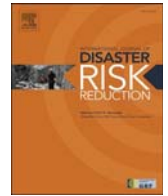




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# Developing a multi-facet social vulnerability measure for flood disasters at the micro-level assessment

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## ABSTRACT

Sri Lanka has experienced severe consequences of flood disasters in recent decades. Hundreds of thousands of people and their homes were affected by mass floods in 2016 and 2017. However, the quantification of social vulnerability to such calamities has not been examined, although this is critical to achieve more efficient response and recovery. In this context, we shed light on an influential mechanism in order to measure social vulnerability to flooding in both rural and urban areas. We developed the multi-facet composite social vulnerability index (MFCSVI) by considering 31 robust variables drawn from five main components including socio-demographic, physical, financial, health, and social networks, as well as related social capital factors. We investigated 21 local administrative units by covering 405 affected households through a household survey. The results demonstrate diverse situations of social vulnerability to flooding between and within regions. The households from Kuruwita are significantly less vulnerable compared to those from Elapatha and Colombo. Our research provides empirical insight for policy makers who are interested in gauging social vulnerability and planning efficient solutions for response and recovery. Especially, this study contributes to the existing body of vulnerability research by elaborating traditional measures of social vulnerability by applying highly detailed survey data and various weight schemes of influential factors for the vulnerability assessment. Also, regional disparity between rural and urban areas is obviously worth to note for Sri Lankan vulnerability assessment.

## 1. Introduction

Vulnerability to natural hazards has been rapidly increasing worldwide, mainly due to climate change induced by anthropogenic activity [1–4]. This is because the empirical investigations on vulnerability to natural hazards have dramatically been proliferated around the world. Vulnerability to natural disasters warrants to be investigated, especially for policy establishment on disaster mitigation and management in terms of revivifying exposed and affected livelihoods. According to the extant body of literature, the notions of exposure, sensitivity and adaptive capacity have been considered as the key pragmatic aspects/parameters of vulnerability studies (e.g. Ref. [5,6]; Frazier et al., 2017). In particular, socioeconomic and physical vulnerability causative factors are quite important in recognizing the level of vulnerability parameters [5,7]. Also, those parameters indicate the status of pressures, stresses, and perturbations of exposed people to vulnerability [5]. In addition, the specific indicator of geographically variegated spatial

domains could help to determine the level of social vulnerability [8]. Despite, just a few number of studies are found for examining and assessing of vulnerability in fine-grain division of spatial units [6]; Frazier et al., 2017). Furthermore, few studies are found on the investigation of social networking, social capital and resource mobilization for vulnerability assessment [9]. Therefore, above aspects of social vulnerability assessment need to be further investigated, in particular for identifying actually vulnerable people and for livelihood revivifying practices.

Vulnerability to flood disasters is regarded as a grave dilemma in South Asia's developing nations such as Sri Lanka, India, Bangladesh, and Pakistan, which are frequently affected by mass floods [10–13]. The resulting socio-economic damage is tremendous [3,10,14,15]. According to Sri Lanka's disaster management center (2017), mass flooding in 2016 and 2017 caused serious casualties, destroying the lives of hundreds of thousands of civilians and their homes in rural and urban areas alike. During the southwest monsoon period, the country's wet zone

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