

Analyzing the effects of awareness in the city resilience building process

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Extended abstract

Crises have globally increased their frequency and intensity due to factors such as climate change, social dynamics or scarcity of basic resources (UNISDR & WMO 2012)(O'Sullivan et al. 2013)(Ludin & Arbon 2017). Disasters, as the earthquake in Japan in 2016, the terrorist attack in Europe in 2017, the fires in Portugal in 2017 or Spain's 2015 floods confirm cities need to be more prepared for similar future events. Taking into account that population's tendency is to move to urban areas, cities are growing exponentially and consequently the risks they are facing increase significantly too (United Nations 2016). In this context, the concept of city resilience has emerged in the last decade related to both natural and man-made crises (Otto-Zimmermann 2011)(World Bank 2011)(Béné et al. 2018). Thus, building city resilience is a priority, not only because of the need to get prepared to face future crises, but also to build robust and sustainable cities (Jabareen 2013). However, the city resilience building process is a complex and long process (Gimenez et al. 2016). The majority of the frameworks available in the literature state that in order to ensure the effectiveness and quality of the city resilience building process, citizens' awareness is required (Hernantes et al. 2011)(Abegaz & Wims 2015)(Torabi et al. 2018). In this paper awareness is defined as "The process of informing the general population, increasing levels of consciousness about risks and how people can act to reduce their exposure to hazards" (UNISDR 2009). Awareness is a much quoted concept in the area of information security and lately in the area of climate change (Bakaki & Bernauer 2017). But even if its relevance has increased, awareness is still understudied, with few studies available (Bodoque et al. 2016)(Hernantes et al. 2011)(Puhakainen 2006).

This paper presents a simple system dynamics model that studies the relationships and behavior of awareness and the resilience level of a city. To do so, the used hypothesis to develop the model is the following: Improving awareness will positively affect the implementation of new policies since crises managers will be more aware of the risks and vulnerabilities around the city. Therefore, this will increase the resilience level of the city, which consequently will also improve the ability to anticipate and recover from a crisis occurrence (Maraña et al. 2015).

The defined model is based on the literature and the findings obtained in the European SMR project and it relates the variables of awareness, city resilience and crisis impact as shown in Figure 1.

- *Reactive awareness*: refers to the awareness caused by the impact of a crisis.
- *Proactive awareness*: refers to the awareness achieved through investments and as a consequence of the city resilience level.
- *Preventive resilience*: refers to the ability of the city to face a crisis before its occurrence.
- *Corrective resilience*: the ability of the city to face a crisis after its occurrence.

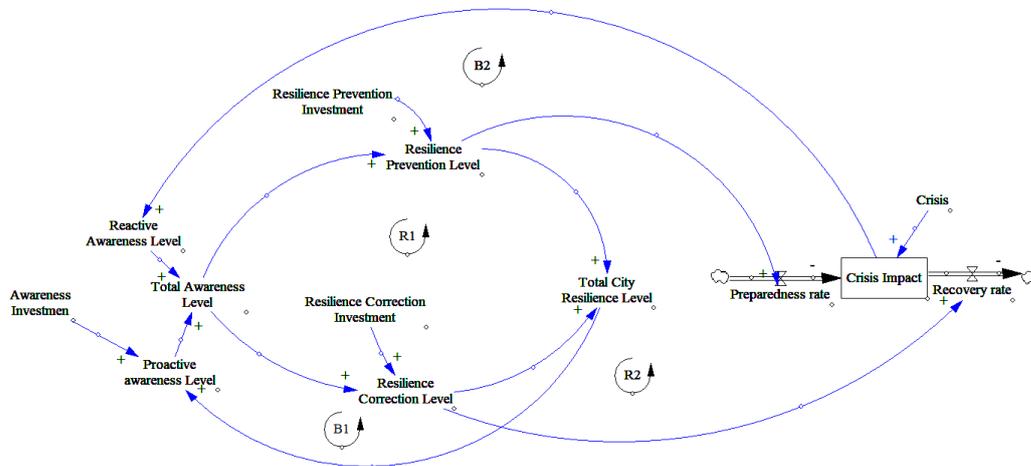


Figure 1 Variables, relationships and loops of the model

Through the simulation of the model two scenarios have been studied: one triggering event and two triggering events. After analyzing the results, the obtained 7 main conclusions are the following:

1. Awareness amplifies the level of both prevention and correction resilience
2. Having a high city resilience level reduces the recovery time after a crisis
3. Investing on city resilience without investing on awareness is neither efficient and effective
4. The impact of a crisis increases the reactive awareness as citizens realize the hazards around them
5. Once the impact of a crisis disappears the awareness also disappears if no investment is done
6. Awareness needs to be maintained over time in order to be able to face more than one crisis over time in an efficient and effective
7. Investing in resilience prevention causes higher need of resilience correction which needs higher period of recovery times.

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