

# Objectives Based Seismic Risk Management

*Vincent Pellissier, Laboratoire de construction en béton & Collège des Humanités , EPFL*

## Short Description of the PhD thesis:

Reflecting the evolution of attitudes towards seismic threats, seismic risk reduction initiatives have been launched in many countries. By gaining a better understanding of how the risk is managed by each sector, the engineer should be able to play a more effective role in the analysis of technical information.

In most situations, a range of different strategies are possible. Decision makers must therefore select the best-suited strategy. This research describes a decision framework for selecting a strategy for seismic risk management. In a first phase, the risk is quantified and strategies are developed. In a second phase the impact of the strategies on the risk is quantified and a comparative evaluation is conducted. In a complex situation, this evaluation must account from multiple criteria and points of view. The comparative evaluation, based on an objective method, provides a rationale basis for the selection of a strategy. The proposed framework will be tested in the context of a pilot project studying the seismic risk management for the built environment of a small town in the Swiss Alps.

## Issues and Goals (Concept) of PhD thesis:

The decision framework discussed in this research is being developed and evaluated in the context of a pilot project. The goal of the pilot project is to quantify the seismic risk for the built environment of a small town. Aigle is located in the Swiss Alps in a region of medium seismicity and includes a population of 1500 buildings of very different age and type. A preliminary part of the thesis presents the vulnerability oriented seismic inventory of the town's building population. The creation of a seismic inventory was the first step made towards seismic risk management. The risk assessment for Aigle serves as the starting point for the selection of a risk management strategy. Competing risk management strategies will be compared within the proposed decision framework. The pilot project will be used to illustrate the decision framework elements developed.

## Methods:

The five phases of the decision making process leading to the selection of a risk management strategy, called Objectives Based Seismic Risk Management, are developed actually in the project. They are:

- Risk Analysis,
- Objectives and Evaluation Criteria,
- Elaboration of Strategies,
- Comparative Evaluation of Strategies (in an Iterative Process),
- Selection of Strategy with classical costs-benefits methods and outranking methods.

## Results (or expected results):

The decision framework presented quickly above is aimed to provide a systematic and transparent approach to the selection of strategies for seismic risk management. The framework is based on classic

risk analysis. The different tasks required to develop recommendations for the selection of a strategy are described. The process starts with the definition of objectives by Experts. These must be validated by Stakeholder Representatives, whose point of view must also be used to weigh the criteria which will be used to compare the strategies. The methodology used for evaluating the strategies, must allow for comparison in a multiple criteria and multiple point of view context. As such, it will facilitate the negotiations which might be required to select a strategy with a broad support.

The framework is being used in the context of a pilot research project for seismic risk management. Focus of the research are:

- The quantification of “soft losses” such as environmental losses or heritage losses, and the estimation of expected indirect losses.
- Development of a typology for seismic risk management strategies.
- The application to seismic risk management of partial aggregation methods, considering multiple-criteria und multiple points of views

***Surname:*** Pellissier

***Prenome:*** Vincent

***Year of birth:*** 1974

***Adress Institute:*** Structural Concrete Laboratory, Swiss Federal Institute of Technology, 1015  
Lausanne

***e-mail:*** vincent.pellissier@epfl.ch

***Referent:*** Prof. Dr. M. Badoux & Prof. Dr . F.-L. Perret

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