[Poster presentation]

Assessment of Climate Resilience of Urban MSWM to Extreme rainfall in South Korea

I. G. Hong*, J. S. Lee, C. G. Phae***

* Dept. of Environmental Engineering, Seoul National University of Science and Technology
** Institute of Environmental Technology, Seoul National University of Science and Technology

*Corresponding author: Prof. Chae-gun Phae

Tel&Fax: +82-02-970-6617
(E-mail: *phae@seoultech.ac.kr*)

ABSTRACT

This study provides methodological insights for adapting to climate crises in order to maintain urban functions in the field of waste management, where such efforts have not previously been undertaken. The purpose of this study is to develop a methodology for assessing the resilience of municipal solid waste (MSW) management to maintain normal functional performance during extreme rainfall events. The research procedure was structured as follows: 1. System structuring – defining the target waste streams and system boundaries, and establishing an evaluation framework in relation to extreme rainfall; 2. Causal loop diagram construction – identifying the impacts of heavy rainfall on MSW management functions as well as reinforcing and balancing factors; 3. Derivation of evaluation indicators – determining key factors from the causal loop diagram and extracting indicators capable of assessing these factors; 4. Application of the evaluation methodology (Anchored Min–Max Scaling, AMMS) – AMMS is an improved normalization technique that incorporates the modal interval and its midpoint to better represent typical conditions, thereby enhancing the realism of the assessment; 5. Resilience assessment – evaluating exposure, sensitivity, adaptive capacity, and their combinations. The methodology was applied to all 229 local governments in Korea, using indicator data for the year 2023. The results were visualized through map-based representations to facilitate intuitive interpretation. Based on these evaluations, spatial variations, inter-indicator differences, and regional vulnerabilities were analyzed. In addition, the study yielded important implications drawn from the evaluation results.

Keywords: MSWM; Climate Resilience; Assessment; Extreme rainfall

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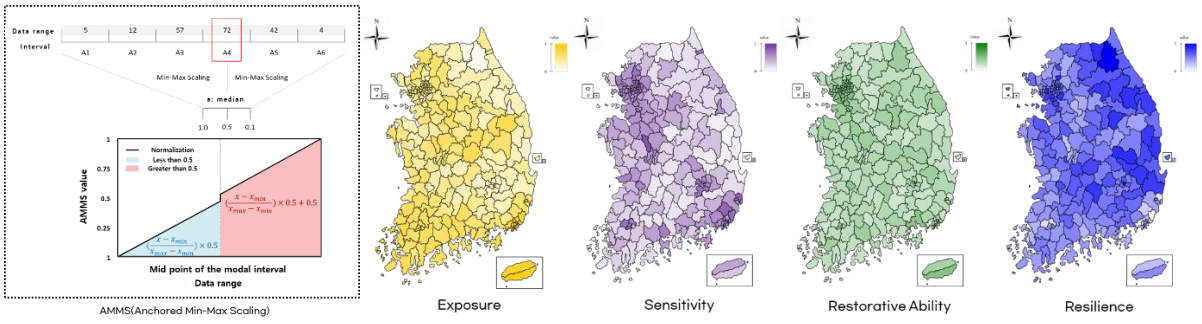
The exposure indicator appeared relatively homogeneous nationwide, except for certain metropolitan areas. Sensitivity was observed to be significantly higher in the Seoul Metropolitan Area and several large cities, while rural regions exhibited relatively low values. Adaptive capacity was generally similar across the country but showed somewhat higher levels in the southern regions. Resilience was distinctly higher in the eastern and inland regions, whereas the Honam region and Jeju Island exhibited lower distributions. The values among indicators displayed patterns that diverged from the spatial distributions. For example, metropolitan areas with high sensitivity tended to exhibit relatively low resilience. These findings suggest that large cities demonstrate extreme values across multiple indicators, highlighting the need for focused management, while rural areas, showing overall low levels, indicate potential deficiencies in resources and infrastructure.



Since the analysis was based on data from a specific year, further investigation into temporal changes is necessary. In addition, quantitative follow-up studies such as regression and correlation analyses are required to elucidate causal relationships among the indicators.