

## Risk, Structural Engineering and Society

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### Summary

One topic of this paper is risk and risk management regarded from both engineering and societal points of view. The various aspects of risk are often complex and need to be investigated from different perspectives. One main part of the paper will discuss risks that should be considered by structural engineers, when they plan, design or build structures and infrastructures.

Related to this is the part dealing with Natural Hazards and Disasters and their influence on the built environment and society. One section deals with vulnerability and resilience of cities, especially in environmentally constrained and urbanized areas. A special topic here is the risk of flooding due to rising sea level caused by a possible climate change.

**Keywords:** Risk, Natural Hazards, Disasters, Vulnerability, Risk management, Risk reduction, Resilience, Extreme events, Flooding, Climate change.

### 1. Introduction

In recent years risk issues have become of more frequent concern to structural engineers. One reason is that modern society has become more complex and another that increasing complexity is found in many large projects in the built environment. We tend to build in more and more risks into our buildings and infrastructure. Some researchers have even characterized our modern industrialized world as a “risk society”.

In this paper special interest will be paid to accidental loading and extreme events like natural hazards. The effects of Natural Hazards and Disasters have increasingly come into focus in both developed and developing countries. The vulnerability of people to these effects is related, among others, to poverty and to the preparedness of the local society [1].

### 2. Risk and risk management

#### 2.1 Concepts of risk

There is a variety of definitions proposed for the concept of risk in different disciplines. A broad overview with interdisciplinary aspects is the recent one by O. Renn [2, 3]. Here are three examples:

1. Risk, a measure of the probability and severity of adverse effects.
2. The idea of risk includes the magnitude of potential consequences of the hazard and the chances that the harm will be realized. This leads to the following *quantitative* definition: Risk is the product of the probability of the hazard occurring and the consequences (=loss).
3. An extended variant of this is to divide that product (Hazard probability times Loss) with a measure of Preparedness (loss mitigation), see K. Smith [4], p 36.

Some basic concepts concerning risk and risk management are often used very loosely without clear definitions. It is therefore necessary to find and use proper definitions.