Swiss Hazard Maps: State of the Art and Potential Improvements

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Damage Caused by Natural Hazards in Switzerland

Mio. Swiss Francs

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Swiss Hazard Maps
## Short Overview on Swiss Hazard Maps

### History:
First hazard maps for snow avalanches after the winter 1951

### Fundamental Laws:
- Federal Law on Water Constructions (Wasserbaugesetz, WBG)
- Federal Law on Forestry (Waldgesetz, WaG)
- Federal Law on Spatial Planning (Raumplanungsgesetz, RPG)

### Considered Natural Hazards:
- Snow Avalanches
- Floods
- Mass Movements

### Synoptic Hazard Map:
Visual combination of all hazard maps

### Scale:
1:2‘000 to 1:10‘000

### Level of detail:
Every single lot has to be assigned a hazard zone
Hazard Zones

Intensity

- high
- moderate
- low

Probability

- high
- moderate
- low

Swiss Hazard Maps
Synoptic Hazard Maps

Labelling:
* Abbreviations of the damage causing processes
* Classes of the magnitude-frequency diagram

Coloured lines:
* Marking borders of damage causing processes

Red:   Rock fall
Purple: Flood
Green:  Landslide
Possible New Ways of Displaying a Synoptic Hazard Map

Interactive visualisation tool:

• Choosing layers
• Zooming
• Blending of layers → create new layers
• Display of Information on mouse-over

Option of adding extra features like

• Import of files containing additional information
• Display of intensities, damage potential, locations of protective structures, etc.

Facilitate **map reading** but also improve the **communication**
Visualisation of Uncertainty: What is Uncertainty?

Different sources:
• Collection uncertainty
• Derived uncertainty
• Visualisation uncertainty

Uncertainty comprises:
• Accuracy/error
• Statistical variation
• Noisy and missing data
• Etc.

Scales:
• Absolute
• Ordinal
• Nominal
Visualisation of Uncertainty

One map containing all the information (maps combined)

Visualisation of uncertainty:
- Saturation
- Crispness (crisp boundary = reliable data)
- Resolution
- Transparency (fog)
- Dials, arrows, bars (extrinsic)

Hazard map and uncertainty are displayed separately (maps compared)

Visualisation of uncertainty:
- Colour
- Texture
Summary

Hazard map = **Important tool** for spatial planning

Digital, interactive solutions might **facilitate the interpretation** of synoptic hazard maps and therefore **improve the communication** between experts and other parties

Uncertainty visualisation = **explosive topic**, **research needed**

Interactive visualisation methods are promising
To Do List

* Disentanglement of the different levels of information in synoptic hazard maps
* New design for synoptic hazard maps and implementation (interactive)
* Investigation of the production process of hazard maps
* Identification of uncertainty sources
* Classification and assessment of uncertainties (if possible quantitatively)
* Creating of different uncertainty visualisation methods
* Determination and Implementation of the best method
* Assessment and implementation of user needs (e.g. of fire brigades, insurance companies, etc.)
Thank you for your attention!

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