# Exploring Challenges and Solutions to Improve Urban Resilience

**D Grimaldi***

*Department of Management, Ramon Llull University, Spain*

**Submission:** October 01, 2020; **Published:** October 06, 2020

***Corresponding author:** D Grimaldi, Department of Management, La Salle Faculty, Ramon Llull University, 08022 Barcelona, Spain

**Abstract**

There is an urgent need to work for building urban resilience to natural disasters which would have a huge effect on the living population. Citizens, associations, private organizations, governments are working in the resilience building process, but their coordination need to be supported by new techniques and tools. In this aim, we believe the use of scenarios, big data and artificial intelligence will make progressing this field and will provide academic and operational benefits in the future.

**Keywords:** Resilience; Cities; Challenges; Solutions

## Introduction

We observe cities are receiving the biggest part of the worldwide population growth increasing more quickly than the country average [1]. They are consequently the locus of major challenges to economize limited natural resources, to absorb the demand of jobs from the immigrants and to mitigate the negative effects due to the congestion of citizens in a space more and more reduced [2]. As cities grow, there is also an urgent need to work for building resilience to diverse type of disasters which would have a huge effect on the living population. These latter can be classified from acute shocks such as floods, droughts or earthquakes to chronic stresses such as climate change or environmental pollution [3]. Resilience of a city is so the capacity of individuals, communities, institutions, businesses and systems within the city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience taking the definition of the 100 Resilient Cities movement [4].

Many stakeholders of the city are involved in the resilience building process [5]. They are individuals, groups or organizations from different disciplines and with different needs, responsibilities and resources but their integration and coordination are considered of paramount importance by scholars, practitioners and governments [6]. Amongst them, governments are recognized as the key drivers in carrying out effective policies and tools for ensuring the development of resilient cities and preparing them to face disaster issues [7]. [8] proposed how the different stakeholders of a city should work and collaborate together. [5] present a maturity model and a list of policies to foster the collaboration, the awareness, the training and the preparedness of the city stakeholders in the resilience building process. In this regard, if the 'how' starts to be properly handled, there is still a little understanding of why the different stakeholders should work and collaborate. Indeed, metrics are missing to estimate a return on investment (ROI) of the actions aimed at improving city resilience.

Indeed, gaps exists today to quantify the impact of defining and implementing a resilience plan. In our opinion, gaps could be covered by a list of common risks that are jeopardizing the cities resilience in the world. Then, scholars with industry experts and local public representatives should estimate the benefits of actions to mitigate or even stop the effects if the risk occurs. The benefits calculated would be according to the triple bottom-line sustainable framework [9]: Profit, People and Planet.

Tools like HAZUR@ [10] aimed to make more efficient and easy these simulations. HAZUR® is a software designed by Opticits[1] company to support the design, implementation and management of cities' resilience strategy. It integrates two modules: Assessment and Management. The Assessment component supports the analysis of the interconnections between services of the city while the Management one allows to introduce a list of hazards, the risk to occur and the potential impacts. The effects would be

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[1]https://www.f6s.com/hazurbyopticits

calculated simulating the city as a system of systems [11] and applying the theory of scenarios based on cascading effects [12] and interdependencies in sociotechnical networks methodologies [4].

## Conclusion

Although risk assessments are not new field, the methods applied have not suffered big changes in the recent years. Today, risk assessments are frequently conducted by internal staff or external consultancy team. These teams lack of efficient tools, techniques and (big) data to make an accurate risk management policy. As an illustration, hazards that occur regularly (on a seasonal basis like forest wildfire or flood) and which have drastic consequences are usually considered more disastrous than 'one in one hundred year' event (earthquake for example) which may have bigger damages but is less frequent [3]. This approach is not always true.

Recently, an alternative of traditional risk assessments based on past experiences and Big Data is emerging based on the application of forecasting efforts and artificial intelligence. Singapore, Manilla… are internationally leaders in this respect, having invested drastically in early warning tools for the last years. In this vein, an important instrument for proactive risk assessments is the use of scenarios. Scenarios engage different emergency management professionals including stakeholders from the emergency agencies, infrastructure managers, governments officials and the use of foresight techniques. These techniques are becoming increasingly important instruments in risk assessment. However, they still lack to precisely evaluate the impacts and the corresponding benefits if the impact is mitigated or neutralised. In the future, new techniques should be identified to reduce this gap analysing correctly the risks, probability and impact to better address the city resilience issue..

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