様式

論 文 内 容 の 要 旨

氏　名　　CHARITHMALI CHETHIKA ABENAYAKE

Disaster risk management, which is operationalized through reducing vulnerability and exposure, and strengthening the capacity to cope, is the precursor to Community Resilience Assessment (CRA). Assessing resilience of the inherently complex socio-ecological systems entrenches an absolute challenge to the domain of decision-making science. In response, resilience assessment tools have approached inductively by establishing a set of indicators as surrogates for resilience. Geospatial indicators have been widely acknowledged in decision-making in building resilience; however, not yet incorporated fully into assessment methodologies. Hence, this study attempts to propose a set of geospatial indicators for community resilience assessment to floods, particularly in regional scale decision-making applications.

First, the study conceptualized flood as a natural process, which is an integral function of mutually interacting, interdependent, and interrelated elements of socio-ecological systems. Hence, the proposed indicators are principally focused on the roles of the natural flood defence mechanisms, and the growth of built-up area. Most of the recent catastrophic floods have been triggered by anthropogenic forcing, primarily due to weakened resilience capacities of systems, i.e., absorptive capacity, recovery capacity, and transformative capacity. Secondly, the study formulated a set of 30 geospatial indicators to assess community resilience against floods. Thirdly, the study developed system performance-based outcome variables to measure resilience capacities. Fourthly, the formulated indicators were externally validated by using community evacuation, and recovery data for the flood occurred on May 2016 at Colombo, Sri Lanka.

Initial findings of the study revealed 14 geospatial indicators that show significant associations ($p < 0.05$) to the resilience-evidenced by three capacities. Based on further analysis, the study selected eight geospatial indicators as independent variables and modelled the community resilience for the given case study area. Modelling results were statistically significant (adjusted r-squared = 0.863 at sig. F change = 0.000) to recommend geospatial indicators as powerful predictors of community resilience.

As one of the key contributions to improve resilience assessment practice, this study has developed a composite environmental indicator representing flood resilience-supportive ecosystem services. Further, this is the first study that has validated geospatial indicators referring to three resilience capacities. Furthermore, the proposed analytical definition can measure community resilience as a dynamically evolving process instead of an aggregation of properties. The set of proxy measures that estimate resilience by system performance throughout each resilience state operationalizes this definition. The developed proxy measures are proposed to be utilized in estimating resilience-

evidenced, where such independent resilience proxies are extremely required for the current practice.

In the urbanizing world that flood damages grow exponentially, geospatial indicators can provide proactive insights for building resilience. Hence, geospatial indicators can strongly be recommended in community resilience assessment tools. Further studies on assessing the validity and adequacy of indicators can make the assessment process more scientific and comprehensive, leading towards a rational decision-making practice. Overall, incorporating theoretically-sound, non-ambiguous, statistically-validated geospatial indicators into CRA tools can direct the risk management decisions towards empowering communities to perform better during floods while ensuring the sustenance of earth's life support systems.