

Retrofitting earthquake protection could save lives

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Whether or not a building collapses and claims many lives during an earthquake is a matter of structure and statistics, according to researchers in Turkey. Writing in the *International Journal of Emergency Management*, civil engineer Kubilay Kaptan of Istanbul Aydin University, explains how preventing total building collapse during an earthquake could be as straightforward as identifying and reinforcing those structures susceptible to serious damage.

Kaptan points out that severely damaged but non-collapsing buildings are a major hazard but the occupants often have time to escape. Most lives lost during a major [earthquake](#) are taken by those buildings that collapse quickly and completely. Reinforcing all the buildings in a city in an [earthquake zone](#), such as Istanbul, would, Kaptan estimates, cost US\$18billion and take two decades to complete. However, he has devised an analytical approach to determining in advance which buildings are most likely to collapse fully. If only the most at-risk buildings are retrofitted with earthquake-resistant reinforcements, the cost would be less than US\$1billion.

The researchers suggest a two-phase approach to the problem. In the first phase, all buildings across the city, public or private, school, hospital and [dwellings](#) would be inspected visually and photographs taken. Information on ownership, plans, [structural materials](#), load-carrying systems, walls and irregularities, such as subsidence, [soil conditions](#) etc would be recorded. Simple calculations could then reveal which are most "collapse susceptible". In the second phase, a non-linear analysis would be performed to determine which of those would most likely collapse under specific quake conditions. Kaptan adds that a building "rehabilitation" program should be implemented once such surveying and analyses have been carried out to strengthening the buildings most at risk.

This approach to risk management in city plagued by earthquakes could lead to an essentially zero loss of life risk due to total collapse of buildings. If a price is to be put on life in the city, then the costs of analysing the several million buildings would cost less than a twentieth of simply retrofitting all buildings built after the stringent earthquake building code of 1975 was first updated in 1998.

More information: "Zero loss of life during natural hazards" in *Int. J. Emergency Management*, 2013, 9, 37-45.

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