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The Components of the Risk: Hazard, Exposure, Vulnerability

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Editorial

Correct and thorough assessment of the hazards posed by natural occurrences like earthquake, flood, and cyclones, as well as their possible effects, is the cornerstone of understanding and managing disaster risk. When evaluating such risk, it is important to consider the events that could happen, how probable they are to occur, and the possible effects that could result if they do. Thus, the use of probabilistic methodologies is required for a thorough assessment of the risk. A better coverage of potential occurrences is made feasible by such a method, which also offers an estimate of the likelihood that each event will occur and the resulting losses. Despite the growing recognition of the importance of understanding the risk from natural hazards as the foundation for effective disaster risk reduction, the practice of systematically assessing risk is not yet widely undertaken. For many nations around the world, a thorough and quantitative assessment of the amount of risk is still lacking.

Looking at risk in terms of economic losses, this initiative produced the first example of a global, multihazard, probabilistic risk assessment that generated information that are the first step for risk-sensitive investment planning. the methods and techniques developed to achieve this probabilistic global risk assessment. The work has been based on a major interdisciplinary research effort which has involved expertise in different disciplines such as: physical, geographic, geological sciences to reproduce the physics of the hazard; social and economic sciences and engineering to represent the exposure and vulnerability; probability and uncertainty analysis to describe the nature of the risk. Further than this, technical solutions had to be developed to manage data and computational efforts for assessing the risk at such scale. As a result of this research, new datasets were created, new hazard models were created, and older hazard and risk modelling tools were updated and modified. The collection of multiple perspectives on catastrophe risk assessment from the numerous organisations included in the study is another result of this research. The main principles behind the techniques described here, although applied to assess the risk at global scale, can be followed to carry out an assessment at national or subnational level. In this sense, this special issue provide a collection of good practice for disaster risk assessment [1-3]

According to the probabilistic risk approach, the risk is represented by using a set of all possible occurrences that are stochastically created, each of which has a frequency of occurrence. In this approach, the likelihood of occurrences occurring at a specific area in the future can be statistically represented. The assessment of global risks is continually being improved. In 2015 it will include other hazards than earthquake and cyclonic wind, such as tsunami, storm surges, river flooding and volcanoes. The initial steps for developing a probabilistic evaluation of the worldwide tsunami hazard are explained. In order to assess the consequences of hazardous events it is necessary to define the receptors of these events, as well as their susceptibility. According to the evaluation done for GAR13, the built environment would suffer economic losses. As a result, it was necessary to recreate the distribution of buildings, develop typologies that complemented the global research, and determine the economic worth of the structures globally. This worldwide exposure database's development process and methodology are described. It is possible to identify and assign the expected losses to each building class exposed to a certain hazard after the physical characteristics of each building class have been determined. To do this, connections are established between a hazard measurement parameter (such as water depth in the case of flooding or spectral acceleration in the case of earthquakes) and the potential damage to a given building class. One vulnerability function is defined for each hazard and each building style.

Each point of the curve ties a characteristic of the hazard to a mean loss value as well as the variance, showing the probability distribution of the losses that are anticipated to occur with the given hazard intensity. Therefore, a probability distribution of the losses is calculated for each hazardous occurrence and each building typology in each cell. The vulnerability of these structures to different natural hazards is expressed from an engineering perspective, by defining relationships between a parameter of the hazard and the likely damage of the particular building type. Choosing such relationships at global level is a non-trivial task. Calculating the losses associated with each of the "potential" events is doable once hazard, exposure, and vulnerability have been identified. Each of these losses is thus linked with their actual annual probability of occurrence. Different events with the same probability of occurrence are modelled, to allow for a relevant spatial coverage but also to obtain a satisfactory spectrum of losses for each occurrence frequency. The key output of a fully probabilistic risk assessments are normally expressed as a loss exceedance curve, in other words the likelihood of having certain losses expressed in terms of their occurrence rate, usually expressed per year [4-6].

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Conflict of Interest

The Author declares there is no conflict of interest associated with this manuscript

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