CONSIDERING CLIMATE CHANGE IN NATURAL HAZARD RISK MANAGEMENT IN ENERGY SYSTEMS

A PRACTICAL APPRAOCH

Antonia Zeidler¹ and Paul Dobesberger²

INTRODUCTION

Over the past years climate change has been one of the most studied environmental issues and it is now accepted, that climate change impacts have to be considered in any risk management procedure at any scale (local to international). Not long ago many planners and decision makers felt that the scientific knowledge about future climate was too uncertain to have the confidence to act on. Especially in the field of natural hazards detailed analysis is still limited and therefore a formal risk framework has not yet been developed. One reason is that there are uncertainties about climate change, the impacts on processes (e.g. natural hazards), the economical losses and the future utilisation of energy resources. It is a challenging task to assess and incorporate uncertainties of different domains at any state in the risk management process today.

The described project is funded by financial means of the Climate and Energyfund of the Austrian Federal Government within the scope of the Austrian Climate Research Program (ACRP). The project started at the end of 2009 and runs until the end of 2012. In this paper we present a first summary of the results with focus on practical applications. The overall aim of the project is to develop a standardised method to assess the vulnerability of an energy system (hydropower) to natural hazards today and, based on climate change scenarios, for the future. Furthermore recommendations will be given on how to incorporate the information in risk management procedures. Figure 1 shows the principle approach, comprising the three modules as described below, chosen in this study. Uncertainties of various domains (climate change, natural hazards, economical losses) will be explicitly addressed. The suggested method was developed in close cooperation with a hydro power company in Austria in order to guarantee practicability. As this study aims at combining climate change, energy and economy the work is based on knowledge gained from prior research projects, however the methods is flexible enough to enable an easy update as soon as more precise data become available. For example, climate models are expected to be available in a higher resolution within the next years and subsequently the information on natural hazard activities in the future may become more detailed in a specific area.

MODULE 1: CLIMATE CHANGE AND ITS INFLUENCE ON FUTURE NATURAL HAZARD ACTIVITY

The suggested concept on natural hazard risk management procedures in a changing climate is based on the information of two hydropower stations in Austria (Zillertal/Tyrol and Kaprun/Salzburg). We used regionally available climate scenarios for temperature and precipitation in order to assess the impacts on natural hazards. The most significant factors were identified for each process of concern (avalanche, debris flow, sediment transport) and a sensitivity analysis was performed. It is not the scope of the project to develop a physical model to quantify the processes and therefore mainly the results of previous research will be used. However, especially in the example study areas detailed observations are available and will supplement the information.

¹ Antonia Zeidler. Department of Natural Hazards and Alpine Timberline (BFW), Rennweg 1 – Hofburg, 6020 Innsbruck, Austria (e-mail: antonia.zeidler@uibk.ac.at)
² Paul Dobesberger. Department of Natural Hazards and Alpine Timberline (BFW)/Austria
Fig. 1  Simplified integrated risk assessment in this study

**MODULE 2: ENERGY SYSTEM VULNERABILITY ANALYSIS**

After assessing the impact of climate change on natural hazards one focus of this study was on how the processes can impact the energy sector (determine critical values, such as the expected pressure of an avalanche which is likely to destroy an object). Therefore this module focuses on the vulnerability and exposure of the objects at risk. In the analysis the status quo will be compared to the results considering climate change.

**MODULE 3: RISK MANAGEMENT PROCEDURE IN A CHANGING CLIMATE**

The results from Module 1 and 2 are the fundamental data for the subsequent development of an integrative risk management concept. In recent years promising concepts for integrative risk management procedures were developed (e.g. IRGC) and now have to be adapted to suit a specific target, e.g. the sustainability in the energy sector. Because the handling of risks related to climate change cannot be seen as a secluded topic, but has to be integrated into a risk management framework it is also important to determine the status-quo as well as the future energy production as these could initiate a rebalancing of the relative priorities between various decision criteria for the energy facility. Consequently, one challenging task was to define protection goals (safety objectives) in regard to sustainability.

**RESULTS**

In this paper we introduce a concept for an integrated risk management procedure in the energy sector in a changing climate. The focus is on practical applications. The more theoretical research topics will be published in professional journals.

**Keywords:** risk management, climate change, natural hazards, energy systems