

Seismic Macro-Vulnerability in China Mainland

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With the worldwide urbanization and the continuous economic development, the loss of destructive earthquakes increases remarkably. The direct physical loss, which characterized building damage, plays the dominant role while talking about the earthquake loss has been gradually broken out. The social disasters of earthquakes impact more important thoroughly. The expected earthquake loss is generally determined by seismic risk and social wealth. Seismic risk is defined as the expected degree of losses due to earthquakes and therefore the product of seismic hazard and vulnerability. Since the numbers of destructive earthquakes almost keep on a stable level in the world, the key factor of seismic risk is the earthquake vulnerability. For the vulnerability analysis, the traditional inventory methodology requires a detailed classified database of the facilities and structure, like the size, location, utilization, and structure characteristics within the region in concern. Nevertheless, the traditional inventory method suffers several limitations from the fast developing modern society, the data collection and update problem, and the most important requirements from the earthquake emergency response and risk management.

Consideration the gradually increases of the earthquake social disasters, Prof. Chen Yong *et al.* proposed another approach to address exposure bypass the problems of the conventional method by employing a macroscopic indicator to represent the social wealth directly. It provided a simplified method to estimate economic loss of social disaster impacts of earthquakes for most parts of the world. Based on this methodology, this paper demonstrated the rationality of using macroeconomic indicator-GDP to measure social wealth within different economic scales, and confirmed the implicit relationship between geographic distribution of GDP and population, and finally updated the relationship between GDP loss ratio and MMI in China mainland based on the loss data of earthquakes during 1990-2000. In order to provide a suitable methodology to assess earthquake social disaster in China mainland, the relationship between life loss and earthquake magnitude was studied further. The life loss caused by earthquake is strongly related to earthquake strength, occurrence time (day or night) and the distribution of population in the affected area. With the data of casualties of earthquakes in China mainland from 1980 to 2000, we figured out a relationship between average life losses and magnitude of earthquakes. Combined with the population density and occurrence time, and by regressive analysis, we also gave another relationship between the loss of life and factors like population density, intensity and occurrence time of quake. Several earthquakes occurred in 2001 were testified for the given relationships.