innovation Foundation Trustee.

"Uber, Airbnb, Wework – we are creating new paradigms for transportation, housing and work that can transform cities" affirms Kyle Corkum, Cofounder and Managing Partner at the real estate developer LStar Ventures.

Anita Roth

The evolution of housing in cities

Platforms like Wework are contributing to the increasing phenomenon of outsourcing. The website puts qualified workers in contact with employers. For example, Bangladeshi or Indian software developers can connect with companies in the United States. And they're doing it. Wework may also lead more professionals to work remotely, eliminating the need to move to big cities.

Gentrification, high housing costs... these factors, together with demographic changes (immigration and aging population, in Europe's case) can lead to social disintegration, where people no longer feel that they are part of the same community and, therefore, do not get involved. Anita Roth states, "We need to try to get blue-collar workers to meet and interact with white-collar workers. Cities make that possible."

The Fight Against Inequality (Among Citizens, Cities and Non-Urbanized Territories)

4.5

One of the main concerns of the experts who participated in the Future Trends Forum in Lisbon was whether the multiple changes that cities are experiencing will tear the urban social fabric. Wilfried Vanhonacker, Cofounder of both the China Europe International Business School (CEIBS) and the Moscow School of Management SKOLKOVO, fears the impact that social inequality, the divide between the haves and the have-nots, will have on the construction of new cities. Paola Subacchi, Senior Research Fellow at Chatham House (The Royal Institute of International Affairs) warns of the fragmentation and segregation that can stem from class conflict, struggles between ethnic groups and conflicts caused by demographic pressure. This issue also worries Emilio Méndez, Director of the Energy Science and Technology Department at Brookhaven National Laboratory.

John de Yonge is a Director in the fields of urban planning, innovation and natural resources at EYQ (a think tank at the consulting firm EY). He is worried about the growing gap between the haves and have-nots, specifically that "smart technology could exacerbate these differences instead of reducing them". Anita Roth from Airbnb fears that income inequality will lead to a split in interests and experiences that will ultimately separate the wealthy and the poor into two entirely different worlds. Esteban-Úbeda believes that social inclusion should be a requirement in cities. "Digital inclusion and mobility for the disabled and the elderly must be achieved through concrete actions."

How do we make social cohesion possible? Experts at the Future Trends Forum agreed: the measures proposed in each city (across all administrations and agencies) need to be integrated, and wealth needs to be generated to support new policies. Universal basic income could be a possible tool in such an effort. It is worth examining its potential.

> Smart technology could exacerbate these differences instead of reducing them.

Rick Jacobs is optimistic: if there is one place where social cohesion can be achieved, it is in cities. "It is a unique form of organization, far different from other levels of government. Cities provide people with the best opportunities to collaborate in solving problems and to lead good lives," explains the Chief Executive Officer (CEO) of Accelerator for America, a nonprofit organization dedicated to supporting the best ideas geared toward improving life in cities. James Fallows from The Atlantic agrees, adding that cities can help revive the currently decrepit domestic policy."

"One of the great challenges of cities is inclusive construction – uninfluenced by age, ethnicity, income or language of its inhabitants. But the reality is that there are serious integration problems across the world. Can technology help reverse this?" asks Khoo Teng Chye. He believes so. The so-called "vertical villages" in Singapore that house immigrants are a good example; they have exceptional infrastructure and 80% of the homes are public housing.

Experts at the Future Trends Forum were also worried about what to do with non-urban territories. It is worth thinking about the relationship that cities need to build with their surroundings, relationships based on a shared understanding of mutual dependence.

It is worth thinking about the relationship that cities need to build with their surroundings.

What do we know about the relationship among large, medium-sized and small cities? If megacities continue to attract talent and offer better opportunities for personal and professional development, where does that leave other cities? According to Alfonso Vergara, Founder and Honorary President of Metropoli Ecosystems (Fundación Metrópoli), "Medium-sized cities are better prepared for the coming changes because they can grow and are more balanced. Large cities, in contrast, may be negatively impacted. They will only improve if they work together." Size can be a problem. According to Jesús de la Quintana, Head of Emerging Initiatives Urban Solutions at Tecnalia, "Cities are becoming so large that it is increasingly difficult for people to enjoy living in them and for cities themselves to meet their inhabitants' expectations.

Manuel Cayre, Cofounder and COO at MobyPark, believes that in a globalized and interconnected world, it does not make sense for cities to work in isolation. "We need to work more with developing countries so that they help us find solutions to our economic and environmental challenges.

(Cyber)security

4.6

Technology can make mistakes, and there will always be those that want to use it against others. For the first time, the 2017 World Economic Forum held in Davos included cyberattacks, systemic data fraud and security breaches of infrastructure as critical risks in its annual Global Risks Report. The world is becoming increasingly connected and digitalized, which means that cybercriminals will continue to do even more damage.

In Spain alone, the Spanish National Cybersecurity Institute (INCIBE) resolved 123,064 incidents in 2017, 6.77% more than in 2016. Companies are becoming aware of the problem and are slowly beginning to protect themselves. The PwC Global State of Information Security Survey 2017 reveals that, since 2012, the average cybersecurity budget of companies across the world has almost doubled, from USD 2.8 million to USD 5.1 million.

Cities are not safe from these attacks, and the threat will only increase with the growth of smart cities. "Vehicles are very easy to hack. Imagine that hackers can reach delivery trucks or even the supply chain, itself. This would disrupt any company or institution and would affect more than just the city," illustrates Natalia de Esteban-Úbeda.

What can we do to prevent this? "First, technology needs to be more secure. Second, greater regulation is needed, as we have seen in the Facebook and Cambridge Analytica case", explains Evan Wolff, Managing Director at The Chertoff Group as well as Cybersecurity and Homeland Security Partner at Crowell and Moring LLP. "We also need to think about how we can update and improve technology. Lastly, the public and private sectors should share the risk, the burden cannot just fall on citizens."

Cities would benefit from considering virtual threats in addition to physical ones, such as war and terrorism. However, Wolff is very clear. "The next big war will be fought in cyberspace.".

Cities would benefit from considering virtual threats in addition to physical ones.

Conclusions

5.0

The city is the prime space for human development. More than half of humanity lives in cities, and this number will only increase with time. Cities, more than any other place on Earth, provide people with opportunities; they account for 80% of global GDP. They are important service hubs and, specifically due to their high population density, have sound infrastructure. However, creating a generic urban sketch would be futile because each city is unique. The size and level of economic development of a given country play a key role in the growth of its cities. Any initiative that seeks to improve our lives must take cities into account.

Our urban centers are facing significant changes that will shape their very nature and appearance. From a demographic standpoint, urban populations in Europe are becoming increasingly older, which necessitates a shift towards a preventative healthcare system in order to improve services and effectiveness. We will need to adapt our infrastructure to this new reality, marked by another demographic trend: increased mobility and migrations flows that bring more people to cities.

The fight against climate change will also define the future development of cities. The international community has affirmed its commitment to sustainable development, as demonstrated by the 2015 Paris Agreement to reduce CO2 emissions or the United Nations Sustainable Development Goals. If we want the planet to last for many more centuries to come, our cities must cease to be dens of pollution and energy waste.

The emergence of disruptive technologies is changing how we expect cities to meet these challenges. How should we expect technology to change the urban landscape? To what extent is technology changing the world in which we now live? What additional challenges will the implementation of technology pose for cities? Below are but a few of the conclusions that experts reached at the Future Trends Forum in Lisbon:

1. Smart cities

Technology, though not a panacea for all urban problems, makes it possible for us to significantly improve our cities. Smart cities stem from the implementation of Information and Communication Technologies (ICT) – as well as other technological advances – in urban development to improve the ways in which services are provided. Urban mobility, the fight against pollution, utilities design – all of these elements radically change in tandem with technology.

2. Disruptive technology that changes connected citizens

The rise of disruptive technology is paving the way for new trends and processes that have an impact on how cities function. The platform economy and the rise of Mobility as a Service (MaaS) challenge the very notion of ownership, calling into question the second greatest purchase of families, following a home: a vehicle. The way in which we design and build housing is changing, as is how we provide connected citizens with services.

3. Pedestrian space

These transformations require decision-making. For example, what do we do with all the space that was originally reserved for parking? It is expected to become less useful as autonomous vehicles are rolled out on a large

scale; there will be no reason for these vehicles to remain parked. The experts are clear: we need to reclaim space for pedestrians.

4. Autonomous vehicles

Autonomous vehicles will gradually be introduced in our cities. Meanwhile, shared mobility is gaining traction in cities across the world, but it has yet to help reduce traffic. Officials must regulate the implementation of new mobility systems, most of which are operated by private companies, so that they can coexist with current forms of public and private transportation.

5. Housing management

Significant regulation will be required to address this issue as well as manage the effects of the widespread use of housing rental apps like Airbnb in cities, such as Barcelona, Paris, Amsterdam or New York. The experts that were invited to Lisbon by the Bankinter Innovation Foundation were largely concerned with developing a flexible regulatory system. Without the involvement of all affected actors (the public and private sectors as well as citizens) it will be impossible to create an agile system.

6. Gentrification

Gentrification and income inequality are significant urban problems that need to be addressed. Yet the potential loss of a sense of community is the most troubling aspect of the new urban landscape. According to the panel of experts at the Future Trends Forum, social fragmentation is one of the five issues to which local governments in major cities should dedicate their time. How do we determine who is part of a community? Are property and income the determining factors? We need to ensure that immigrants can form part of society, that all citizens have access to goods and services and that urban planning promotes unity, not segregation.

7. Elderly citizens

Another key concern is caring for the increasing elderly population and the underprivileged. We need to develop policies to combat loneliness in the elderly population and must adapt education, healthcare and infrastructure to their needs.

8. New infrastructure

Preparing infrastructure for the future will be another headache for local governments. As we have seen, transportation, communication, energy and other utilities will put significant stress on local governments, who should prioritize and analyze the development of each utility. Engaging the private sector will be the key to success.

9. Environmental sustainability

Cities are not alone. In addition to bringing together people that are in close proximity, globalization promotes the creation of close links among many different people, irrespective of their location. Our guiding principles and practices should be transparency, the use of big data to make management more efficient, strong incentives for environmental sustainability and a sense of shared responsibility regarding the future of the planet.

10. Innovation

Another tenet of globalization is that cities should promote and attract innovation. They must strive to become places where anyone would want to live and have the ability to seize ideas and put them into action. Technology can be good or bad depending on how we use it and our imaginations.

Cities are dynamic, living spaces. They reflect society at any given moment. It is up to us to shape the city of the future. We have all the tools to build the city of our dreams.