



BUILDING RESILIENT CITIES TO PROMOTE CLIMATE CHANGE REDUCTION (GA)

INTRODUCTION

Resilience is the capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience. In the twenty-first century, building resilience is one of our most urgent social and economic issues because we live in a world that is defined by disruption.

Cities are more susceptible to weather and climate-change threats, because, as they grow, buildings and structures are often developed in areas that are more vulnerable to hazards. They are more in danger of systems dysfunction because infrastructure is inadequate, non-existent, or poorly maintained. They are more likely to experience rapidly spreading disease outbreaks because of the close contact of shifting populations and insufficient health-care facilities. Economic systems are burdened, governance structures are strained, and social cohesion comes under stress. Moreover, expansion and further development of urban areas typically affect ecosystems, the natural systems that are fundamental to human resilience, so the impact of urbanization is almost always a social-ecological one.

Cities across the globe, particularly those with urban poor communities, face long-term challenges in ensuring the wellbeing of their inhabitants. These challenges are partly a result of direct and indirect impacts of climate change, and are often compounded by pre-existing vulnerability. Urban resilience is the capacity of cities to function, so that the people living and working in cities—particularly the poor and vulnerable—survive and thrive no matter what stresses or shocks they encounter.

Urban areas that are most susceptible to external shocks and stresses (including climate change) are those that have fragile systems as well as large populations of the socially or economically marginalized.

The direct impacts of climate change are twofold: shocks and sudden impacts such as storms, typhoons, and heat waves; and stressors or impacts that build gradually over time such as sea level rise, average temperature increase, and long-term changes in rainfall patterns. Between 2000 and 2012, the damage from natural disasters was \$1.7 trillion globally.

The direct impacts of climate change are twofold: shocks and sudden impacts such as storms, Indirect impacts on urban areas resulting from these shocks and stresses include: severe flooding (stopping port or train operations, thus affecting travel to work and preventing goods to reach market); blackouts (as energy generation is affected by storms); increased risk of water- or vector-borne diseases (due to rainfall and changes in temperature); and heat stress (exacerbated by temperature increase)

While building climate resilient cities, certain factors must be kept in mind like climate change adaptation, mitigation actions, and disaster risk reduction while recognizing the complexity of rapidly growing urban areas and the uncertainty associated with climate change. This approach places greater emphasis on considering cities as dynamic systems capable of evolving and adapting to survive and even thrive in the face of volatile shocks or stresses. Urban resilience to climate change describes a city that is resilient on three levels:

- the systems of the city survive shocks and stresses;
- the people and organizations are able to accommodate these stresses into their day-to-day decisions; and
- that the city's institutional structures continue to support the capacity of people and organizations to fulfill their aims.

There is no single action that will make a city resilient to climate change. Resilience is instead achieved through a number of actions, building upon each other over time. These actions would be enhanced and progressed as peoples and institutions learn from past experiences and apply it to future decisions.

NEED FOR BETTER INFRASTRUCTURE

Cities need a new way of thinking about the design, planning, building and management of essential infrastructure — including energy, mobility, water, sanitation, shelter, information, emergency response and other critical services, the report continued. Basically, they are the first responders in the critical early stages of a crisis and in many regions, the only entities around for support, resources and reconstruction as the crisis ebbs and wanes.

In short, they need to be smart and resilient. Cities are similar to global supply chains: If one part of the chain fails, the entire enterprise is at risk. A resilient city can survive, adapt and grow no matter the stresses and shocks they experience.

The Arup/Siemens/RPA report defined resilience as “the ability of a system to survive and thrive in the face of a complex, uncertain and ever-changing future.” It’s a mind-set that encompasses both short-term cycles and long-term trends: “Minimizing disruptions in the face of shocks and stresses, recovering rapidly when they do occur, and adapting steadily to become better able to thrive as conditions continue to change.”

The report focuses on physical infrastructure, including energy, transportation, water and buildings. These particular systems were highlighted because they underpin many other essential city operations and services, including sanitation, emergency response, and the delivery of food, fuel and other materials.

UNDERSTANDING RESILIENCE

Resilience encompasses the following concepts:

- **Robustness:** infrastructure that can withstand the impacts of hazard events without significant damage or function loss
- **Redundancy:** systems with the capacity to absorb sudden changes in demand or partial loss of supply
- **Diversity and flexibility:** services are supplied through a number of pathways that use distributed resources and multifunctional equipment

- **Responsiveness:** responsive systems use automated monitoring, short feedback loops and controls at multiple points
- **Coordination:** knowledge is shared, planning is collaborative and strategic

Thus, creating resilient city systems will require major changes, a high degree of collaboration, and advanced technology and instrumentation to facilitate the development of systems with greater ability to withstand and respond to sudden impacts. Also, lots of money and a high degree of innovative thinking is required to bring about the change.

SUSTAINING RESILIENT CITIES

Further, resilient infrastructure networks must incorporate components that will continue to function in an ever-changing environment. Equipment must be able to withstand stronger winds, more intense rainfall, higher temperatures and other impacts. Energy, transportation and water infrastructure can be designed to operate both as part of a large system and to serve a more localized community independently of the wider network.

System monitoring and control is supported by increased application of IT networks and IT-enabled equipment, such as sensors and field devices, either embedded in new infrastructure or retrofitted into existing assets.

Urban planning and land use policies can direct development in ways that protect people and structures from harm when disaster strikes. Resilience practices should be adopted in policies, planning and construction across all city districts, “to ensure that resilience of the whole city is increased and not enhanced in one community at the expense of another.” Governance thus needs to take a “whole system” approach to city management, meaning collaboration and a minimum of turf battles. “Collaborative planning should be normal behaviour, not just a crisis response strategy.”

Moreover, Innovative and sustainable financing mechanisms are needed to support investments in resilient city infrastructure, for both capital and operational investment. Innovative approaches can involve new incentives and revenue streams such as grants, taxes and fees.

Sustaining resilient cities requires an understanding of the political economy of the city, and how municipal and other incentives for behaviour change can have a long-term impact.

Identifying pilot actions and investments that create transformative change in cities will be critical to enabling cities to function in the face of climate induced disruption in the long term