URBAN RESILIENCE:
introducing this issue and summarizing the discussions

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Resilience is an issue of increasing importance to city managers and policymakers. The idea first emerged in the scientific world and was then taken up by psychologists and ecologists to describe the ability to resist unforeseen events and return to a pre-event state. Since the turn of the millennium, many major cities are increasingly adopting resilience strategies to plan for and manage a range of risks, not only environmental but also economic, social, food security, and so on. Cities are at the center of the idea of resilience insofar as they are simultaneously part of the problem, as the major source of greenhouse gas emissions, but also potential victims of natural disasters – coastal cities are, for example, vulnerable to hurricanes and rising sea levels. Cities are also the source of future solutions, via, for instance, networks of resilient cities and their capacity to manage problems on a "human scale." There is a measure of disagreement surrounding the term resilience, with some encouraged by its all-embracing nature and others decrying it as simply a catch-all concept. Resilience – assuming that certain strategic, holistic, durability and collaborative conditions for achieving legitimacy have been met – can, however, provide an array of new tools to help foster the emergence of the sustainable and enduring city of tomorrow.

KEYWORDS

- **DEFINITION**
- **LEGITIMACY**
- **MEGACITIES**
- **RISKS AND OPPORTUNITIES**

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Resilience has emerged in recent decades as one of the core words in the language that structures our era. Just like other often-used yet imprecisely defined notions – sustainability, smart and inclusive being three good examples – resilience is an ever-changing concept that is hard to pin down. The word first gained currency in scientific literature, specifically physics, as a term used to designate the resistance to impact of a material. The term was then extensively picked up by psychologists to describe a similar phenomenon: the capacity to recover after individual or collective trauma. Ecologists use the term to designate an ecosystem's capacity to rebuild itself and restore its balance after being disturbed, as, for example, in the natural regeneration of a forest and its ecosystem after a fire. Used in this way, resilience describes not simply a capacity to resist, but also an ability to recover after a shock and return to a previous state. The notion is also used in the sociotechnical field (at the interface between engineering and social and human sciences) to designate a system's capacity to adjust to unsettling events.

The past decade and a half has seen the term adopted outside purely scientific spheres, where it is now used to describe complex ecosystems such as cities. Resilience has become a big deal for cities, especially since the Rockefeller Foundation sponsored the emergence of the 100 Resilient Cities network in 2013, seeking to assist the world's major cities to overcome the multiple shocks they might increasingly have to face. Michael Berkowitz, President of the 100 Resilient Cities program, defines resilience as "the capacity of a city to thrive in the face of shocks and stresses."

Urban resilience is increasingly essential as the populations of the world's cities continue to grow, with 70% of the global population being city-dwellers by 2050 according to the U.N.,[1] and cities facing greater threats from natural disasters and unprecedented social tensions.

1. URBAN RESILIENCE HAS BECOME A PRESSING ISSUE IN THE FACE OF THE MULTIPLICATION OF RISKS, PARTICULARLY ENVIRONMENTAL

The success of resilience as a concept is above all a manifestation of growing awareness, not to say a degree of pessimism, in the face of natural risks.

The Lisbon earthquake of 1755 is widely seen as a turning point in the history of Enlightenment and the western world's attitude to scientific progress. The earthquake that devastated the city was met with a unanimous response: only scientific progress could avoid disasters of this nature. As Luc Ferry puts it, sciences would "make it possible to predict and, consequently, prevent the sorrows that the absurdity of nature inflicts so cruelly on humans. In essence, the scientific mind allied with an enterprising spirit was going to save us from the tyrannies of materials in the raw."[2]

This control over the world would not only free people from enslavement to natural forces but would, more fundamentally, also enable those same forces to be harnessed for profit: herein lies the idea of happiness, which was considered a "new idea in Europe" at the time.
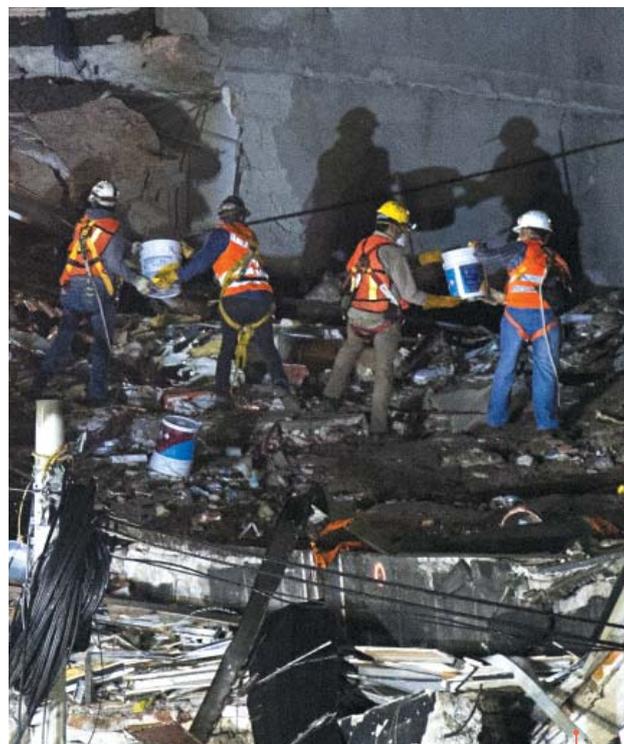
Mexico, September 25, 2017.
Rescue work in a collapsed building

Three centuries later, we find our attitudes to science and nature profoundly altered. In the light of Hans Jonas' essay *The Responsibility Principle*[3] and the emergence of the precautionary principle, progress seeks no longer to be continuous and to harness nature, but simply to avoid the worst case scenario. Disasters are henceforth inevitable and unavoidable. We need to understand how to cope and recover.

As pointed out by Michel Juffé,[4] head of the scientific council of the French Association for Prevention of Natural Disasters, "the success of the word resilience in the prevailing discourse and the media is doubtless highly symptomatic of our doubt, perhaps even our despair, of our chances of achieving a better world. But such fatalism is itself a reaction to the optimism inherent in a rationality rooted in the Enlightenment, the idea that with continuous scientific progress, natural and social phenomena would ultimately be mastered and rendered harmless; it was to be the triumph of prediction and prevention."

The primary explanation for this fatalism is the growing number of natural disasters caused by climate change. It is also the product of the international community's inertia in the face of the radical transitions that are required.

1 United Nations, *World Urbanization Prospects*, 2014
2 Luc Ferry, *Le syndrome du gyroscope*, Institut Montaigne, 2004

3 Hans Jonas, *The Responsibility Principle*, 1979
4 Michel Juffé, *Resilience of what, for what and to what?* Annales des Mines - Responsabilité et environnement, 2013-14 (issue 72)

FOUR DEFINITIONS OF RESILIENCE

Serge Tisseron, psychiatrist
Extract from his intervention at the colloquium on Resilient Cities and Territories, September 2017

"There is not one but several definitions of the word resilience. The history of the word began in the field of psychology. It is an intrinsic quality of individuals: we speak of resilient children and resilient people. Two approaches claim to offer an explanation: genetic origin and the quality of the early environment. This initial definition brought with it the risk of dividing people into two camps: those who are resilient and those who are not. A second definition of resilience appeared. What if it were a relationship-driven process? Everybody could become resilient providing they were given the help they needed. But the collective is marginalized under this definition, which focuses on relationships of duality, leading to the emergence of resilience teachers. Resilience teaching was even imposed on people with mental illnesses in some hospitals in Canada. This was also the era of resilience-mongers, and an ever-greater number of guidebooks and advice about how to become resilient. The third wave saw resilience defined as a strength possessed by all, and that can manifest in different ways. Resilience became a capacity for reconstruction and rebirth shared by all living species. This third definition opened considerable opportunities to psychology researchers as it made it possible to imagine people's psychological reconstruction as a function of their innate possibilities and environment. The definition brings with it the notion of prevention: if resilience is a strength, then it must be possible to ensure it is exercised under the best conditions. To help find a way between these three definitions, I proposed using three alternate spellings: 'resiliences' to define individual's qualities; 'resiliance' with an 'a' to designate the process; and 'Resilience' with a capital 'R' to designate the strength. We are now entering a fourth period. Resilience is viewed as being collective; we speak of societal resilience. This enables us to include the three mutually exclusive definitions above: they become complementary and together participate in the definition of resilient systems, those in dynamic equilibrium, able to prepare thanks to early warnings and foresight, to resist, to recover and to rebound by learning, adapting and innovating, and finally, to evolve toward a new state of dynamic equilibrium by mitigating the physical and psychological consequences of previous unforeseen events."

RESILIENCE AT THE SOCIOTECHNICAL SCALE: RISK MANAGEMENT AND RESILIENCE ENGINEERING

Eric Rigaud, research associate, Mines ParisTech PSL, CRC
Extract from his presentation to the colloquium on Resilient Cities and Territories, September 2017

"Resilience is associated with a system's capacity to respond and adapt to the appearance of significant threat or severe adversity. The concept of resilience is used to denote the process contributing to an adaptation, the growth path following the appearance of the source of adversity, the result of the process of adaptation, or all of these characteristics.
At the scale of sociotechnical systems, resilience is deployed to discuss the nature and role of individual and collective capacities to adapt and ensure safety. The safety of any system resides in a set of processes designed to provide that system with arrangements to prevent and protect it from a potentially damaging event and to prepare it to deal with and overcome such an event. These arrangements can be physical barriers such as fences, guardrails and embankments, symbolic measures such as posters and signposts, special training to help people adopt safety-first attitudes, or procedures and regulations to govern individual and collective behavior. The specification, design and maintenance of such arrangements require, among other things, identifying sources of adversity with the potential to impact the system, such as unforeseen external events, technical malfunctions, errors, and so on, and drafting a sufficiently precise description to make it possible to deduce the specifications for arrangements needed to manage safety, and the human and financial resources to deploy and maintain them. A system can be deemed safe if all scenarios for events liable to damage it are taken into account, if technical barriers are correctly designed and scrupulously maintained, if procedures are comprehensive and accurate, if operators apply them and if the time, human and material resources needed are available and sufficient.
System safety is challenged by the tendency of sociotechnical systems to move toward greater complexity as well as programs to optimize resources and shrink budgets, shortened production lead-times, and the whole array of changes that organizations are subject to, such as digital transition and environmental transition. This means that actors in a system are confronted with situations of adversity that the system has anticipated. They have to adapt their behavior to obey the procedures and rules associated with these situations. They are also confronted with anticipated situations where no barriers have been planned, or planned barriers prove to be inoperative. In this scenario, they have to adapt their behavior by altering the procedures or improvising. Lastly, they may be confronted with exceptional, extreme and unprecedented situations, when they not only have to improvise but also alter their entire mindset to find a solution.
Resilience engineering aims to understand the different forms of individual and collective adaptation to the diversity of adverse situations that may arise, and to design solutions to allow these adaptations to develop."

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2. CITIES: DECISIVE CRITICAL ACTORS IN RESILIENCE

Cities have rapidly emerged as key to exploring resilience, as they are at once partly responsible for the environmental crisis as well as being potential victims of disaster, particularly natural disasters, and the primary wellsprings of solutions.

2.1. URBAN POLLUTION IS THE ROOT OF THE ENVIRONMENTAL CRISIS

By the year 2050, two-thirds of humanity will live in a city.

And cities are at the root of changes to our environment. They consume two-thirds of worldwide energy production and generate over 70% of all greenhouse gas emissions. The latest analysis from C40, presented at the March 2018 meeting of the IPCC, estimates that this proportion is in fact even greater once consumption-based emissions are included.[5] Indirect emissions are rising in the world's most developed cities such as London, Paris and New York. Most pollution in cities in commodity-producing countries of the southern hemisphere is generated by industry and the production of goods subsequently exported to and consumed in the USA and Europe.

2.2. CITIES ARE POTENTIAL VICTIMS OF ENVIRONMENTAL DISASTERS AND SOCIAL TENSIONS

Recent years have seen many cities impacted by natural disasters: Hurricane Michael hitting the coastline of the Gulf of Mexico, the tsunami in Palu in Indonesia, Hurricane Florence along the coast of South Carolina in the USA, a devastating monsoon in Kerala, India, Storm Alberto in Cuba, and so on. High population density means that the human and material cost of natural disasters in urban areas is often extremely high.

Close to 90% of metropolitan areas worldwide are coastal and thus at risk from flooding and violent storms. Climate Central, an NGO, estimates that almost 275 million people currently live in areas at risk of disappearing under rising sea levels in the event of a 3°C rise in global temperature. In this scenario, 5.2 million people would be impacted in Osaka, 3 million in Alexandria and 1.8 million in Rio de Janeiro. Water levels rose around 20 centimeters during the 20th century, with some estimates saying they will rise close to 1 meter by 2100. In France, recent loss of life caused by rainstorms hitting the Aude department caused many to criticize the unbridled urbanization of the past half-century that has seen significant building occur in flood-risk zones. One in four people in France currently live in an area liable to flooding.

Cities are also hotbeds of socioeconomic risks because of the inequalities they exacerbate. On the one hand, cities in OECD countries contributed 60% of all job creation and GDP growth over the past 15 years, and household revenues are on average 18% higher in cities than in other areas.[6] But within cities the wealth gap continues to grow and the challenge of improving social inclusion is now a worldwide issue. The recent OECD report *Making Cities Work for All* showed that in all OECD countries, income inequality in metropolitan areas is higher than the national average. And the bigger the city, the greater the inequality. Metropolitan areas with over 1.5 million inhabitants show higher Gini coefficients in terms of overall disposable household income. But inequalities in cities go beyond household revenues, impacting also access to essential services: a third of city-dwellers in emerging economies live in informal settlements. The ongoing migration crisis also represents a shock of almost unprecedented scale that cities in Europe are having to grapple with. The example of the German city of Hamburg, presented in this issue by Anselm Sprandel, head of Hamburg's Central Coordination Unit for Refugees, shows how, from 2015, the city authorities focused on twin objectives: accepting and housing refugees to avoid leaving people homeless while simultaneously trying to ensure as little disruption as possible to the daily lives of the city's 1.8 million residents. In some cities degrowth is also at the origin of greater levels of inequality, leading to a far-reaching reassessment of urban planning policies. Whether in European cities, as described in the article by Daniel Florentin, or in Japan as covered by Professor Hidetoshi Ohno's article, urban, demographic or economic shrinkage brings a change of paradigm to cities that have long been viewed through the prism of growth and wealth creation. The breakdown of social ties in cities is a further issue that cannot be ignored.

As a result, the concept of resilience has recently been expanded to include the social dimension, such are the potentially unsustainable risks represented by the yawning wealth gap.

2.3. CITIES ARE HOTBEDS OF SOLUTIONS AND EMERGING AS THE PRIME MOVERS FOR CHANGE

Recent years have seen cities worldwide assume greater responsibility for tackling these challenges: gathered at the Paris Climate Conference, they have since formed global networks and associations, launching concrete initiatives to accept refugees and protect the environment. The U.N. finally recognized the power and strength that cities represent. Countries are adapting to new realities and city mayors are increasingly playing a role as legitimate and active leaders, with their views listened to on the international stage.

> *"CITIES HAVE EMERGED AS KEY TO EXPLORING RESILIENCE, AS THEY ARE AT ONCE PARTLY RESPONSIBLE FOR THE ENVIRONMENTAL CRISIS AS WELL AS BEING POTENTIAL VICTIMS OF DISASTER, PARTICULARLY NATURAL DISASTERS, AND WELLSPRINGS OF SOLUTIONS."*

5 C40 Cities, *Consumption-based GHG emissions of C40 cities*, March 2018
6 OECD, *Making Cities Work for All*, 2016

The first Global Climate Action Summit, held in mid-September in San Francisco, is highly symbolic of the growing role played by cities as well as illustrating the importance of all non-state actors in seeking solutions to problems facing the world. Attendees at the summit were, therefore, generally in favor of a city-business-civil society governance model.

We are seeing an increasing number of city alliances and coalitions addressing topics that relate to resilience. They include C40, founded in 2005 and whose members include over 80 major world cities, and the 100 Resilient Cities network set up by the Rockefeller Foundation, which sponsors a network of Chief Resilience Officers, a high-level cross-function role in city halls designed to help formulate each city's resilience strategy.

But this proactive role for cities can lead to some ambiguous situations. On the one hand, forward-thinking megacities increasingly have the right structures in place and can be drivers for solutions. At the San Francisco summit, C40 emphasized the encouraging results shown by the strategies of 27 cities[7] in terms of combating global warming and reducing greenhouse gas emissions. These cities have managed to achieve a 2% annual reduction in GHG emissions by cutting the amount of fossil fuels used, optimizing new-build constructions, encouraging residents to leave the car at home, and cutting overall volumes of waste while also increasing the amount that gets recycled.

On the other hand, resilience is now something that needs to be addressed by smaller towns and cities. As Michael Berkowitz explains in an interview in this issue, the roots of the 100 Resilient Cities initiative lie in a determination to bring together a hundred cities with the power to inspire thousands of others of all sizes. The network currently includes major world cities like Paris, New York and Jakarta as well as modest towns like Vejle in Denmark (50,000 residents). More work is needed on differences experienced by cities in emerging nations compared to their developed nation counterparts, as they face a toxic cocktail of very limited resources and greater vulnerability. Mark Pelling, principal investigator on the Urban Africa: Risk Knowledge project, shows in this issue how the cities of sub-Saharan Africa must face an accumulation of risks, meaning that the slightest alteration in climate coupled to already inadequate infrastructure can quickly lead to deteriorating living conditions for local people.

3. THE LIMITATIONS OF TOO WIDE A CONCEPT

Paradoxically, the very success of the concept of resilience risks to undermine its effectiveness. Michel Juffé sums up the current situation like this: "'Resilient' is too often used as a qualifier applied to anything: to be considered as being in good shape, a person, institution, region or firm merely needs to be resilient."[8]

The notion of a resilient city has become particularly difficult to define because it has become so multi-faceted. There are two schools of thought: enthusiasts who feel that the inclusive nature of the notion makes it more useful, and skeptics who worry it is simply a catch-all notion, ill-defined with little substance beyond generalities. The skeptics feel that a better definition of resilience is needed, for urban resilience in particular: does resilience have to be all-encompassing (the city must be resilient in all ways) or specific (resilient infrastructure, resilient to natural disasters, etc.). It is also becoming necessary to measure resilience; how can we measure a city's resilience without limiting it to only quantifiable aspects? Michel Juffé provides several pointers, encouraging people to systematically ask themselves three questions: "resilience of what, for what and to what?"

4. CONDITIONS FOR SUCCESSFUL RESILIENCE: STRATEGIC, HOLISTIC, DURABILITY AND COLLABORATIVE

4.1. DEFINE STRATEGY AND PRIORITIES

Because it is an all-embracing notion that extends to numerous fields and areas of action, designing resilience for a city requires a precise strategy to be defined, setting out priority action areas. This is what cities do when they appoint a Chief Resilience Officer. Arnoldo Matus Kramer, Chief Resilience Officer for Mexico City, in his interview describes his role as follows: "delivering the resilience strategy of a city and monitoring and following up its implementation." The goal is to set long-term priorities. In New Orleans, Veolia and the Swiss Re reinsurance firm, facilitated by the Rockefeller Foundation, signed the first ever public-private partnership for urban resilience as part of the post-Katrina process. In this issue, Laurent Auguste, a member of Veolia's Executive Committee, and Ivo Menzinger from Swiss Re, look back on the partnership and methodologies used to analyze risks and recommend priority actions. A similar process occurred in Copenhagen, and this is described in the second section. The city has changed profoundly in recent years, building its resilience strategy around the themes of environmentally friendly and inclusive urban development, focusing on revitalization of declining neighborhoods, creating more open spaces, encouraging the use of bicycles and public transportation, and so on.

4.2. TOWARD A HOLISTIC APPROACH TO RESILIENCE

Resilience encompasses far more than just infrastructure and public services optimization. As Serge Tisseron points out,[9] resilience is

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7 Barcelona, Basel, Berlin, Boston, Chicago, Copenhagen, Heidelberg, London, Los Angeles, Madrid, Melbourne, Milan, Montreal, New Orleans, New York, Oslo, Paris, Philadelphia, Portland, Rome, San Francisco, Stockholm, Sydney, Toronto, Vancouver, Warsaw and Washington

8 Michel Juffé, *Resilience of what, for what and to what?* Annales des Mines - Responsabilité et environnement, 2013/4 (issue 72)

9 Serge Tisseron, Preface – *Résiliences : comment s'y retrouver ?* in *La Résilience*, PUF, Que sais-je, 2014

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created during four key stages – preparing for the shock, resisting, recovering, and consolidating the rebuilt situation – which aim for long-term, not precarious, re-establishment. Seen in these terms, resilience is a cycle rather than just the post-disaster reconstruction phase. The holistic approach to resilience involves considering not only environmental and infrastructure risks, but social and societal risks too. In Roubaix, a city hard-hit by deindustrialization and economic downturn, La Condition Publique, a creative space that is part museum, part social center and part re-socialization center, is contributing to urban regeneration in the Pile neighborhood as well as fostering encounters and ties between local people. For its director, Jean-Christophe Levassor, the space gives residents a chance to engage with subjects of shared importance, giving them a voice in designing new policies for regeneration and urban resilience in their neighborhood.

4.3. IDENTIFYING BUSINESS MODELS THAT WILL DELIVER LASTING RESULTS

Finding the right economic equation for resilience is vital if the approach is to prove lasting. When a city is struck by a natural disaster, it usually acts as insurer of last resort, a situation no longer sustainable in a world characterized by the increasing severity of natural disasters. First, spending on resilience is not a very attractive prospect for cities. It requires spending money to prevent an event that may or may not happen. The issue of business models also impacts the overlap between different horizons: short term for emergency situations and political timeframes, and longer term for risk prevention. Several economic actors are now engaged with studies of business models for resilience. Insurance companies certainly have a primary role to play here. Innovative financial mechanisms such as resilience bonds are emerging, as Shalini Vaijhala and James Rhodes from re:focus partners explain. These bonds have been designed to finance risk-reduction projects via a resilience credit that transforms adverse incidents avoided into sources of revenue.

4.4. COLLABORATIVE APPROACH

Resilient cities were originally driven by a vertical top-down mindset, where public authorities working with ICT companies delivered centrally designed smart cities via the introduction of digital technologies into city policies and infrastructure. But resilience demands the rapid emergence of new ways to live, work and consume in the city. Therefore, these early approaches were soon overtaken by new mindsets that set out to enable citizen-users to share goods and services quickly and simply. This is the platform mindset that allows the "multitude" to interact, as described by Henri Verdier and Nicolas Colin.[10] No longer is the resilient city the result of a centralized strategy designed by public authorities; rather, it is the consequence of interactions between city-dwellers who now have the ability to self-organize. The city-as-platform helps residents to get in touch with each other and helps to accustom people to risk and resilience. The objective is to move from resilient cities to resilient citizens.

The example of Facebook groups, shown in this issue, which in the USA helped to organize assistance and mutually support hurricane-

“BUT RESILIENCE SHOULD BE THOUGHT OF IN TERMS OF OPPORTUNITIES: TO IMPROVE EXISTING INFRASTRUCTURE, TO INVENT NEW BUSINESS MODELS AND TO FIND NEW WAYS OF COLLABORATING BETWEEN PUBLIC, PRIVATE AND CIVIL SOCIETY ACTORS.”

affected people, demonstrates the new mindset driving self-organization and building bridges between public authorities – emergency services in this case – and residents. A similar example is the nonprofit organization called SINGA, presented by its director Guillaume Capelle, which leverages citizen networks to help refugees integrate into new cities. Later, Gaël Musquet describes the fundamental pre-requisite to this self-organization mindset: accustoming people to risk. This is what led him to set up a network called Hackers Against Natural Disasters in 2011, helping people to become more resilient.

This tension between vertical and horizontal mindsets lies at the heart of the construction of resilient cities. Neither seem sufficient when taken in isolation: self-organization risks being sub-optimal, and top-down profoundly undermines citizen appropriation. Deciding how best to combine these two approaches is the biggest single challenge currently facing public and private actors.

CONCLUSION: LOOKING BEYOND RISKS TO SEE OPPORTUNITIES OFFERED BY RESILIENCE

The notion of resilience is heard more and more frequently and is now part of the common parlance of city policymakers and managers. In a world characterized by environmental, economic and social phenomena of ever-increasing criticality, risk prevention and a culture of forward planning are key factors in ensuring that systems can resist and continue. Related to the notion of risk, urban resilience often surrounds issues of disaster prevention and management. But it should be thought of in terms of opportunities: to improve existing infrastructure, to invent new business models and to find new ways of collaborating between public, private and civil society actors, and to promote social ties in cities. Ultimately, urban resilience provides an array of new tools to help foster the emergence of the sustainable and enduring city of tomorrow.

10 Henri Verdier, Nicolas Colin, *L'âge de la multitude, entreprendre et gouverner après la révolution numérique*, 2012