Estimation of Business Lifeline Resilience Factors to Disaster: A Markov Model Analysis of Multiple Lifeline Disruptions

HUAN LIU [1, 2] HIROKAZU TATANO[1, 2]
1 Disaster Prevention Research Institute, Kyoto University, Kyoto, Japan
2 Graduate School of Informatics, Kyoto University, Kyoto, Japan

E-mail: huan.liu.53m@st.kyoto-u.ac.jp

Keywords: Business recovery, disaster, Markov Model, lifeline resilience factors

Abstract

This research aims at empirically estimating the economic impact of lifeline disruption due to a natural disaster. It is common that business did not suffer direct losses from the disaster but has indirect losses due to lifeline disruptions. Thus, measuring the resilience factors of lifeline to reduce the business losses from disaster is an important priority for economy and society. However, the economic impacts of lifeline disruption have not been widely applied into empirical study due to lack of data, or only estimated the impact of single lifeline disruption. By using business survey data obtained after the 2011 Great East Japan Earthquake, the lifeline resilience factors are estimated to illustrate the impact of multiple lifeline disruptions on the recovery gap by developing a Markov model. In addition, the supply status of each lifeline was provided in the survey data, through which the production capacity correspond to lifeline disruptions and recovery patterns can be calculated in consideration of multiple lifeline disruptions. The results may contribute to providing references to the priority of the lifeline factors recovery after a disaster in different industries, and formulating an improved lifeline factors restoration pattern to achieve a quick recovery.