Chapter 2
Composite Indicators as Decision Support Method for Flood Analysis:
Flood Vulnerability Index Category

Ahmed Karmaoui
https://orcid.org/0000-0003-3881-4029
Southern Center for Culture and Sciences, Morocco

Abdelkrim Ben Salem
https://orcid.org/0000-0002-2283-5928
Cadi Ayyad University, Morocco

Guido Minucci
Politecnico di Milano, Italy

ABSTRACT

Floods are highly relevant extreme events with increasing frequency at a global scale. They remain among the most dangerous and complex natural disasters in middle and low-income countries. In this context, it is necessary to develop decision-support tools to reduce the flood risk and increase the resilience. The chapter reviews one of the most relevant tools, the flood vulnerability index (FVI) category at a global scale. These tools use hydrological, topographic, socio-economic parameters strongly associated with flood vulnerability. The findings indicate that FVI is a flexible tool for integrated assessment of vulnerability to floods for application in different regions. Social, environmental, and physical components are the main components used in the FVI. Household and neighborhood, basin, urban, sub-catchment, and coastal are the different levels of vulnerability analysis.

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INTRODUCTION

Globally, among all extreme events, a flood is one of the most devastating natural hazard (Anees et al., 2018) the most frequent, and the most deadly (Pulvirenti et al., 2011). Furthermore, Climate change may increase the occurrence of flood and make it more common (IPCC, 2012) whereas unplanned rapid urbanization and changes in land use may worsen the effects of a flood event in many ways. In this context, there is an international demand as the one posed by the Sendai Framework for Disaster Risk Reduction to better understanding disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment.

There is a rising need to better understand and assess what are the vulnerability factors, which increase the susceptibility of a community to the impact of hazards (UNISDR 2009), in order to support decision-makers in mitigating and adapting to the impact of flooding hazards (Douben, 2006). In the last twenty years, the management plan of floods integrated more and more of variables and dimensions. The composite indicators constitute multidimensional tools to evaluate the risk and vulnerability to floods. The vulnerability assessment is the primordial step towards risk reduction and resilience to disasters (Birkmann, 2006). There is widespread recognition that flood vulnerability index family provides useful methods to evaluate flood in urban areas (Villordon, & Gourbesvill 2016; Karmaoui et al., 2016), in coastal zones (Balica et al., 2012), in sub-catchment and basin scale (Balica et al., 2009), and at Neighborhood level (Fernandez et al., 2016). This kind of method was developed for arid zones (Karmaoui & Balica 2019), and Mountains level (Meraj et al., 2015).

Whether using and combining statistical analysis, remote sensing, or geographic information system, the composite indicators are important decision-making tools since they facilitate the analysis of the relative state of the overall system by reflecting (or trying to reflect) the socio-economic, environmental and physical condition of a geographic region. This study was carried out to find the widely used indices for different scales using different dimension (types of parameters). A comparison of these numerical models was also carried out.

The objective of this review is to provide current methods linked to flooding assessments applied worldwide. The research was oriented toward flood vulnerability. The focus was on the flood vulnerability index categories.