CHARTOGRAPHIC TECHNIQUES FOR REPRESENTING REGIONAL-SCALE SEISMIC RISK: APPLICATION TO NORTHERN SPAIN

Rivas Medina Alicia
ETSI. Topografía, Geodesia y Cartografía. Universidad Politécnica de Madrid
amedina@topografía.upm.es
España

The main objective of the RISNA Project is a scientific-technical seismic risk evaluation of the Region of Navarre (Northern Spain) to be used as basis for the development and implementation of a Civil Protection special plans against seismic risk at (firstly) regional and (secondly) municipal scale. This plan is part of the Territorial Civil Protection Plan of Navarre (PLATENA), approved in Foral Decree 230/1996, which establishes the need of developing scientifically- and technically-based special prevention plans for protecting the population potentially affected by the effects of natural risks.

Several variables taking part in hazard assessment are calculated and estimated in this project. These include seismic hazard, geotechnical soil conditions and the related soil amplification effects on seismic motion, seismic vulnerability of buildings and parameters relating the aforementioned variables, such as the damage probability matrices. Seismic risk is calculated following a probabilistic approach, where expected damage corresponds to the seismic motion expected with a 0.1 probability of exceedance in 50 years (equivalent to a return period of 475 years).

Results of this study encompass a large sort of variables that provide a general view of seismic risk over the region. Results of this analysis should be understood by non-scientific audiences who carry with the responsibility of decision making (financial managers, politicians, civil protection officials) and need to interpret them correctly in order to evaluate the material and human resources required to tackle a future catastrophe. For this reason, a precise transmission of results is an especially important part of this project.

Taking into account the nature of the resulting variables and the need of transmitting them in an intuitive, straightforward fashion, it was decided that the best instrument to achieve this goal was a collection of maps illustrating partial and final results, paying special attention to those variables that affected individuals may mitigate themselves, such as dwelling vulnerability.

For the cartographic realization of this study, a profound analysis of the represented variables was carried out. With the aid of specialists on seismic hazard and risk, cartographic techniques were established and the most suitable intervals of the represented variables were decided, taking into consideration their heterogeneous nature.

The collection of maps was basically divided in two types: maps displaying continuous information and maps displaying discrete information. The first ones refer to hazard and soil characterization maps, where continuous colour-graded pattern maps and isolines maps where drawn. Provided that several seismic hazard parameters where calculated and represented (expected spectral accelerations for different frequencies), and that these must be compared each other to extract conclusions, the use of adequate intervals and colour patterns was a much studied decision. The second maps (discrete variables) refer to maps representing vulnerability and damage. In these cases it was decided to use choropleth maps. Further, maps were combined two by two representing the same variable in relative and absolute terms, hereby allowing evaluating not only total damage, but also the reaction capacity of municipalities. Special care was taken with these maps in order to avoid ambiguous interpretations.

The final work consisted on an assemblage of 64 maps that allowed interpreting results in partial and final form for different purposes: those oriented to reduce vulnerability (and thus risk) by means of economic support to improve infrastructures; and those helping to draft actuation plans in emergency cases, redistributing resources and evaluating them.