NATURAL HAZARDS IN SWITZERLAND: DATA ACQUISITION, MANAGEMENT, DISTRIBUTION AND USE

THE IMPORTANCE OF CONCEPTUAL DATA MODELS

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INTRODUCTION

Within the integrated risk management in the field of natural hazards, a certain amount of geodata is crucial for fulfilling its needs. Most important are the data of past events, the existence and state of protective structures, maps indicating the magnitude of potential events and its related hazards, the damage potential. All these data are needed for identifying risks, planning and enforcing of land use measures, structural and organisational measures, establishing forecast- and warning systems, local measures for the protection of assets, emergency planning, and maintenance of the protective structures. Furthermore, limited financial resources require to prioritise the measures to be carried out and a solid investment planning for the future.

A large number of stakeholders is involved in the integrated risk management. In Switzerland, there is a shared responsibility for the protection against natural hazards. On a strategic level, the main responsibility is given to the Federation, whilst the Cantons are responsible for the enforcement. Emergency planning is carried out on a communal level. Land and house owners are responsible to undertake local measures to protect their properties, often in a partnership together with the insurance companies.

This complex structure leads to the fact that data mining and collecting is undertaken by different institutions. As so far standards were given only for the processes of hazard assessment, but not for most of the data themselves, data are at present inhomogeneous in quality, content and structure, which makes them difficult to use for all tasks, where a larger region is considered, where data must be comparable, or where data from different sources must be used (simultaneously). Harmonisation of the content and structure of the existing data is therefore needed. The same objective is given by the new legislation in Switzerland about geodata, which additionally claims for the publishing of all existing geodata.

PROCESS OF DATA MODELLING

The establishing of the conceptual data models requires a process involving all relevant stakeholders starting from those dealing with data acquisition, over data management, distribution and data use. Involved are, among others, experts in the field of natural hazards, GIS, insurances, and the public. It was shown that the development of a common language and understanding is crucial. The analysis of the need of the data as well as a good understanding of the methodology of the data generation was essential to be able to establish the models. The working group of different experts elaborated the models, which were presented to a wide range of stakeholders for discussion and feedback.

The conceptual data models are designed in accordance with the Swiss legislation, which prescribes the use of INTERLIS as a precise conceptual data modelling language. This guarantees the data interoperability and therefore the possibility of data exchange independently from the technical platforms and systems. Additionally, all models will we described as well in the format of the Unified Modelling Language UML and in a detailed object catalogue. It is furthermore foreseen to develop a representation model corresponding to each data model.

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RESULTS OF THE DATA MODELLING

In the field of the integrated risk management of natural hazards, most important are the four topics to be modelled: hazard mapping, past events, protective structures, damage potential. The hazard mapping, finalised in 2011, consists of an obligatory part including the state of the hazard mapping, magnitudes and hazard zones and an optional part including the maps of the synoptic view over all types of hazard, and the underlying physical parameters, such as e.g. water depth and velocity. The data model reflects the present state of the legislation in the field of hazard mapping and its supplementary enforcement guidelines. Because of missing detail specifications in these documents, the already existing cantonal data models differed from each other, which posed a special challenge in the modelling process, and which required a certain flexibility in the model. There is a close link between these documents and the data model, so the further development of these will also require adaptations in the model.

Undergoing work is done in the field of the databases of the past events and the structural measures. There are a number of different databases for past events in Switzerland – distinct in the types of hazard considered or in the methodology of the acquisition. The already existing main database was established in 1994 with a very high complexity: The practical experience demonstrated that the number of attributes is too big. Therefore the complexity will be reduced, but the completeness of the remaining attributes should be enlarged. The different existing databases will be better coordinated or integrated as well. During the conference, the present state of these three projects (hazard mapping, past events, and protective structures) will be presented.

The last of the fundamental data models will deal with the damage potential. Here, a close collaboration with the insurance companies will be needed.

INFORMATION SYSTEM FOR NATURAL HAZARDS

The conceptual data models together with the Swiss legislation about geoinformation will allow to exchange all relevant data in the field of natural hazards between the data owners and the users in a harmonised format. The original data will remain at the owners of the data, where they will be managed, archived and a where a history will be kept. Nevertheless, it is the aim to make them all accessible by a single point of access, thus allowing to combine different data and make specific analyses.

CONCLUSION

The data modelling is an important step for the use of the data in the field of natural hazards. Through this, the transfer of data will be greatly facilitated, and the standardisation will make the use of these data and any elaboration much easier. This is an added value, which justifies the effort of the work. Furthermore, the entire process of commonly developing the data models detected hitherto existing deficits in the existing guidelines and led to a better understanding between the stakeholders. It also showed, where the present enforcement guidelines must be better specified for the future. The data will provide the information needed for the future spatial planning, emergency planning, elaboration of structural measures, and the planning of the future investment into protective infrastructure.

Keywords: data modelling, natural hazard assessment, natural hazard management