

Interoperability and Geohazards: A Conceptual Framework for Natural Risk Management in Carinthia, Austria

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Abstract. The interdisciplinary project "Natural Risk Management Carinthia" started in January 2004 and has its focus on the integration of distributed geodata sources provided by different authorities for the visualization and evaluation of alpine geohazards. The project partners are 4 authorities of the provincial government (geology, water management, forestry and regional planning), one national authority (Forest Technical Service for Torrent & Avalanche Control Carinthia) and an educational institution (School of Geoinformation - Carinthia Tech Institute). In order to provide an integrated, interdisciplinary view on the heterogeneous data sets managed by the different authorities, interoperability is a key issue in this project. Furthermore, there is also a strong need to consider geodata sets 'beyond borders', i.e. from either other federal states or bordering states like Italy and Slovenia. We will present and discuss a conceptual framework for the integration of natural risk geodata sets using OGC-conformal Web Services.

1 Introduction

As population growth forces more communities to expand into areas at risk from natural threats, concern increases about the danger that geohazards pose to people, property, and the environment. Natural disaster events like avalanches (Galtür, 1999) or floods (Province of Lower Austria, 2002) in Austria and throughout Europe caused significant damage in recent years. In order to prevent such damages in the future and to support sustainable regional planning for authorities, the interdisciplinary project “Natural Risk Management Carinthia” started in January 2004. The major goal of the project is to capture, analyse, assess and visualize alpine geohazards, which are torrents, avalanches, rockfall, landslides, and floods. The project partners are 4 authorities of the provincial government (geology, water management, forestry and regional planning), one state authority (Forest Technical Service for Torrent & Avalanche Control Carinthia) and an educational institution (School of Geoinformation - Carinthia Tech Institute) (Fig.1).

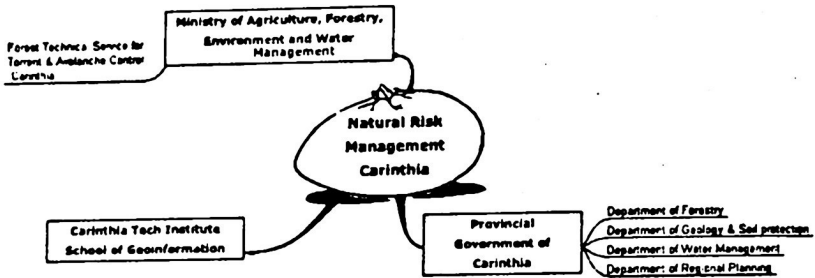


Fig. 1. Interdisciplinary expert group “Natural Risk Management Carinthia”

2 Project Motivation

The following reasons were important issues for initializing this project:

- Recent changes in different laws imply an “interdisciplinary” mission for governmental bodies to capture, document and visualize all relevant geodata for natural risk assessment and disaster planning. Examples are on European level the European Water Framework Directive [1] or the Alpine Convention [2, 3]; on national level the Forestry amendment [4], the Forestry Act [5] or the Austrian Research Organizational Act [6] and on provincial level the Carinthian Regional Planning Act [7].

- Many different geodata sets dealing with geohazards exist and are maintained by the different governmental departments on national and provincial level. Currently, there exist no possibility for an expert to access and link these data sets or visualize them in order to get an interdisciplinary database for risk assessment. Furthermore, often multiple versions of the same datasets exist throughout the different authorities resulting in an inconsistent database for regional planning and risk assessment when fusing geodata together.
- High quality, up-to-date geodata like orthoimages with a resolution of 25 cm or digital elevation data (10m resolution) are now available for the whole area of Carinthia.
- New technologies like Geographic Information Systems (GIS), Internet-GIS and Web Services [8] provide new opportunities for visualizing and analyzing multidisciplinary geodata within a common framework.
- Spatial data infrastructure initiatives are currently being build on European level (INSPIRE, [9]), national level (e.g. GEOLAND geodata infrastructure initiative in Austria for access to geodata across administrative provincial boundaries [10]) and on regional level (e.g. ISA-Map, a INTEREG IIIB EU-cofinanced project between Carinthia, (Austria) – Friuli-Venezia-Giulia, (Italy) – and Slovenia for harmonisation of regional data resources for cross-border planning (www.isamap.info)). Common harmonized and broadly accessible cartography and data resources are lacking in the service sector of public administration. Such common resources shall be elaborated and implemented in the framework of ISA-Map. They represent the basis for the preparation of the cross-border planning and information instruments (e.g. natural disaster risk management) that must be urgently and jointly implemented in the immediate future. The type of efficient and citizen-friendly access to modern information and telecommunication facilities to be established by ISA-Map as well as the services based on such facilities represent an important prerequisite as well for economic and social development than planning. Availability of comparable data and indicators allowing observation and evaluation of spatial development is of particular importance for future development. Compatible cooperation tools such as harmonized cartographic maps and harmonized databases, including a GIS component, must be available to the actors of spatial development policy. Exchanging information on the practice of spatial planning and exchanging know-how is important to support transnational networking. In a follow-up project this infrastructure could be uses for risk management. Data resources focusing on geohazards and natural risk assessment have not been covered by these projects so far.

3 Who will benefit?

The project will provide significant benefit to the following groups:

1. *Expert Group*: Experts in different departments will have access to up-to-date interdisciplinary geodata and therefore can perform more efficiently analysis and risk assessment on a higher quality level.
2. *Decision Maker Group*: From a political point of view sustainable planning in order to prevent geohazards are often not very popular for the involved parties. Any transparent and well documented database for a regional planning decision will expect more acceptance and can be argued to all relevant people more reliable. Fig. 2 shows the results of regional planning driven by assigning a low priority to potential flood risk. Marton [11] analysed the distribution of different land use classes affected by a flood event. More than 40 % of the flooded areas were intensively anthropogenic used. 63 % of the anthropogenic activity in the flooded area is based on a legal and valid enacted land utilization plan.

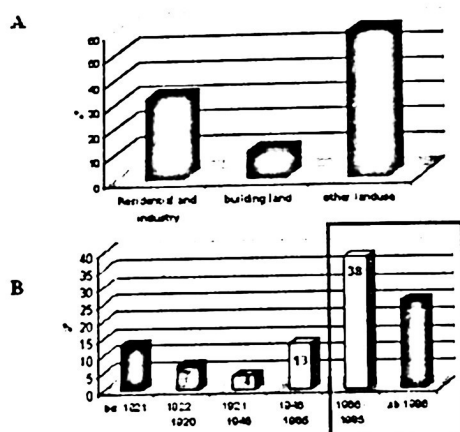


Fig. 2. Connection between regional planning, anthropogenic land use and a flood event [11]
 A) Anthropogenic land use in a flooded area, flood event 1997 (St. Veit/Gölsen, Lower Austria). B) Building activity divided by building eras in the flooded area. From 1966 on, any activity in the flood affected areas are based on an enacted valid land utilization plan.

3. *Public Group*: The public will benefit by getting focused information about geohazard risks that can potentially happen in their individual environment. Transparent information providing to the people will result in building more public awareness and sensibility for preventive actions in order to protect people and property from damage by geohazards (Fig. 3).



Fig. 3. Building awareness – “Building land for sale?”

4 Project Phases

The project “Natural Risk Management Carinthia” will be implemented in 2 phases.

4.1 Phase I (2004 – 2006)

1. Design and organization of a common spatial data infrastructure for geodata necessary for the assessment of potential geohazards.
2. Development of an internet and intranet application for visualization of multidisciplinary geodata with different access levels (expert – public).

Phase I is divided in 14 sub-projects with a total funding volume of € 410000.

4.2 Phase II (starting 2006, not financed yet)

3. Improvement and development of methods for interdisciplinary risk assessment of geohazards based on multidisciplinary geodata sets.
4. Development of a dynamic risk potential map for geohazards for Carinthia.

5 Interoperability and the Design of a Geohazard – Spatial Data Infrastructure

As already discussed, the major goal of the project is the capture, analysis, assessment and visualization of alpine geohazards. In order to perform an assessment of potential geohazards effectively , a consistent, up-to-date, interdisciplinary data

base must be available. The first step is therefore the conceptual design of a spatial data infrastructure for the assessment of geohazards providing an integrated view on a variety of geodatasets from different disciplines maintained by different authorities and institutions. Fig. 4 shows a prototype bringing together geodata from 3 disciplines and 2 different administrative authorities in an intranet application. This prototype is called "geohazards.service".

To develop an interoperable, non-redundant, decentralized geodata access architecture, OGC-conformal Web Services will be used [12]. Such an architecture based on standardized interfaces has been recently implemented for geo- basedata like cadastre or road network by the Austria Provincial geodata initiative GEOLAND (www.geoland.at; [10]). In this initiative 9 provincial GIS- Systems provide their geodata via web-service technology in order to access geodata across any administrative borders. Using this architecture, this Service can be extended by a WMS- Natural Risk Application Schema to integrate geohazard relevant geodata not only on national, but also on international level (Fig. 5).

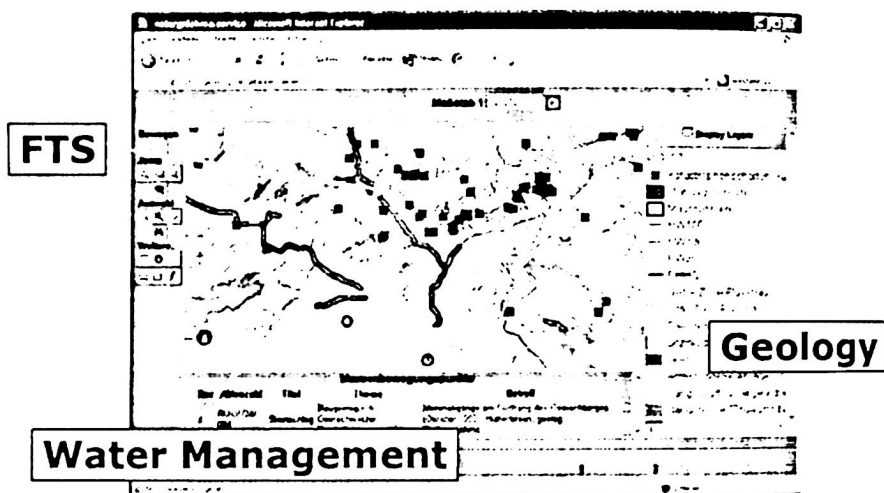


Fig. 4. Prototype of the Intranet application *geohazards.service* of the Provincial government of Carinthia. Integrated view on geodata hosted and maintained by different authorities and disciplines. (FTS = Forest Technical Service)

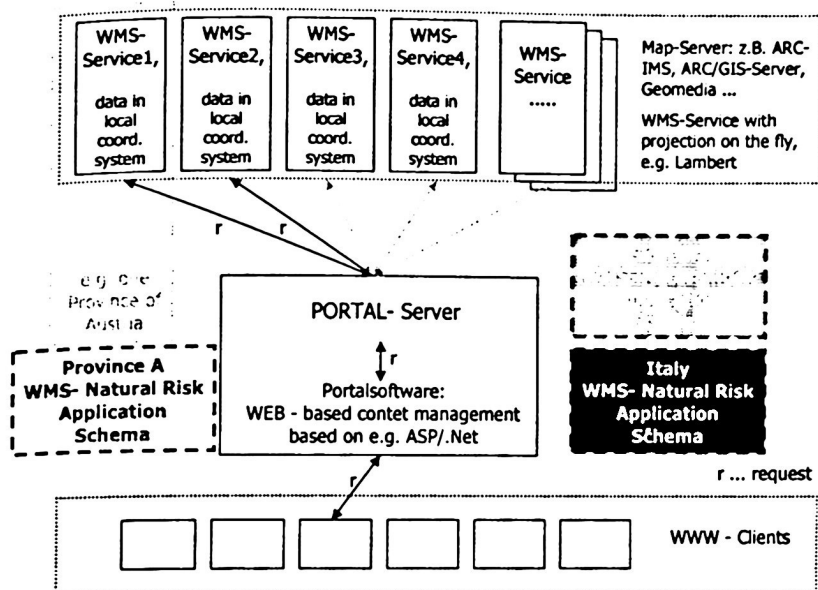


Fig. 5. Open GIS-conform architecture based on webservice provided by individual geodata-server linked to a portal server [13]

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