

HDS028-06

Room:302

Time:May 23 17:45-18:00

Seismic risk analysis on building damages and human casualties based on seismic hazard of National Seismic Hazard Maps

Yasushi Komaru^{1*}, Satoshi Shimizu¹, Hiroyuki Fujiwara², Shinichi Kawai², Nobuyuki Morikawa², Hisanori Matsuyama³, Yuzuru Hayakawa³

¹OYO RMS Corporation, ²NIED, ³OYO Corporation

1. Introduction

To contribute to effective disaster mitigation in response to changes in seismic risk over the next few decades, we conducted a seismic risk analysis on building damages and human casualties, using seismic hazard curves of National Seismic Hazard Maps for Japan. To consider the changes of the social environment in the future, we calculated not only the seismic risk in 2010 but also that in 2025 and in 2040.

2. Estimation of the buildings and the population distribution data for the seismic risk evaluation

We estimated the distributions of the buildings and the population as of 2010, 2025 and 2040 in Japan, for the seismic risk evaluation as follows.

As of 2010

We estimated the number of buildings for each construction age group and for each structure group and the amount of population for each age group at grid cells of 250m*250m each in size for all of Japan, using "Grid Square Statics of 2005 Population Census" and "Building Structure Database" developed by National Research Institute for Earth Science and Disaster Prevention.

As of 2025 and 2040

We estimated the distributions of buildings and population by correcting the estimated 2010 data according to changes in future population, using "Population Statistics of Japan 2008" by National Institute of Population and Social Security Research.

3. Seismic risk evaluation method

We selected appropriate methods from the existing relatively simple methods considering the vast calculations for all of Japan. Then we tested several methods for the seismic intensity distributions estimated by spatial interpolation method from the recent observed records in actual destructive earthquakes, and compared the estimated amount of damages with the actual amount of damages. In order to conduct the future risk evaluation accurately, we revised the selected seismic risk evaluation methods so as to reflect the effects of aged deterioration of wooden buildings and aging of population.

4. Results

We calculated the risk curves for the number of the completely damaged buildings and the death toll at grid cells of 250m*250m each in size and estimated expected values based on the risk curves. As a result, we estimated that 500,000 buildings will be damaged completely and 7,000 people will be killed by destructive earthquakes as expected values within the next 50-year period for all of Japan as of 2010. And 420,000 buildings will be damaged completely and 6,700 people will be killed as expected values within the next 50-year period as of 2025 and 330,000 buildings will be damaged completely and 6,100 people will be killed as expected values within the next 50-year period as of 2040. In these estimations the expected values are dependent on the variations of seismic hazard and it is important for seismic risk evaluation to deduce the variations of seismic hazard as much as possible.

5. Next approach

We are planning to conduct a seismic risk analysis on building damages and human casualties for all of Japan as of 1890, 1920, 1950 and 1980 for the purpose of verifying the seismic risk evaluation method and understanding changes in the seismic risk during 150 years in Japan to contribute to effective disaster mitigation.

Keywords: National Seismic Hazard Maps for Japan, Seismic Risk