

## Social Vulnerability Mapping in New York City to Discuss Current Adaptation Practice

**Authors :** Diana Reckien

**Abstract :** Vulnerability assessments are increasingly used to support policy-making in complex environments, like urban areas. Usually, vulnerability studies include the construction of aggregate (sub-) indices and the subsequent mapping of indices across an area of interest. Vulnerability studies show a couple of advantages: they are great communication tools, can inform a wider general debate about environmental issues, and can help allocating and efficiently targeting scarce resources for adaptation policy and planning. However, they also have a number of challenges: Vulnerability assessments are constructed on the basis of a wide range of methodologies and there is no single framework or methodology that has proven to serve best in certain environments, indicators vary highly according to the spatial scale used, different variables and metrics produce different results, and aggregate or composite vulnerability indicators that are mapped easily distort or bias the picture of vulnerability as they hide the underlying causes of vulnerability and level out conflicting reasons of vulnerability in space. So, there is urgent need to further develop the methodology of vulnerability studies towards a common framework, which is one reason of the paper. We introduce a social vulnerability approach, which is compared with other approaches of bio-physical or sectoral vulnerability studies relatively developed in terms of a common methodology for index construction, guidelines for mapping, assessment of sensitivity, and verification of variables. Two approaches are commonly pursued in the literature. The first one is an additive approach, in which all potentially influential variables are weighted according to their importance for the vulnerability aspect, and then added to form a composite vulnerability index per unit area. The second approach includes variable reduction, mostly Principal Component Analysis (PCA) that reduces the number of variables that are interrelated into a smaller number of less correlating components, which are also added to form a composite index. We test these two approaches of constructing indices on the area of New York City as well as two different metrics of variables used as input and compare the outcome for the 5 boroughs of NY. Our analysis yields that the mapping exercise yields particularly different results in the outer regions and parts of the boroughs, such as Outer Queens and Staten Island. However, some of these parts, particularly the coastal areas receive the highest attention in the current adaptation policy. We imply from this that the current adaptation policy and practice in NY might need to be discussed, as these outer urban areas show relatively low social vulnerability as compared with the more central parts, i.e. the high dense areas of Manhattan, Central Brooklyn, Central Queens and the Southern Bronx. The inner urban parts receive lesser adaptation attention, but bear a higher risk of damage in case of hazards in those areas. This is conceivable, e.g., during large heatwaves, which would more affect more the inner and poorer parts of the city as compared with the outer urban areas. In light of the recent planning practice of NY one needs to question and discuss who in NY makes adaptation policy for whom, but the presented analyses points towards an under representation of the needs of the socially vulnerable population, such as the poor, the elderly, and ethnic minorities, in the current adaptation practice in New York City.

**Keywords :** vulnerability mapping, social vulnerability, additive approach, Principal Component Analysis (PCA), New York City, United States, adaptation, social sensitivity

**Conference Title :** ICSR2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020