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PRESENTATION OF A NEW METHOD FOR ASSESSMENT DIRECT LOSSES FROM EARTHQUAKE IN IRAN

Ghazaleh FALLAH MORTEZAEI
M.Sc. Student, IIEES, Tehran, Iran
g.fallah@iiees.ac.ir
Erfan FIRUZI
Ph.D. Student, IIEES, Tehran, Iran
e.firuzi@iiees.ac.ir
Kambod AMINI HOSSEINI
Associate Professor, IIEES, Tehran, Iran
kamini@iiees.ac.ir

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Earthquake is considered as one of the most destructive natural disasters. This phenomenon imposed significant losses in term of both human losses and economic losses to the societies. Thus, providing appropriate plans to reduce the consequences of the earthquake is necessity. This issue especially for developing countries such as the Iran which compensating the probable losses of earthquake is too difficult is a crucial need. Clearly, the first step toward providing the mitigation plans is developing appropriate casualties and economic loss models to estimate the potential losses of earthquakes. This paper essentially focuses on developing an empirical model to estimate the economic losses of earthquakes. Generally, the economic losses of earthquakes are categorized into two sections: 1) direct losses and 2) indirect losses. The direct losses are related to the physical or structural impact caused by the ground shaking. The indirect losses refer to declines in output or revenue, and impact on wellbeing of people, and generally arise from disruptions as a result of a disaster. Although proper modelling of these losses is crucial in providing risk mitigation plans; in the present study, we focus on the developing an empirical model for estimate the economic losses due the buildings.

There are two approaches to quantify the direct economic losses of building: 1) the direct estimation of damages of building by adopting appropriate fragility/vulnerability models, 2) estimation of losses using macroeconomic indicators such GDP (Gross Domestic Product) and Disposable Personal Income (DPI). Each of the aforementioned procedure has advantages and disadvantages. The need to access a reliable database of building characteristics in and categorizing them into groups which shows similar performance in ground shaking and developing appropriate fragility or vulnerability curve for each type are the main challenges of the direct procedure. Although the indirect estimation of building losses using macroeconomic indicators surpasses the need aforementioned databases, it introduces other uncertainties to the results. In the present study, we provide economic losses using two models and results will be compared.

Clearly providing a reliable database of losses of past earthquakes is the vital parameter to develop the empirical models. The critical point in this regard is considering the uncertainties. In fact, the economic loss due to earthquakes is an unknown value. Thus, different figures of economic losses have been present for an earthquake. For instance direct economic loss of Bam Earthquake has reported from one to two billion US dollars that none of those figures are reliable. To this end, the authors reviewed different sources of information from official reports, paper, newspaper, mass media and peer review article to provide the best possible value as the economic loss of an event. Based on the compiled database the authors will be developed empirical models using both approaches of the direct and macroeconomic indicators for economic loss of building in Iran. It should be mentioned that there is very limited studies regarding the economic losses of the building in Iran. Thus, this paper can be considered as an appropriate reference for risk assessment studies in Iran. Also, the model can be implemented in rapid loss estimation system for economic losses of earthquakes.

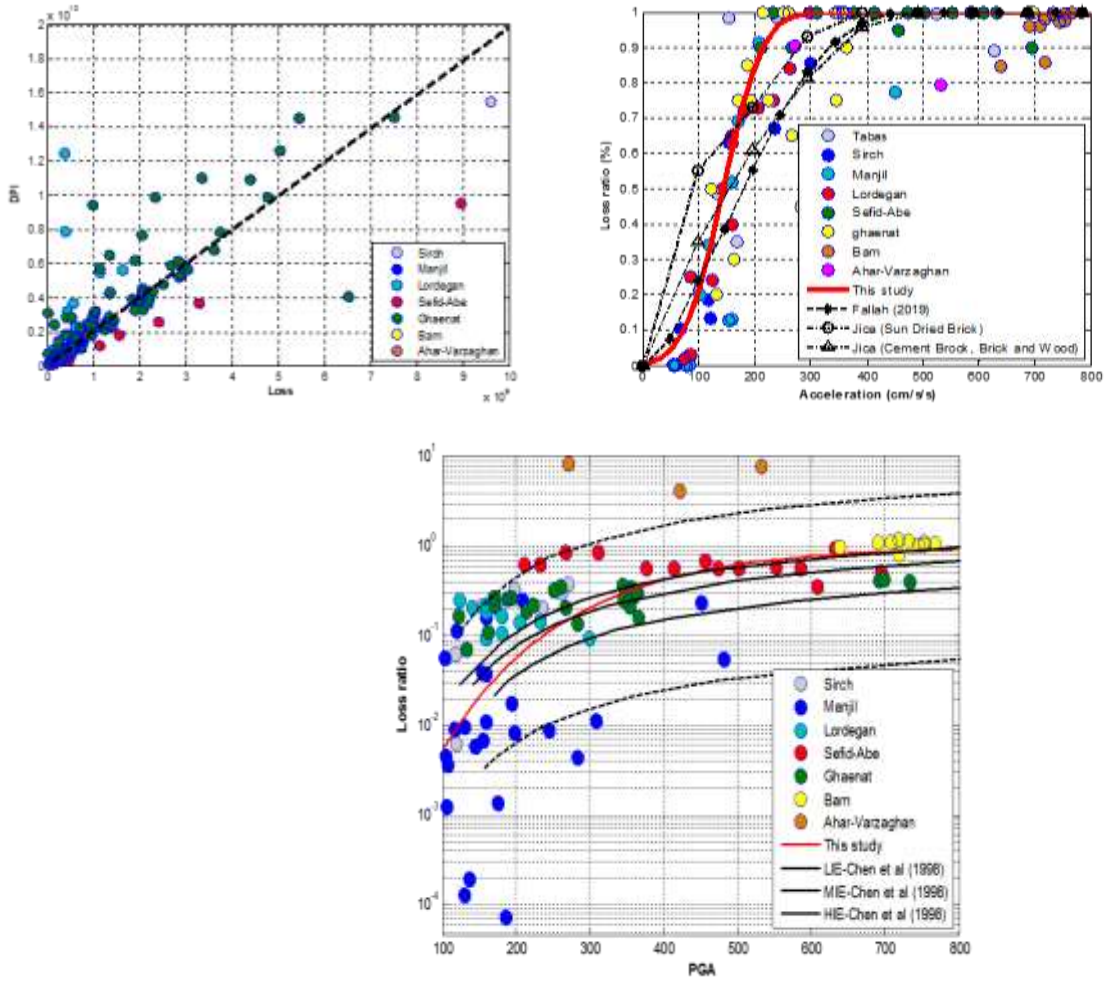

Figure 1. Economic loss models developed based on Iranian earthquake.

REFERENCES

Ba, E., Crowley, H., Pinho, R., and Gulten Gulay, F. (2008). Detailed assessment of structural characteristics of Turkish RC building stock for loss assessment models.

Chan, L.S., Chen, Y., Chen, Q., Chen, L., Liu, J., Dong, W., and Shah, H., Assessment of Global Seismic Loss Based on Macroeconomic Indicators.

Federal Emergency Management Agency (FEMA) (2006). HAZUS-MH MR2 Technical manual.

Jaiswal, K., and Wald, D.J. Estimating Economic Losses from Earthquakes Using an Empirical Approach.

Moudi, M., Yan, S., Bahramimianrood, B., Xiaoping, Li, Liming, and Yao, Jun (2018). Statical model for earthquake economic loss estimation using GDP and DPI: a case study from Iran.