

## Comparative Comparison (Cost-Benefit Analysis) of the Costs Caused by the Earthquake and Costs of Retrofitting Buildings in Iran

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**Abstract :** Earthquake is known as one of the most frequent natural hazards in Iran. Therefore, policy making to improve the strengthening of structures is one of the requirements of the approach to prevent and reduce the risk of the destructive effects of earthquakes. In order to choose the optimal policy in the face of earthquakes, this article tries to examine the cost of financial damages caused by earthquakes in the building sector and compare it with the costs of retrofitting. In this study, the results of adopting the scenario of "action after the earthquake" and the policy scenario of "strengthening structures before the earthquake" have been collected, calculated and finally analyzed by putting them together. Methodologically, data received from governorates and building retrofitting engineering companies have been used. The scope of the study is earthquakes occurred in the geographical area of Iran, and among them, eight earthquakes have been specifically studied: Miane, Ahar and Haris, Qator, Momor, Khorasan, Damghan and Shahroud, Gohran, Hormozgan and Ezgole. The main basis of the calculations is the data obtained from retrofitting companies regarding the cost per square meter of building retrofitting and the data of the governorate regarding the power of earthquake destruction, the realized costs for the reconstruction and construction of residential units. The estimated costs have been converted to the value of 2021 using the time value of money method to enable comparison and aggregation. The cost-benefit comparison of the two policies of action after the earthquake and retrofitting before the earthquake in the eight earthquakes investigated shows that the country has suffered five thousand billion Tomans of losses due to the lack of retrofitting of buildings against earthquakes. Based on the data of the Budget Law's of Iran, this figure was approximately twice the budget of the Ministry of Roads and Urban Development and five times the budget of the Islamic Revolution Housing Foundation in 2021. The results show that the policy of retrofitting structures before an earthquake is significantly more optimal than the competing scenario. The comparison of the two policy scenarios examined in this study shows that the policy of retrofitting buildings before an earthquake, on the one hand, prevents huge losses, and on the other hand, by increasing the number of earthquake-resistant houses, it reduces the amount of earthquake destruction. In addition to other positive effects of retrofitting, such as the reduction of mortality due to earthquake resistance of buildings and the reduction of other economic and social effects caused by earthquakes. These are things that can prove the cost-effectiveness of the policy scenario of "strengthening structures before earthquakes" in Iran.

**Keywords :** disaster economy, earthquake economy, cost-benefit analysis, resilience

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