Emerging challenges in urban resilience: The resilience of digital cities

Section written by Ina Schieferdecker, a Member of WBGU, Director of Fraunhofer FOKUS and Professor at TU Berlin. Ina is also member of the German Advisory Council on Global Change and Spokesperson of the Smart City Network Berlin.

We live in the century of the cities. Hence, there is an urgent need to optimize the processes within a city and push for new innovation and business-oriented "ecosystems" generating novel operational and business models and increasing quality of life and work, whilst at the same time meeting sustainability goals. Thereby, Information and Communication Technology (ICT) plays a vital role in enabling urban environments that may emerge around the notion of data/information gathering and making this data/information available across multiple domains towards the combination and exploitation of synergies amongst various aspects of urban processes and everyday life.

According to a study on mapping smart cities in the EU by DG Internal Policies 2014, *smart cities – also called digital cities – are cities seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipality-based partnership*. In this context, ICT is used as the enabler for the interlinkage between urban and municipal systems, e.g. for mobility, energy or heat supply, logistics or safety management. Such interconnected systems enable holistic and flexible solutions. For example, they could prevent construction sites or hazardous weather conditions from obstructing traffic flows or compromising public safety during a cultural event in a city. New forms of problem resolution become possible with ICT as citizens, tourists, operators and/or emergency forces can be easily and directly informed according to their needs and preferences, and can also easily communicate and cooperate.

The general lack of awareness about the security risks associated to digital technologies was the starting point of the conversation which took place at Resilient Cities 2018. Issues that were discussed through expanded far beyond the real threat of cybersecurity, data protection and risk management in the digitalization era, toward concepts of governance and open systems, automated and (semi/fully) automatized systems and their correlation to urban resilience.

However, it was made clear that cybersecurity is a growing concern for local governments, which are the owners of valuable personal data – from welfare benefits to parking fines – and serious measures need to be taken to protect citizens from attacks in an ever digitalized world.
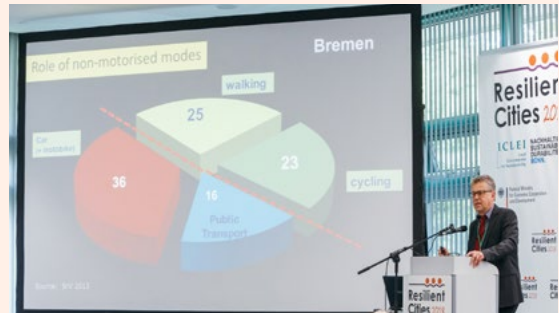
Michael Glotz-Richter from the City of Bremen on the topic of autonomous driving as a future challenge to cities' resilience

"It's only a matter of time before you have problems and so we should deal with (cyber-attacks) like a natural catastrophe – you know it will come and you have to be prepared." Thomas Stasch, Head of IT-Security and Civitec-CERT at Civitec, Siegburg, Germany

Urban platforms to enable interlinkages of information flows

Like an operating system for a computer or an electronic device, an *urban platform* provides common means, services and features to construct such ICT solutions in an effective manner. It is comprised of several layers that define how to digitalize urban infrastructure systems, interconnect them by communication networks, manage their assets and operational services, manage data and provide data analytics. Above this urban data layer, integration, choreographies, and orchestrations are used to construct generic municipal services, such as stakeholder engagement and collaboration. Like the ability to offer and use services, *privacy and security* are cross-cutting and central aspects of all these layers (DIN, 2017).

Along with the further proliferation of digital solutions, automated and autonomous systems are increasingly taking on complex monitoring and control tasks and make their "own" decisions in society, business and the public space. They make our societies, organizations and individuals more dependent on interconnected, digitally-controlled technical infrastructure. As *municipalities go from plain solution providers* (in terms of services for local stakeholders and citizens and supporting digital applications) *to platform providers* (in terms of public IT and digital urban infrastructure), new vulnerabilities in the so-called critical infrastructure of urban spaces may evolve. Therefore, it is of utmost importance to secure digitalized infrastructure by design and to maintain security throughout.

"Openness allows cities to build on the work and best practices of others by re-using others' components and solutions. For municipalities with limited ICT resources and capabilities it should be top priority to rely on open standards and on ICT"

Peter Head (left), Founder and CEO of The Ecological Sequestration Trust, and Ina Schieferdecker (right), Member of WBGU, Director of Fraunhofer FOKUS during the Opening Plenary

One well-established solution is to "open" the digitalized infrastructure by following open standards (readable by everyone), offering open interfaces (digitally accessible by everyone), and – if possible – using and/or providing open source (reusable and readable by everyone) platforms. Simply put, open systems are: "*system(s) in which the components and protocols conform to standards independent of a particular supplier*" (English Oxford Living Dictionaries, 2018). They facilitate the interoperability amongst multiple vendors, as well as the security of the overall solution. Security is even more fostered with open source.

Altogether, **open urban platforms** utilize open interfaces based on open standards, in order to ensure interoperability and compatibility to platform or system components of various vendors as well as to other urban platforms. In such a way, they enable urban resilience. Openness allows cities to build on the work and best practices of others by re-using others' components and solutions. For municipalities with limited ICT resources and capabilities it should be top priority to rely on open standards and on ICT solutions with open interfaces and formats. There is no need to re-invent similar things, but rather an opportunity to reuse, customize and adapt existing resources to the administrative needs of a municipality.

Good governance for resilient cities data

Besides these technical requirements we need to ensure that the digital transformation of cities is embedded in appropriate urban governance that supports the implementation of the Agenda 2030. To this end, **four key guidelines** were established in the **Smart City Charter**, developed by Germany's Smart Cities Dialogue Platform (BBSR/BMUB, 2017). According to the Charter, digital transformation requires:

1. Goals, strategies, and structures
2. Transparency, participation, and co-creation
3. Infrastructure, data, and services
4. Resources, skills, and co-operation

The flagship report of the German Advisory Council on Global Change (WBGU) on global digitalization and sustainable development (forthcoming 2019) will also address the question of how the digital transformation can be integrated into urban development in a way that meets the needs of the population majority. The concept of *technology sovereignty* is in this regard an indispensable prerequisite: City administrations and urban stakeholders need to build capacities and technological knowledge to make sure that the selected urban technology pathways are a valuable contribution to common welfare.

In view of the expected massive expansion of infrastructure in the urban century, the challenge from the onset lies in avoiding unsustainable path dependencies. New homes and digital urban infrastructure will have to be built at great speed for approximately 2.5 billion new city dwellers by the middle of the century (WBGU, 2016). Digitalization can play thus a decisive role to assure a prosperous urban future without leaving anyone behind, provided that the process is controlled and driven by a joint effort of urban stakeholders and city administrations.