

Danger maps in Switzerland

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THE SWISS CONTEXT

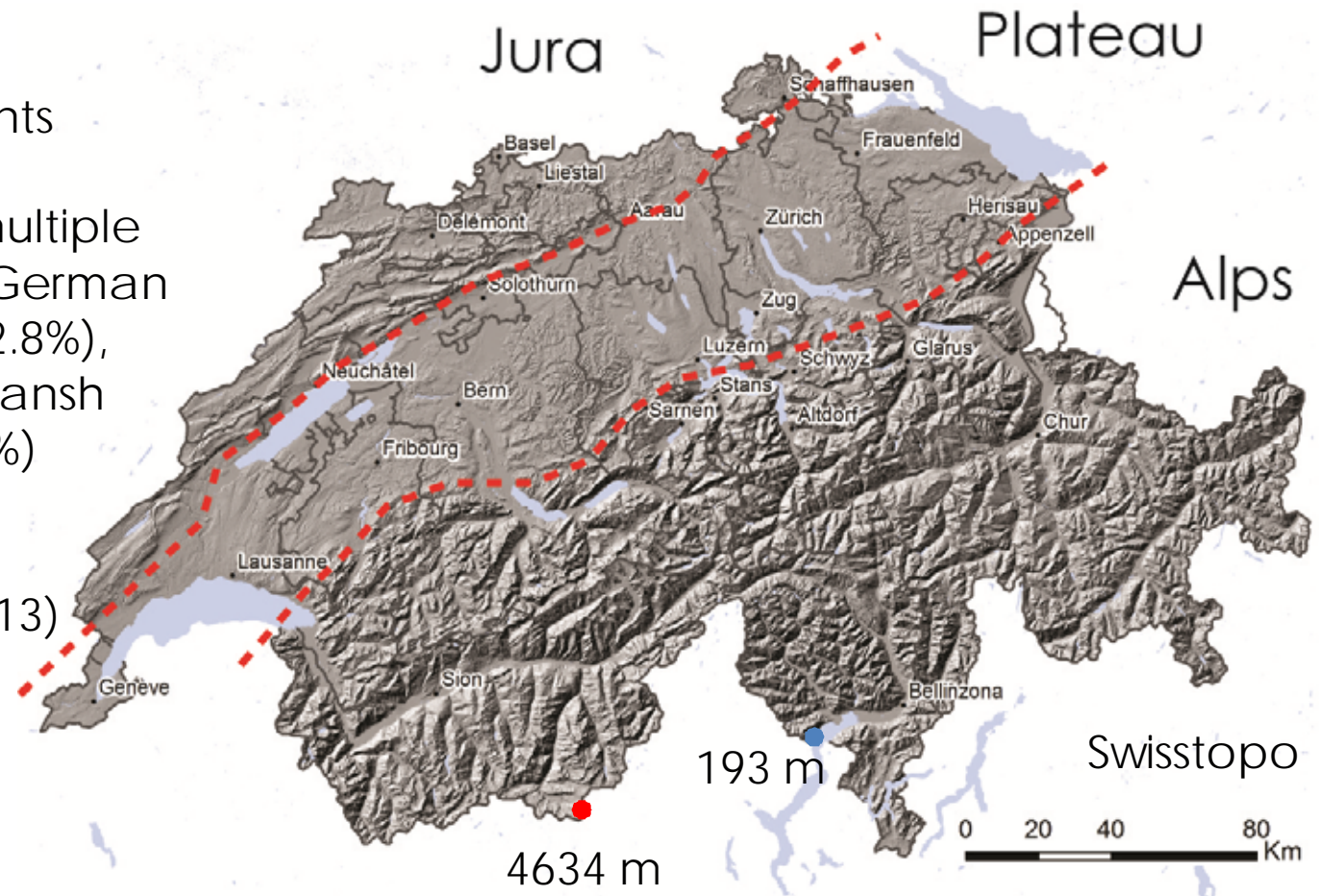
Switzerland

Federal State divided in 26
Cantons and 2495
Communities

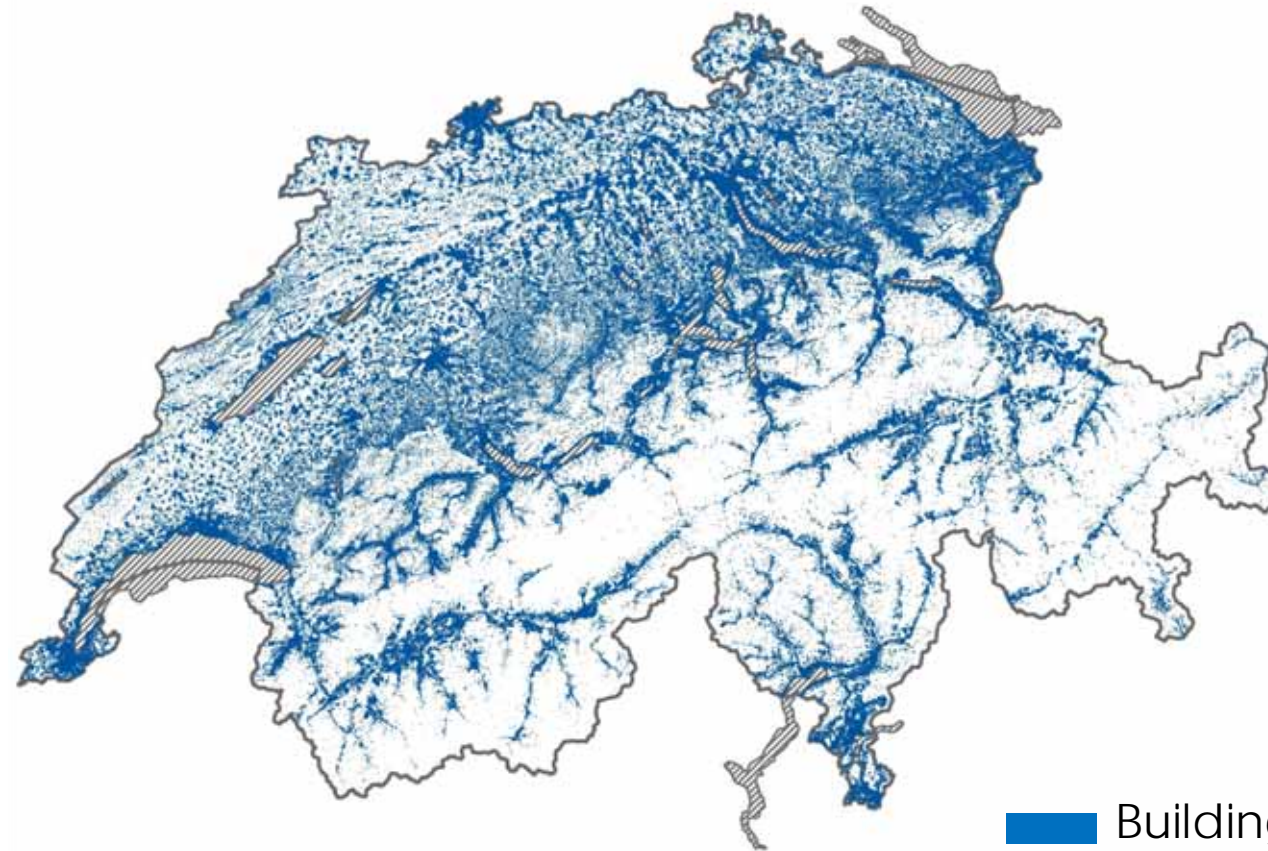
7,954,622 inhabitants

Main language (multiple
answer possible): German
(65.6%), French (22.8%),
Italian (8.4%), Romansh
(0.6%), other (18.7%)

Source: Swiss
confederation (2013)



Buildings density



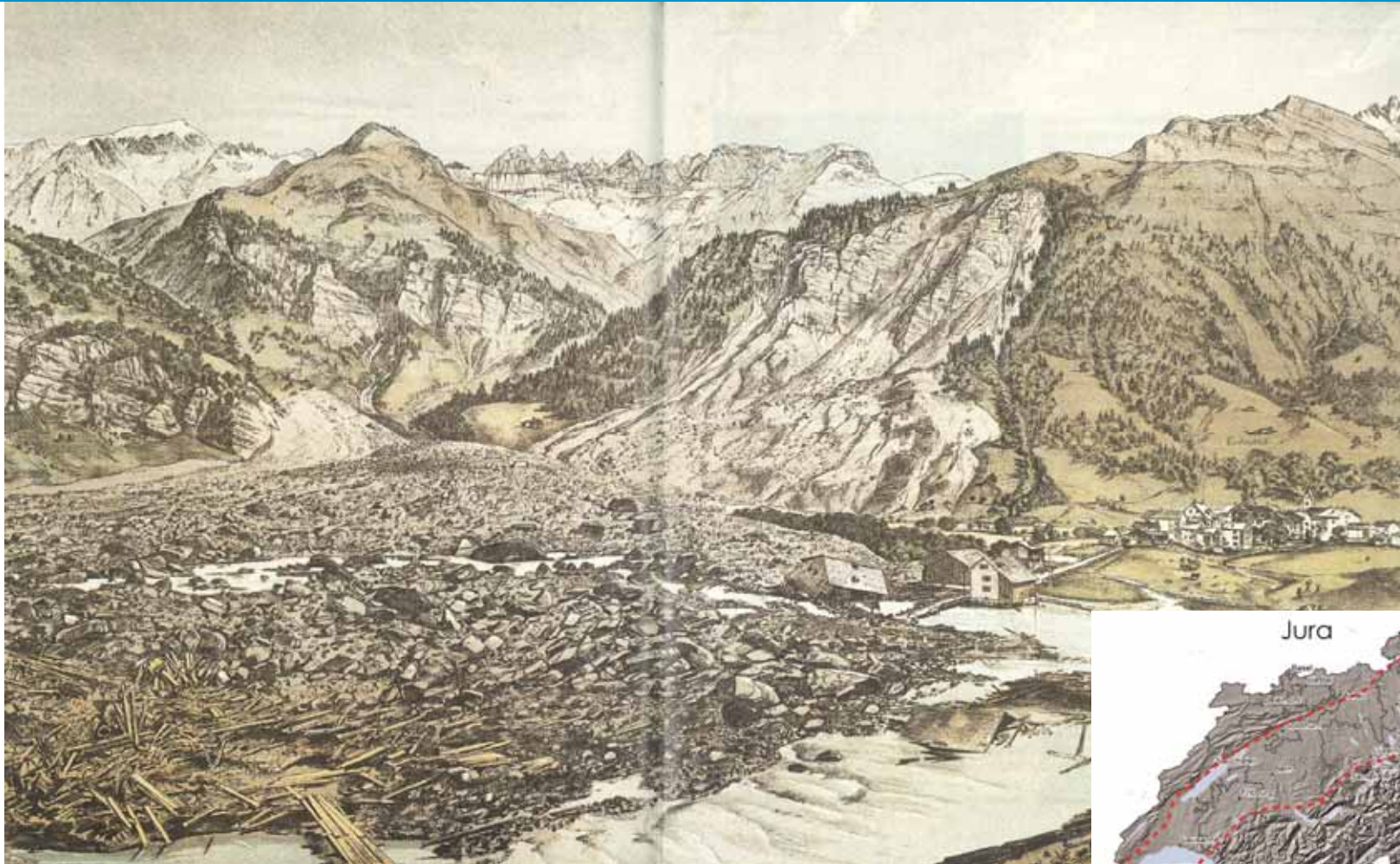
Buildings value
CHF 2'400 Bio.

Furnitures value
CHF 720 Bio.

(AEAI, 2010)

Modified by M. Choffet after OFT

Rock avalanche in Elm (1881)

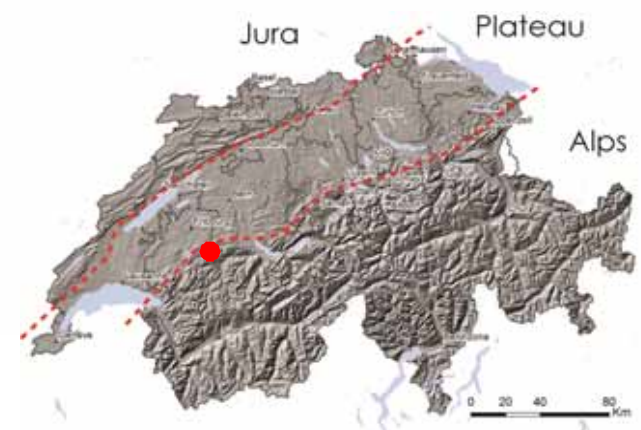
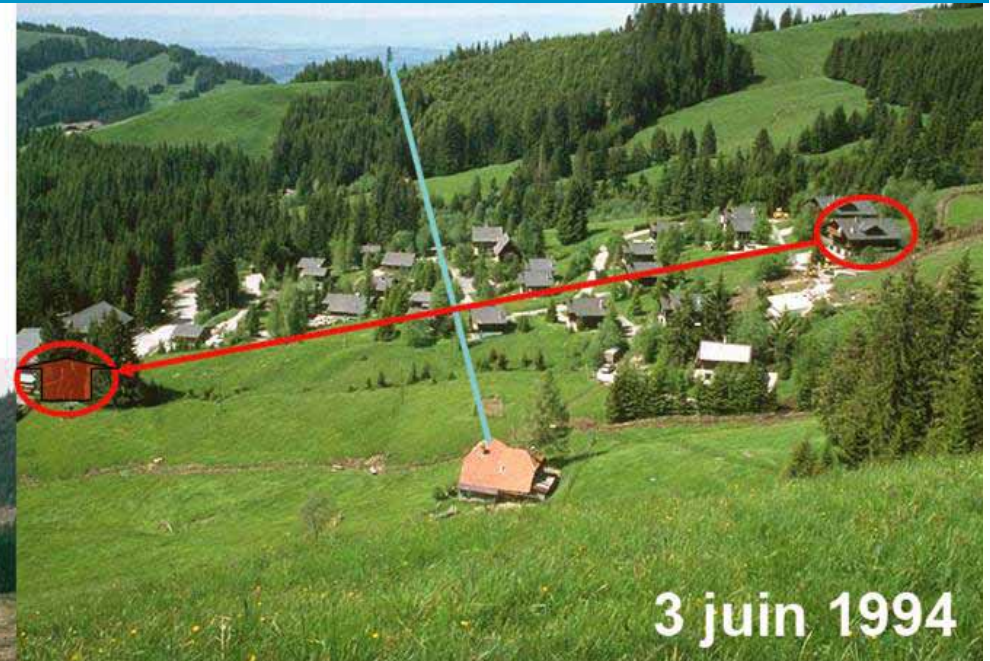


Blauer (2002)



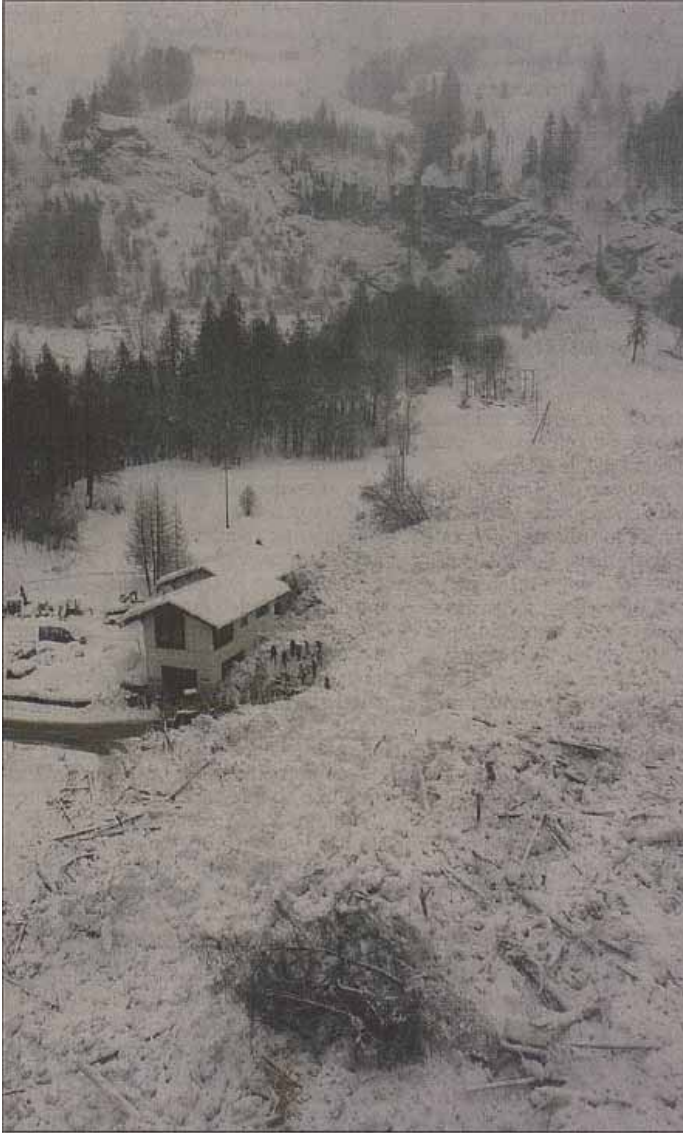
Landslide in Falli Hölli (1994)

- 200 m in 4 month
- Damage cost: 17 Mio \$
- Initialize the danger mapping process



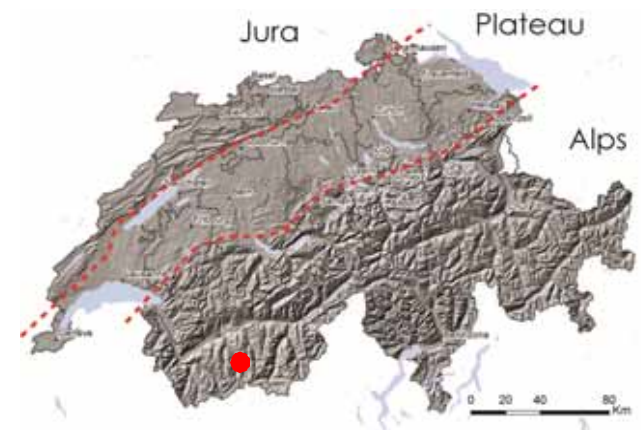
Source: Loup (1994)

Snow avalanches in Evolène (1999)



- 12 person killed
- The avalanche propagated farther than the hazard maps
- Some houses had been evacuated before the event
- The president of the community and the person in charge of the security condemned to 2 and 3 months in prison for negligent homicide

(swissinfo.ch)



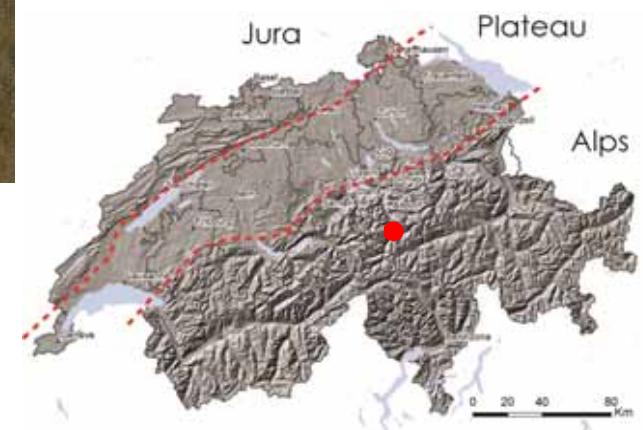
Picture: 24Heures

Rockfalls in Gotthard Highway (2006)



- 11 blocs of around 10 m³ reached the highway (Liniger and Bieri, 2006)
- 2 Germans killed
- Highway closed for one month
- 16'500 vehicules per day in 2005 (including 2'700 trucks)

Picture: 24Heures

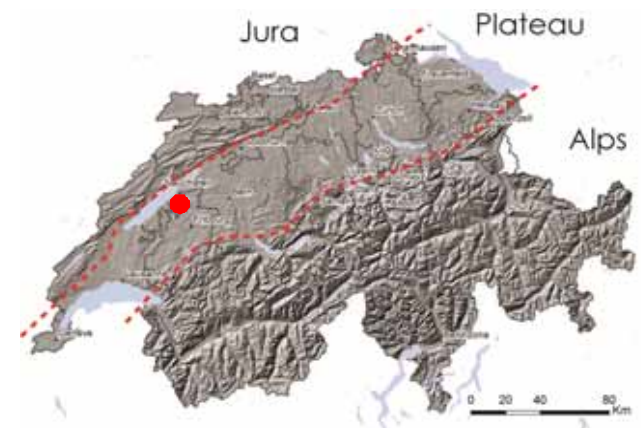


Rockfalls in Vallamand (2006)



- Frequent rockfall events from 1991
- Many events in 2006
- 15 houses evacuated and expropriated
- Cost of the expropriation: 12.5 Mio \$
- 1 house not evacuated in 2006 but abandoned in 2013 after a mudslide

Swisstopo

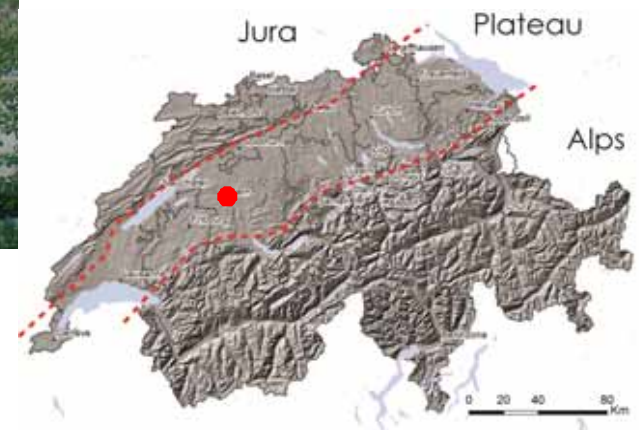


Floods in Bern (2005)



Picture: Simone Hunziker, PLANAT

- Large flood and landslide event in central Switzerland
- Damage cost: 3 Billion \$
- 6 persons killed



Floods in Bern (2005)

- Canton of Bern floods in late August 2005. 166 million francs in damages (www.be.ch) in the Canton of Bern (06.12.2005) (from 24 heures 23 août 2005)



Floods in Bern (2005)



<http://www.esigge.ch>

Bern, middle of the XIX century



Bern, today



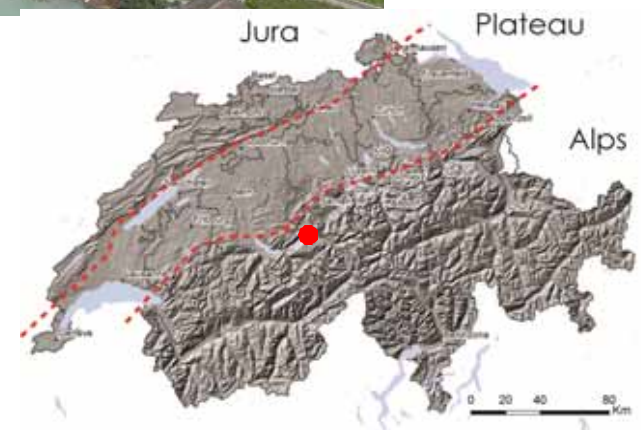
Data Swisstopo (CD)

Debris flow in Brienz (2005)



- 2 people killed and 28 houses destroyed by the debris-flow on the right
- Many other debris-flow in the region

Source: planat.ch, pictures: Swiss Airforce



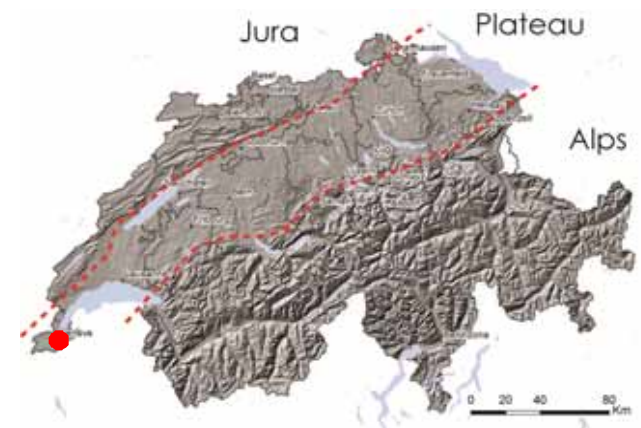
Hail and floods in Geneva (last Thursday)



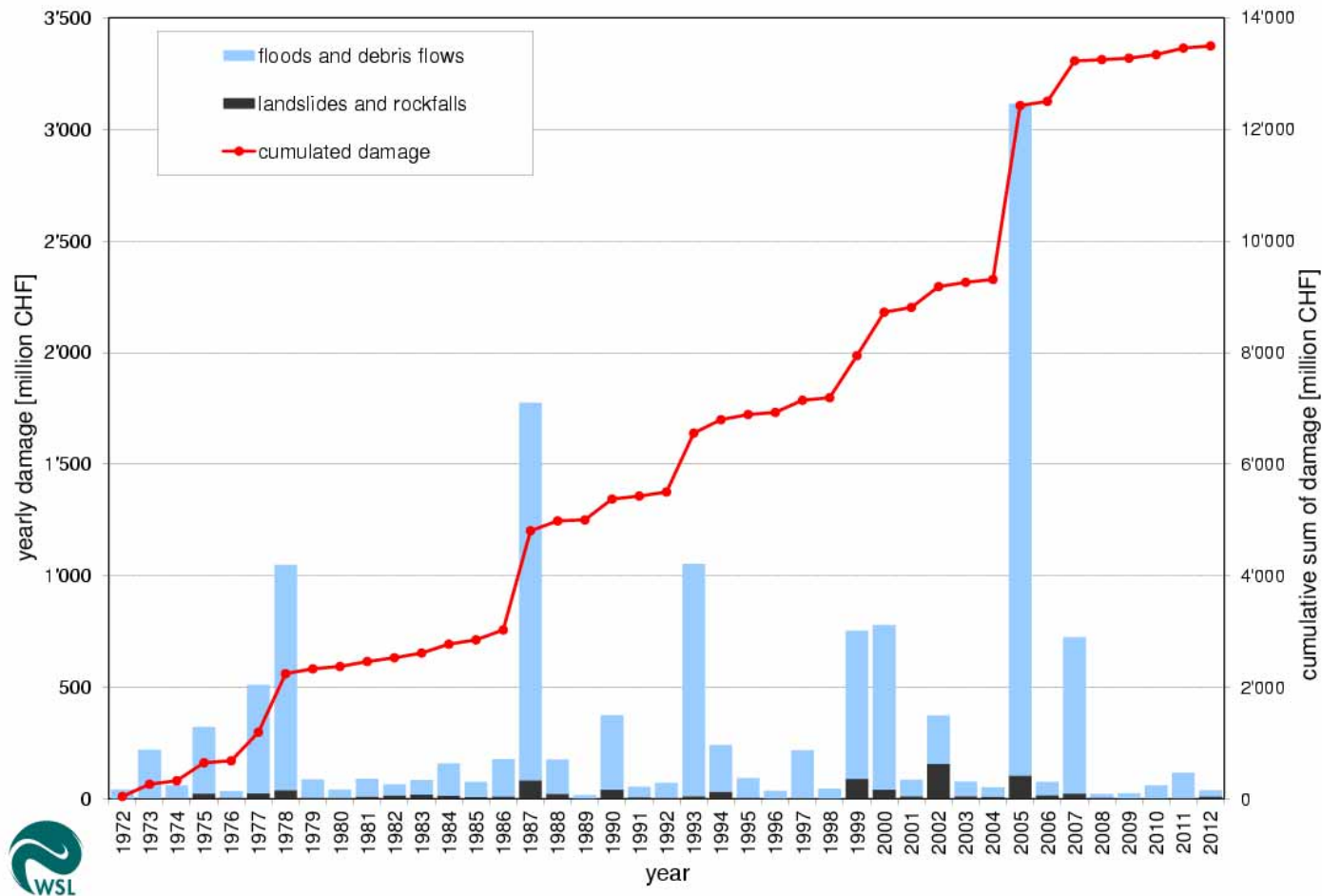
Photo: Luc Mégroz, Tribune de Genève



Photo: Laurent Guiraud, Tribune de Genève



Damage costs



Source: WSL

A large part of the total cost is produced by widespread flooding events

N.B. This statistics does not include hail and storms

DANGER MAPS FRAMEWORK

Federal Constitution of the Swiss Confederation

Art. 57 Security

¹ The Confederation and the Cantons shall within the scope of their powers ensure the security of the country and the protection of the population.

[...]

Art. 76 Water

¹ The Confederation shall within the scope of its powers ensure the economic use and the protection of water resources and provide protection against the harmful effects of water.

[...]

Art. 77 Forests

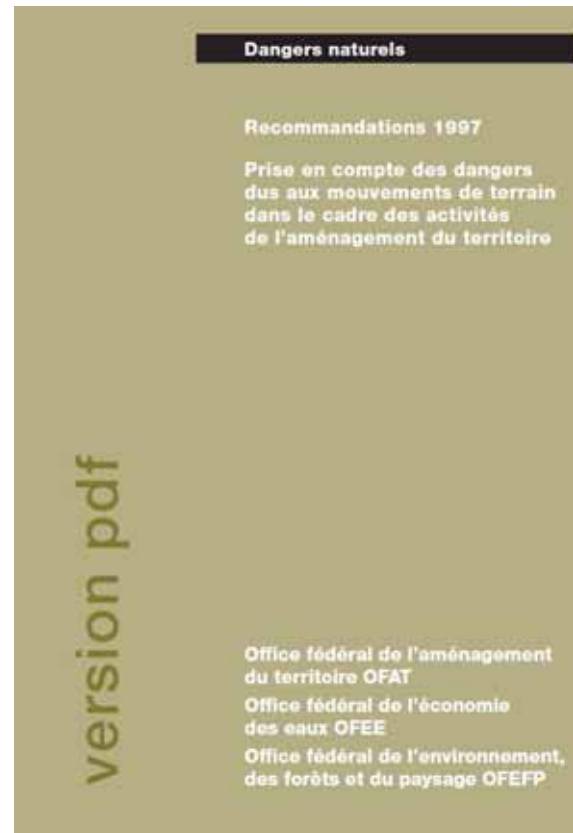
¹ The Confederation shall ensure that the forests are able to fulfil their protective, commercial and public amenity functions.

[...]

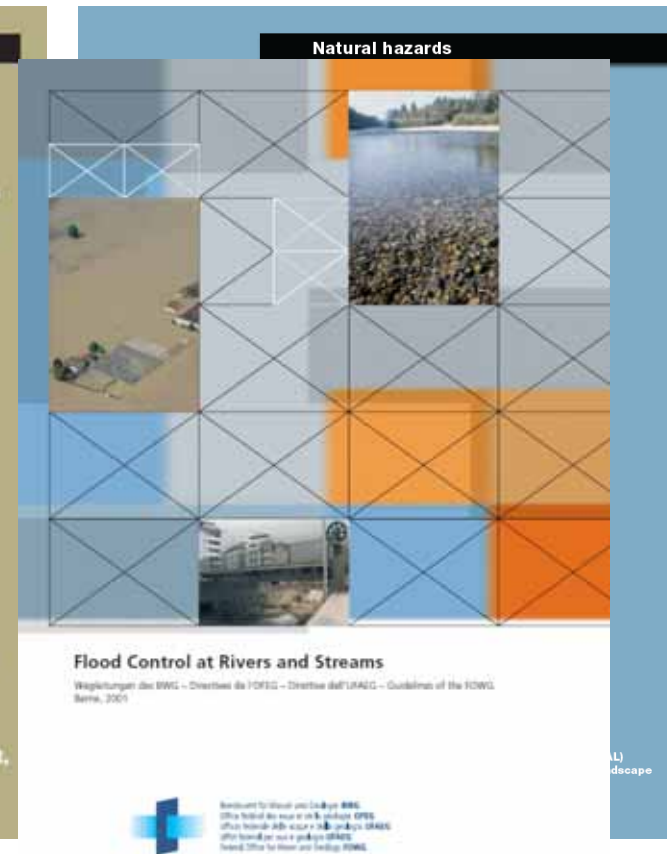
Federal guidelines: consideration of natural hazards for landuse planning



Snow avalanches
(1984)

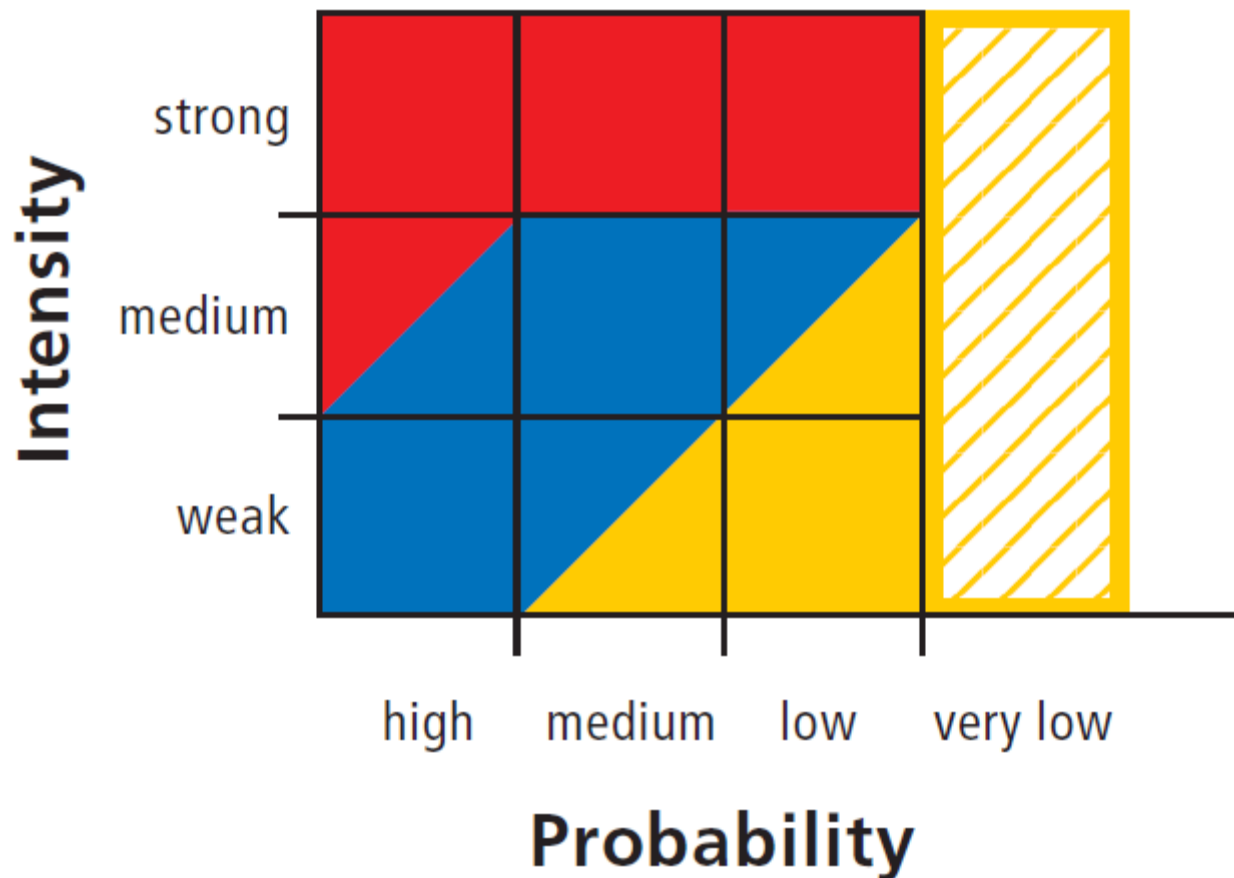


Landslides (1997)



Floods (1997, 2001)

The Swiss danger matrix



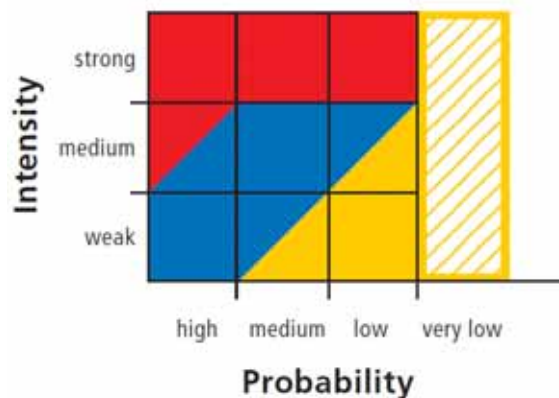
Same matrix
(with small
modifications)
for all processes

Based on the
intersection of
an **intensity** and
a **probability** (or
a frequency)

FOWG (2001)

General rule (new constructions)

- Red: prohibition area
- Blue: conditional-use area
- Yellow: index zone
- Yellow-white: index zone
- White: No restrictions



FOWG (2001)

Responsibility of the authorities

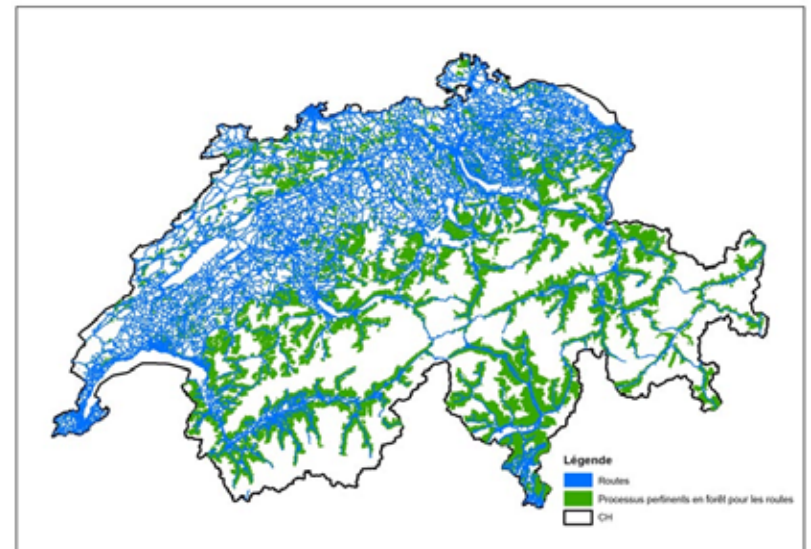
- The danger maps must be integrated in the community land use plan
- If not, the hazard map is not a sufficient reason to refuse a construction permit, neither for the community or for the public insurance company

(Judgment of the Canton de Vaud Administrative Court, 2010)

Subvention for...

Funding for the following elements is a shared task of the Confederation and the cantons :

- Danger maps
- Protection forests
- Technical measures



Who pays the danger maps ?

In the Canton de Vaud :

- 7 % Communities
- 93 % Canton, insurance company and Confederation