Resilience

RESILIENCE

Sustainability is a good basis for resilience. Resilient cities have a high degree of recycling and turning waste into new and useful materials. Resilient cities transform urban farming, energy generation, information sensing and processing into a lifestyle. Future cities must be planned for resilience. Existing cities can be transformed in order to become more sustainable and resilient.

Resilient cities represent the convergence of science, technology, art, design, and in particular highlight the growing importance of digital interface in our culture.

In order to make cities more resilient, we need to understand the interacting functions of the city, as well as their influence on its people and on the physical, built environment. The metaphor of an urban metabolism and the concept of stocks and flows are helpful to understand and define the factors that shape the city and make it prospering over a long period of time. Important stocks and flows of a city are related to its people: entering the city, living in the city, and leaving the city; its materials, its water, its energy, its finances, the health of its population, its density, and its information. Each one of those stocks and flows is critical, but none of them by itself can guarantee the resilience of the city.

Cities and Organisms

Cities are not organisms, but they bear similarities to organisms: they have a physical presence, a metabolism, and they constantly change. They normally start small and eventually reach a status of balance or maturity. They can grow and prosper, degrade and die. Yet each of these phases can be radically different from known organisms. Although more than half of the world's population lives in urbanised areas, today's cities are not sustainable. Their resilience greatly depends on the factors that led to their establishment and on the forces that drive them. But it mostly relies on the initiative, ingenuity and adaptability of its people. Detroit is a striking example for this observation.

Resilient Urban Patterns

Few cities today are designed and built from scratch, and few of those are immediately successful. Examples are Brasilia, Chandigarh or Masdar. Instead, a city develops under the constant interaction with its changing environment, starting from the choice of its site and the preconditions that can foster or hinder its development. Sustainable cities consist of sustainable urban patterns. Resilient cities display resilient urban patterns. Sustainability and resilience are interrelated, and design planning must be based on the knowledge of context-based best practice for sustainable and resilient urban patterns.

Sensing, Sourcing and Urban Big Data

In the past, city planners used geometric and mathematical rules to design, engineer, and build the city. Cities were expected to function and grow for a long period of time. Rarely were they planned for constant interaction with their increasingly independent and mobile citizens who demand changes. Today, crowdsourcing and sensing provide powerful instruments to dynamically influence the design and management of cities. This applies mostly to existing urban systems with a large number of people with smart phones, who actively influence the development of their city. Cities are also installing an increasing number of sensors that are able to monitor the day-to-day operations, as well as to alert with regard to expected natural or other threats. Sensing and sourcing also lead to Urban Big Data. The combination of crowd sourcing and urban sensing can increase the resilience of cities, but only if the necessary governance precautions are taken to avoid the misuse of the sensing and sourcing data.

Prosperous and resilient or poor and vulnerable

The combination of powerful information technology, sensing and sourcing, Urban Big Data and the development of intelligent computer algorithms improves the capability to look at the consequences of decisions before they are actually made. It requires the construction of computer models that represent the behavior of cities in the best possible way. These models must be able to handle the different scales of the city, which reach from the building scale to the neighborhood and urban scale, to the territorial scale encompassing the city and its hinterland as an urban-rural system. This way, simulation becomes a necessary instrument for the citizens and the city government to explore future scenarios. The more realistic the scenarios are, the more likely they will support the avoidance of risk, and increase the resilience of cities.