Flood Hazard Mapping and Flood Insurance in Switzerland An Overview

Presentation · February 2023

CITATIONS
0

READS
44

1 author:

Richard Kuntner
Teysseire & Candolfi SA Switzerland
15 PUBLICATIONS **178** CITATIONS

SEE PROFILE

Flood Hazard Mapping and Flood Insurance in Switzerland
An Overview

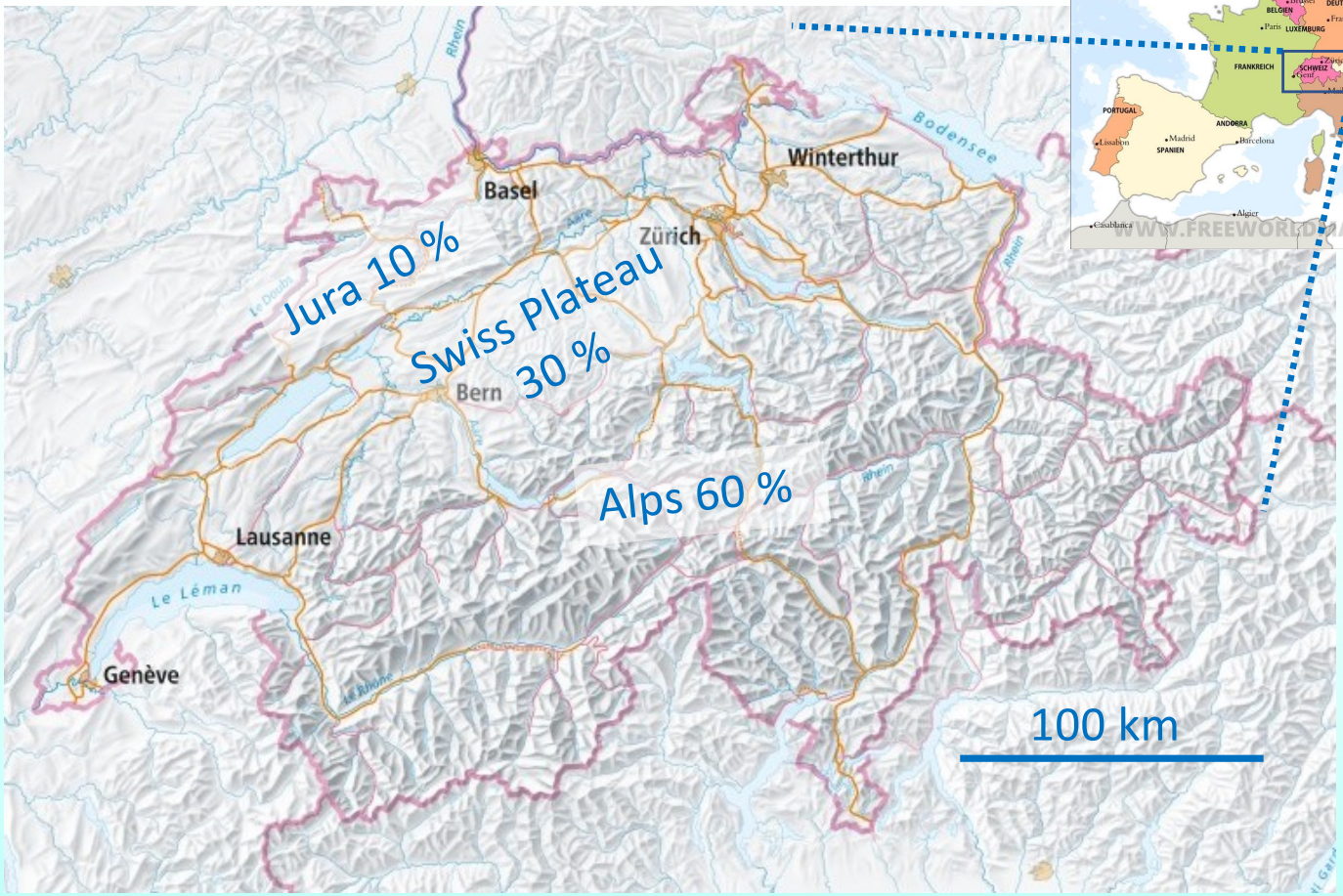
Richard Kuntner PhD

Introduction
History / Context

Introduction

Switzerland - topography

source: www.freeworldmaps.net



source: www.geo.admin.ch

Introduction

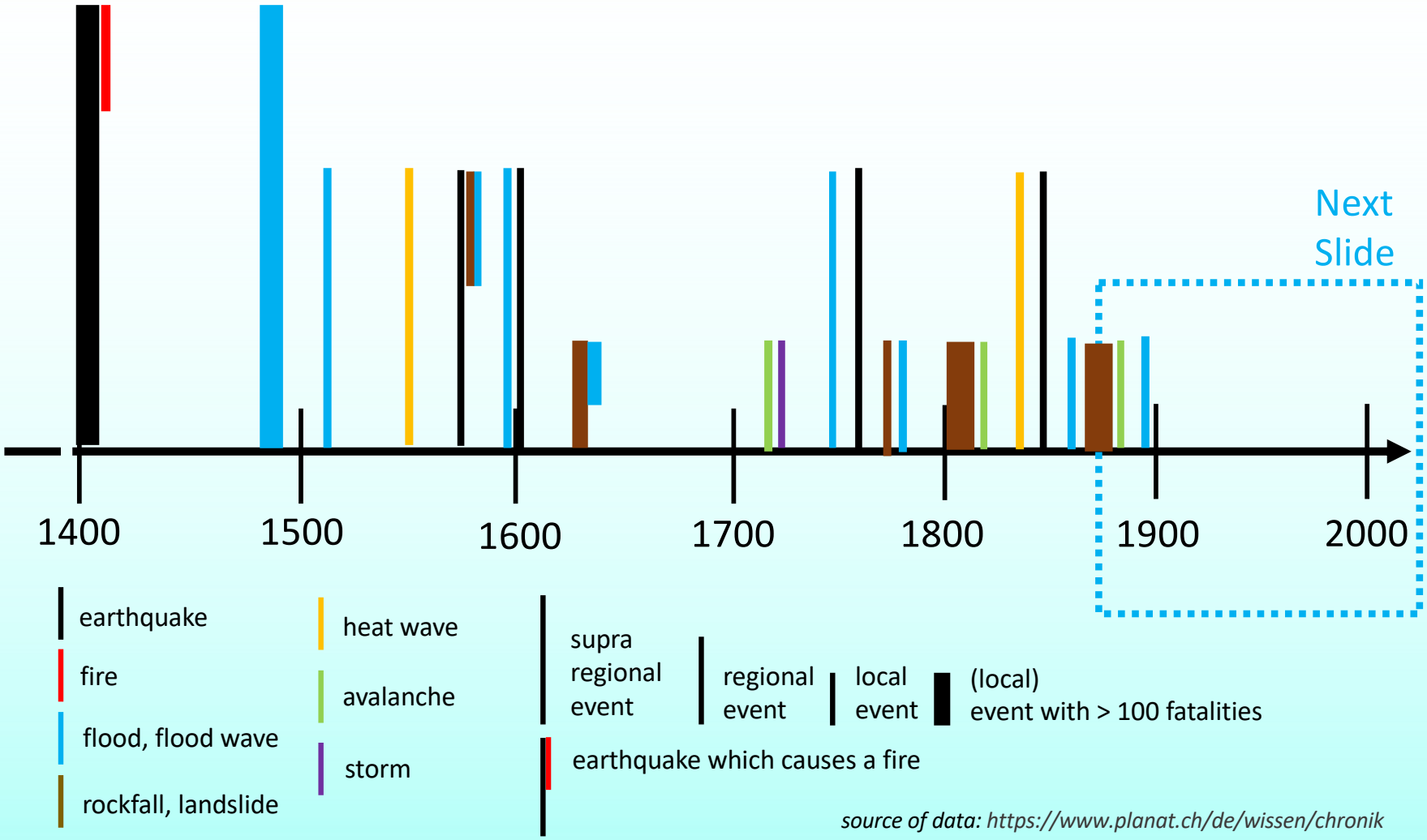
Historical natural hazard events

source: Baselländ. Gebäudeversicherung (2017)

source: D. Vischer (2003)

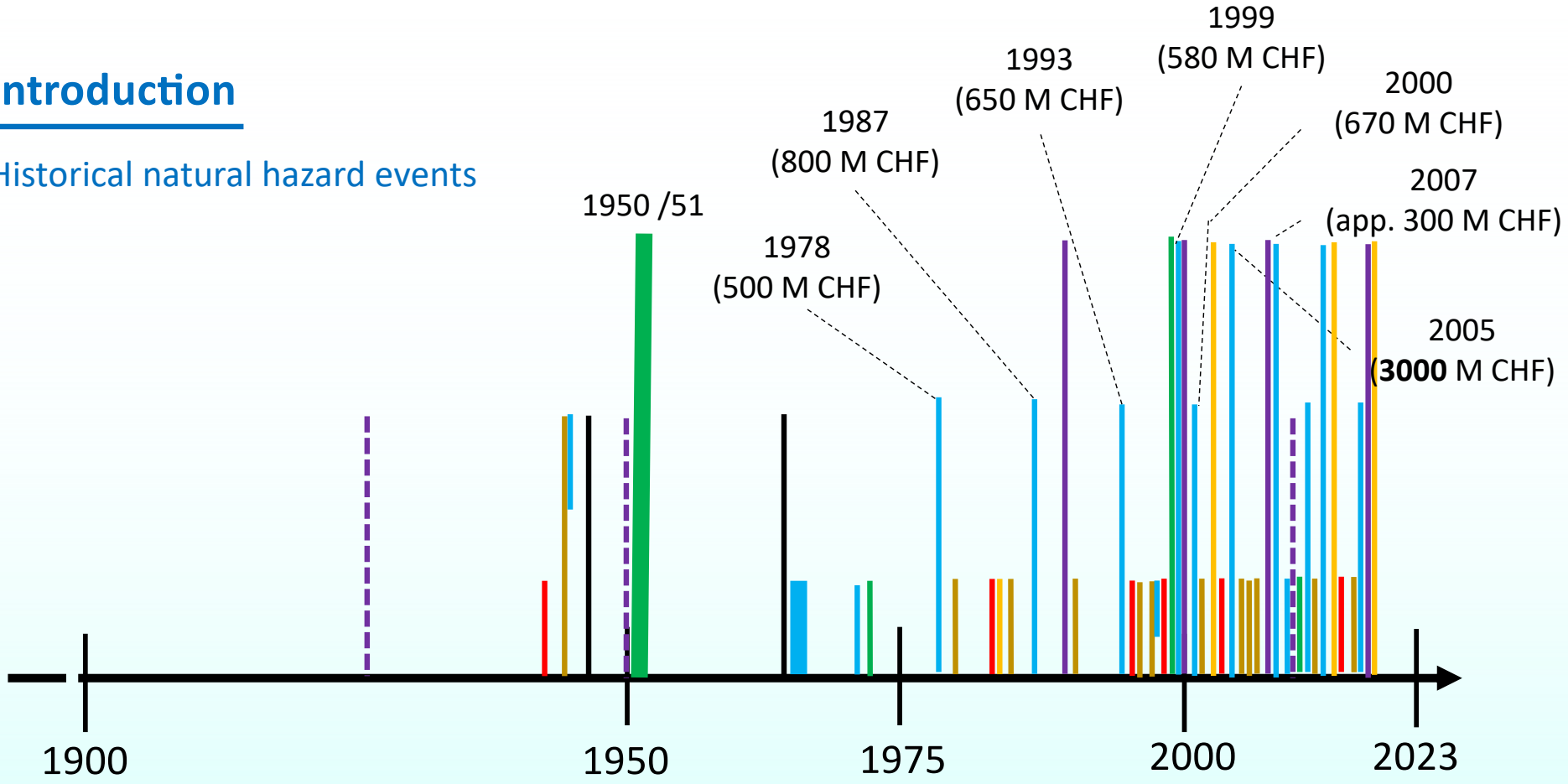
Introduction

Historical natural hazard events



Introduction

Historical natural hazard events



earthquake
fire
flood, flood wave
rockfall, landslide, debris flow
heat wave
avalanche
storm
hail
supra regional event
regional event
local event
(local) event with > 100 fatalities
earthquake which causes a fire

(800 M CHF –> damage)

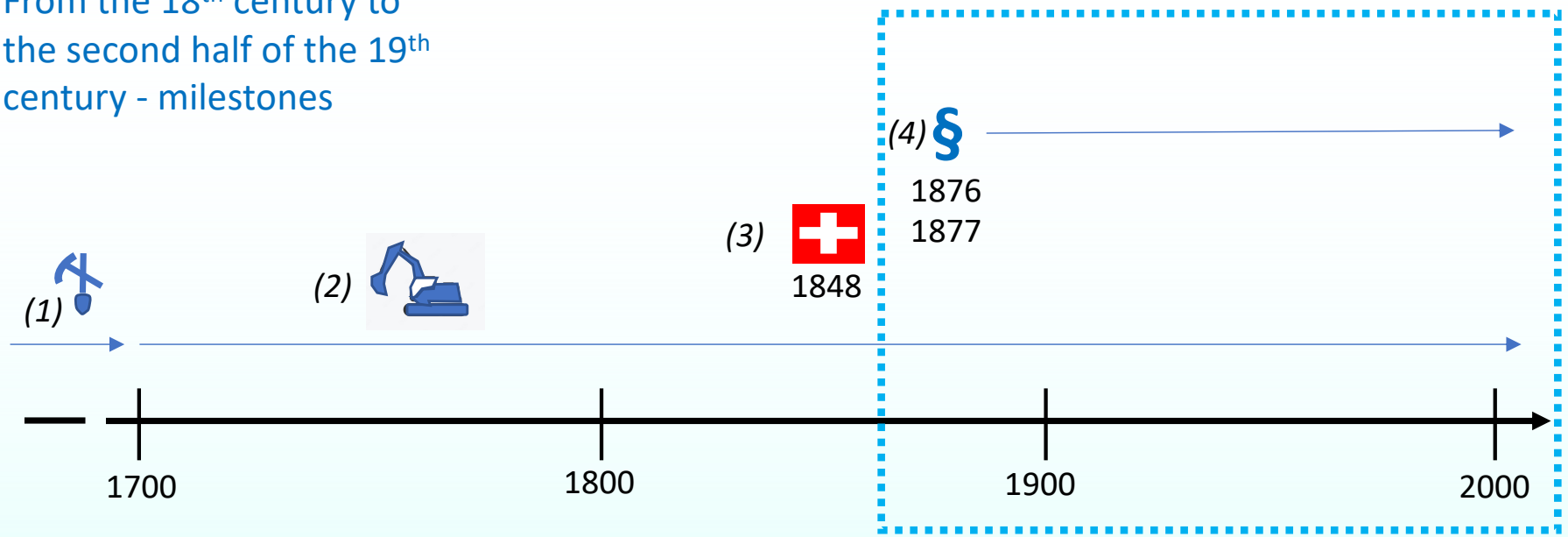
source of data: https://www.planat.ch/de/wissen/chronik

Agenda

- Introduction ✓
- History / Context
- Flood Hazard Mapping / Protection goals (federal standards)
- Flood Hazard Mapping (implementation by cantons / provinces)
- Flood Insurance
- Outlook

History / Context

From the 18th century to the second half of the 19th century - milestones

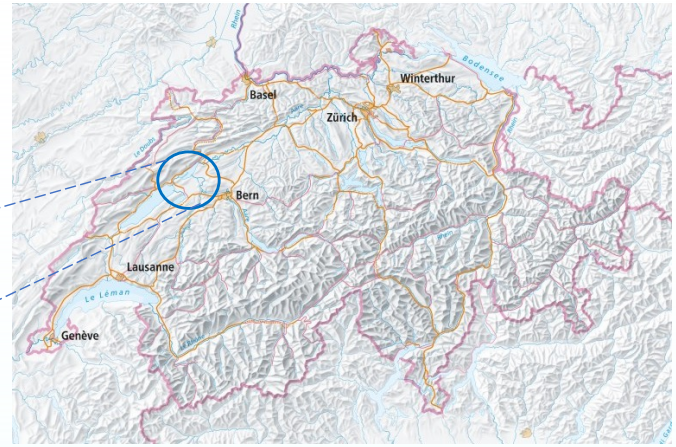


- (1) Before the 18th century flood protection measures were private small scale endeavors
- (2) Starting from the 18th century flood protection became collaborative endeavors of municipalities an other organism. Many rivers were channelized, large surfaces drained and river beds relocated in order to also gain agricultural land and fight malaria. (> example: 1. Correction of the Jura water bodies)
- (3) the Swiss Confederation replaces the Federation of sovereign Cantons; the Federal Constitution enables the (financial) support of the construction of large public infrastructure.
- (4) Law of forestry and hydraulic engineering police – Based on this legal foundation public authorities started significant programs to stabilize slopes (protection against avalanches) and channelize /armor rivers

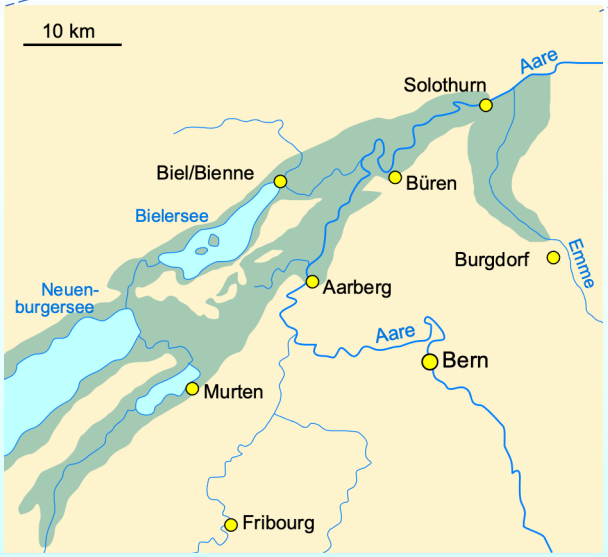
Source of information: Bundesrat / BAFU (2016)

History / Context

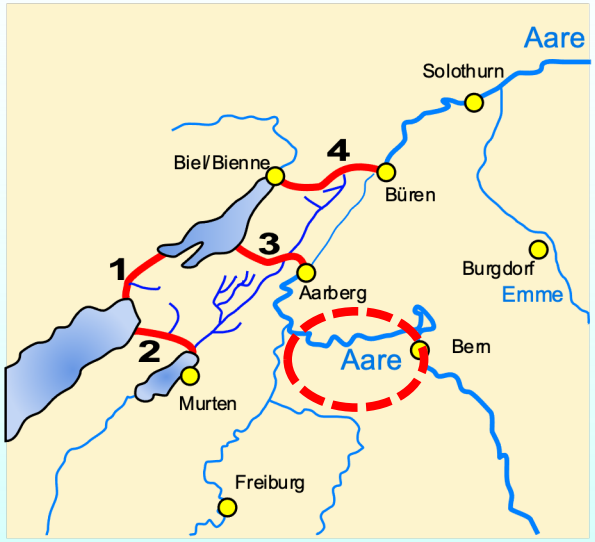
First correction of the Jura water bodies (1868-1891)



source: www.geo.admin.ch



source: Von Karte: NordNordWest, Lizenz: Creative Commons by-sa-3.0 de, CC BY-SA 3.0 de, https://commons.wikimedia.org/w/index.php?curid=49845940

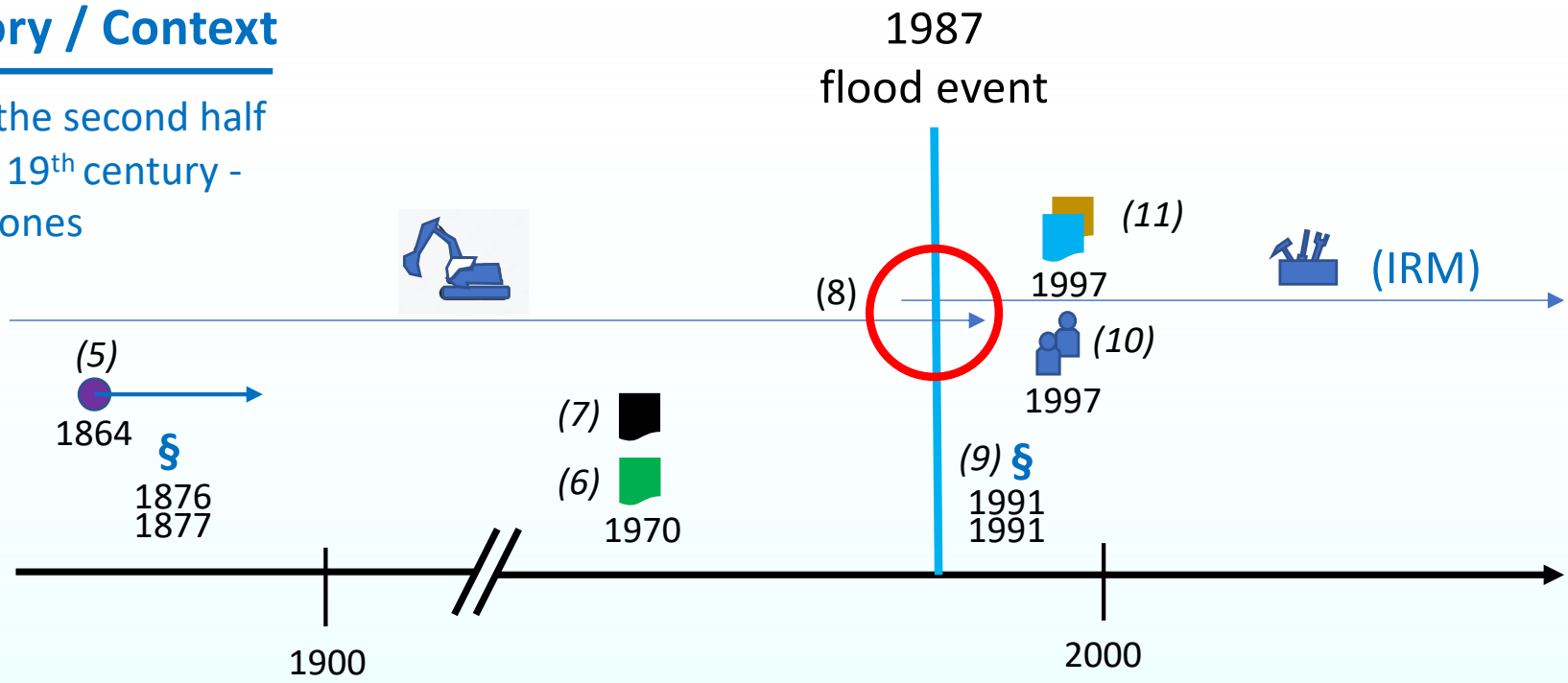


source: Von derivative work: Axdot (talk)Corrections_eau_jura_après2.svg: - Eigenes Werk, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=107539347

New channels, as key element, the Aare river was deviated into Lake Biel (sediment deposition in the lake)

History / Context

Since the second half of the 19th century - milestones

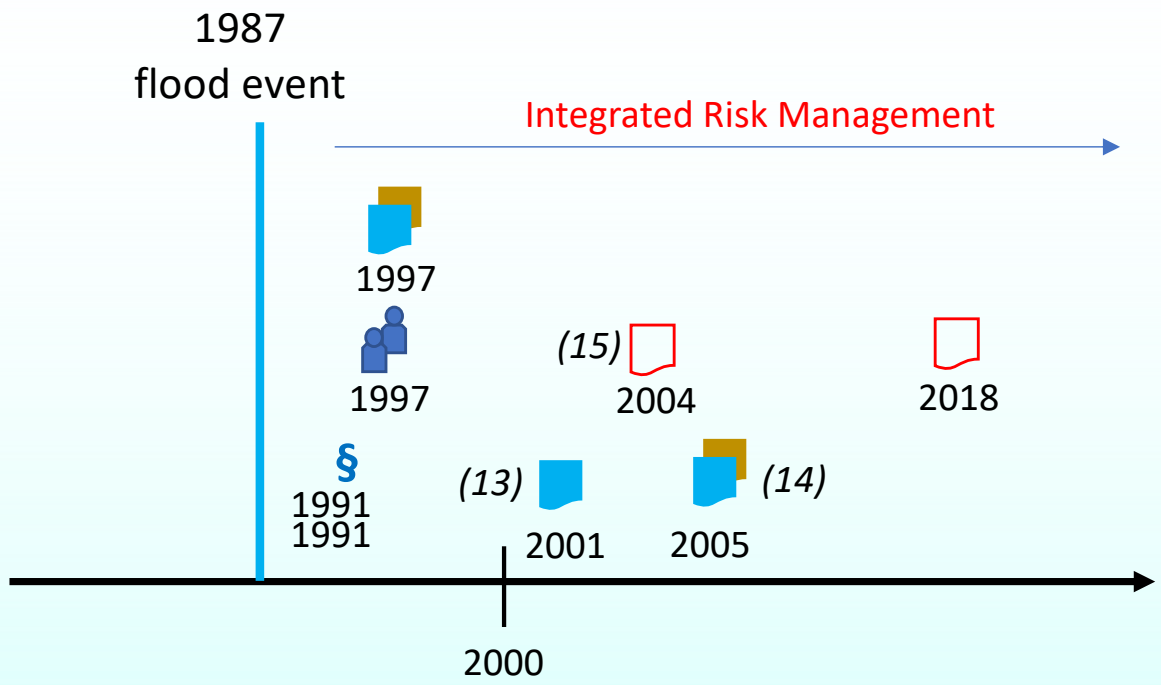


- (5) systematic measurement of meteorological data
- (6) first guidelines for avalanche hazard maps
- (7) first building codes for earthquakes (revised several times since then)
- (8) paradigm change from protection against hazards to **integrated risk management (IRM)**
- (9) new laws (forestry and river engineering): the cantons elaborate natural hazard maps and registers (natural hazard events, protection infrastructure) and install emergency management systems
- (10) Swiss National Platform for Natural Hazards (PLANAT)
- (11) guidelines on how to incorporate natural hazards (hydrological, mass movements) into all activities with spatial relevance

Source of information: Bundesrat / BAFU (2016)

History / Context

Since 1987 - milestones



- (13) guideline for flood control at rivers and streams
- (14) recommendation natural hazards and land use planning
- (15) management strategy of risks from natural hazards; first published in 2004, revised in 2018

Source of information : Bundesrat / BAFU (2016)

History / Context

Management of risks from natural hazards **Strategy 2018**

Objectives

Switzerland provides adequate security against natural hazards

- Switzerland is resistant
- Switzerland is able to recover
- Switzerland is able to adapt

Principles

Switzerland addresses natural hazards with a risk-oriented approach

- Switzerland practices a comprehensive risk culture
- Integrated risk management involves everyone
- Risks from natural hazards are managed in a spirit of solidarity
- Knowledge of natural hazards and risks is up-to-date and accessible
- Risk management takes into account all aspects of sustainability

Source of text: PLANAT (2018)

History / Context

Management of risks from natural hazards **Strategy 2018**

Federal Department of the Environment Transport, Energy and Communications 2012 (strategy) (source: UVEK 2012)

Objectives

Switzerland provides adequate security against natural hazards

- Switzerland is resistant
- Switzerland is able to recover
- Switzerland is able to adapt

Principles

Switzerland addresses natural hazards with a risk-oriented approach

- Switzerland practices a comprehensive risk culture
- Integrated risk management involves everyone
- Risks from natural hazards are managed in a spirit of solidarity
- Knowledge of natural hazards and risks is up-to-date and accessible
- Risk management takes into account all aspects of sustainability

Protection deficits related to natural hazards eliminated by **2030**

By **2030** Switzerland is **adapted** to climate change in particular to its effects on natural hazards

Financing of natural hazard risk management secured In the long term

Source of text: PLANAT (2018)

History / Context

Management of risks from natural hazards **Strategy 2018**

Objectives

Switzerland is **resistant**

Avoid hazards – land use planning / behavior
Provide adequate protection – reduce risk to an acceptable level
Providing redundancies where necessary

Switzerland is **able to recover**

Preparing ourselves– instruments, organizations, training
Provide adequate resources – personnel, technical, financial
Offer mutual assistance – **subsidiarity**, solidarity

Switzerland is **able to adapt**

Identifying and reacting to changes - constant monitoring of nat. hazards
Creating and deepening knowledge - personnel, technical, financial
Imparting knowledge – dissemination of findings from research

Source of text: PLANAT (2018)

Management of risks from natural hazards **Strategy 2018**

Principles I

Switzerland practices a **comprehensive risk culture**

Risks for natural hazards are know to all stakeholders
Ongoing risk dialogue as prerequisite for cooperation between stakeholders
Decision making takes into consideration the risks from natural hazards

Integrated risk management **involves everyone**

It applies comparable standards for quantifying risks and comparably manage those risks involving all stakeholders and all parties affected

Risks for natural hazards are managed in a **spirit of solidarity**

As natural hazards can effect everyone in Switzerland everybody must be involved in dealing with them (individuals, businesses, society, insurance sector, public authorities, policymaker, planners / engineers, academia, professional associations

Source of text: PLANAT (2018)

Management of risks from natural hazards **Strategy 2018**

Principles II

Knowledge of natural hazards and risks is up-to-date and accessible

Sound scientific principles and their implementation as practical information form the basis for competent management of natural hazards

Risk management takes into account all aspects of **sustainability**

Achieve a level of security that is ecologically tenable, economically reasonable and socially acceptable

Source of text: PLANAT (2018)

History / Context

Integrated Risk Management

Integrated Risk Management
answers the following three key questions:

- **What can happen?** Risk assessment is a science-based process; it looks into both the intensity and frequency of natural hazards and the expected consequences and damages.
- **What is allowed to happen?** Evaluation identifies acceptable and unacceptable risks.
- **What has to be done?** Integrated planning of measures weighs risks and opportunities and defines the degree to which risks are to be avoided, reduced, or borne.

Source of text: PLANAT (2018)

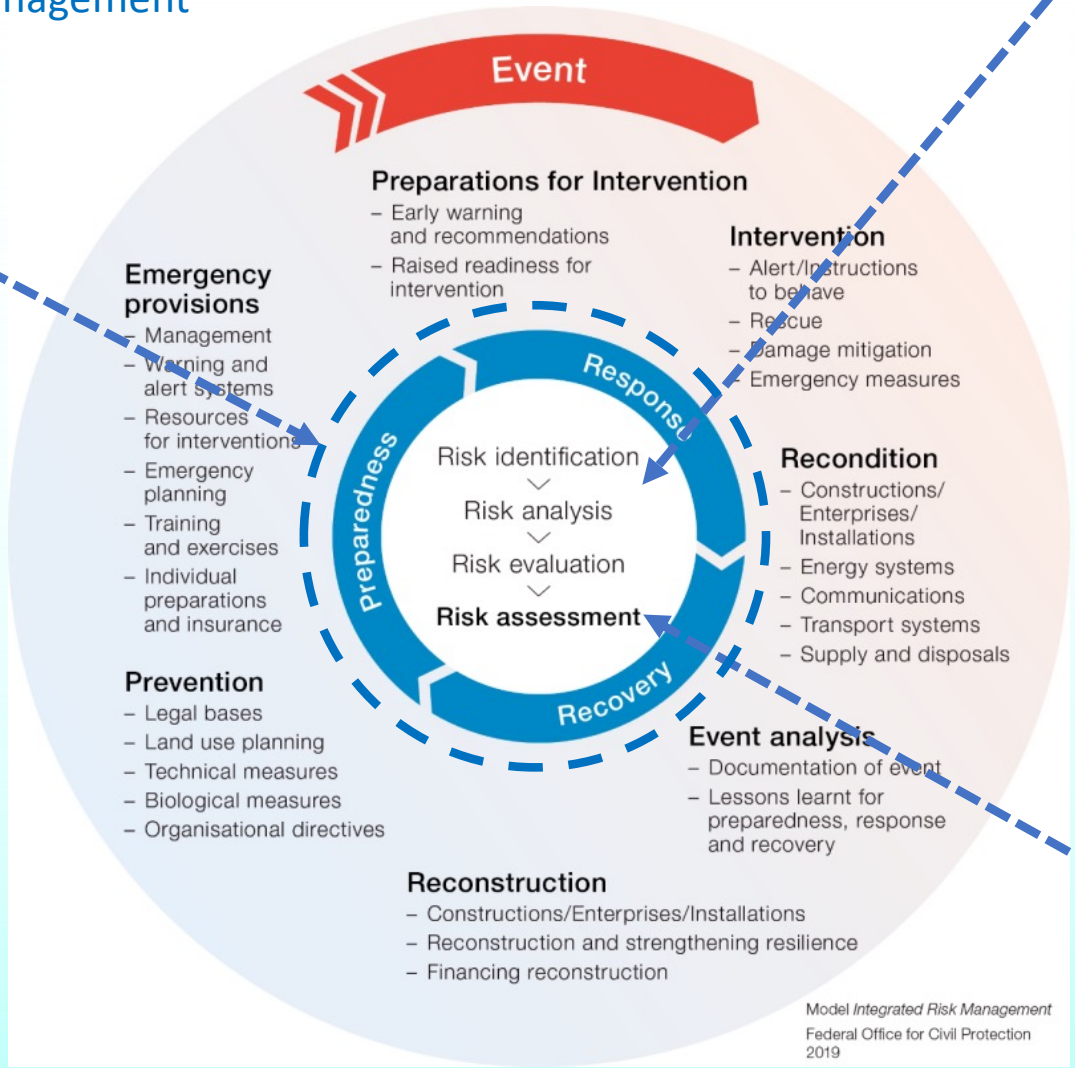
History / Context

Integrated Risk Management

What has to be done ?

What can happen ?

Hazard mapping
Risk analysis

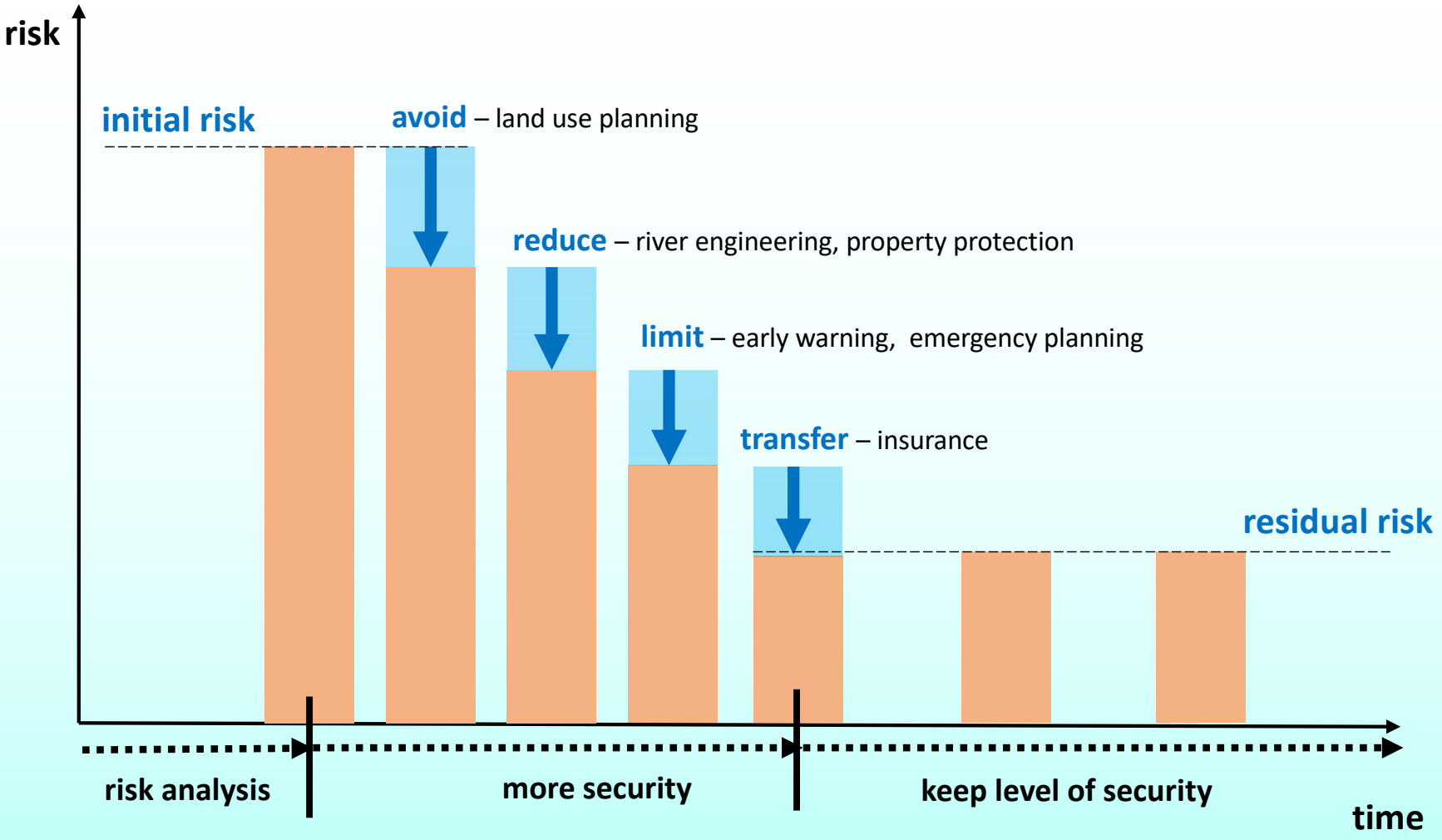


What is allowed to happen ?

Differentiated protection goals

History / Context

Integrated Measurement Planning

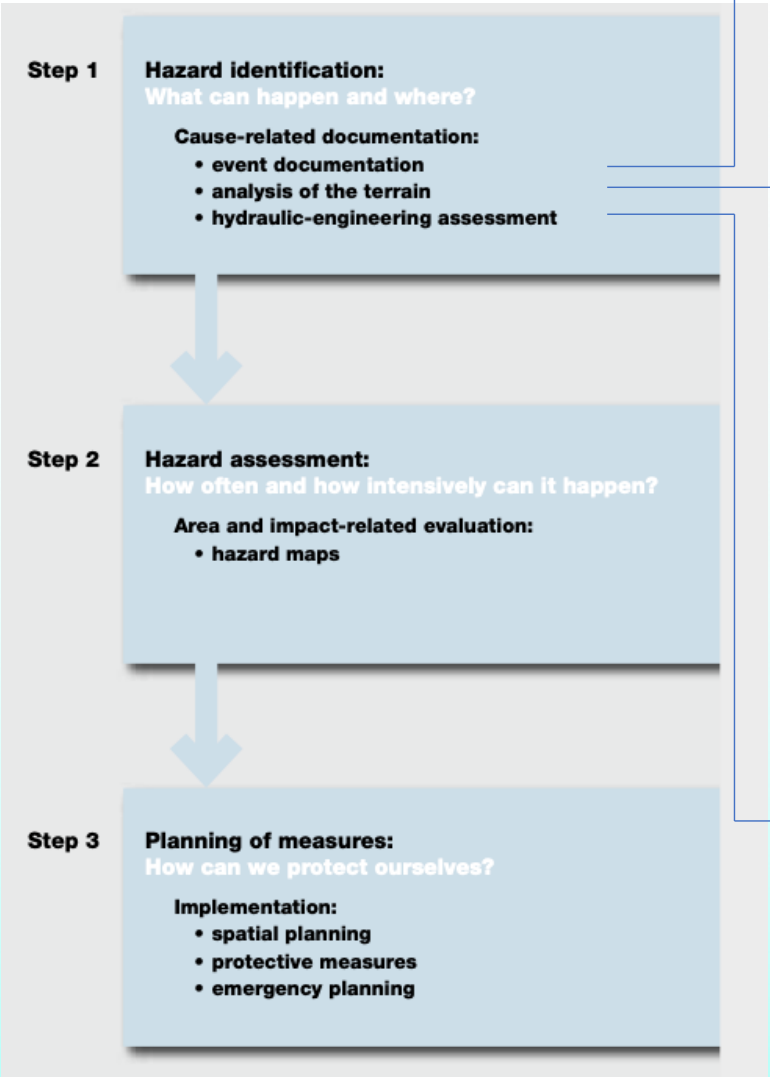


*Adapted from: Departement für Bau und Umwelt / Gebäudeversicherung **Thurgau.**, (2013)*

Flood Hazard Mapping

(Flood) Hazard Mapping

Elaboration - Principles

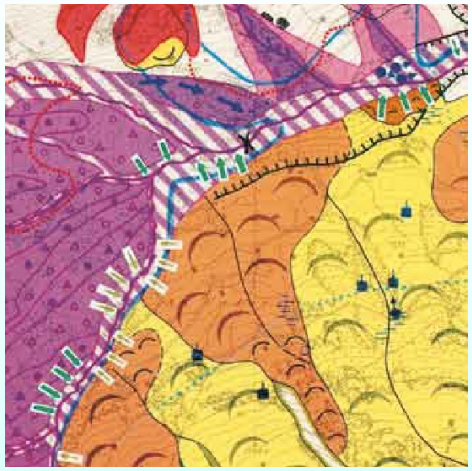


Event documentation (text and map)

Record of observed events describing the main processes, damages, areas affected. Meteorologic-conditions,…inventory

Map of phenomena (1:1000 – 1: 25'000)

Features and indicators observed in the field
"mute" witness of historical events



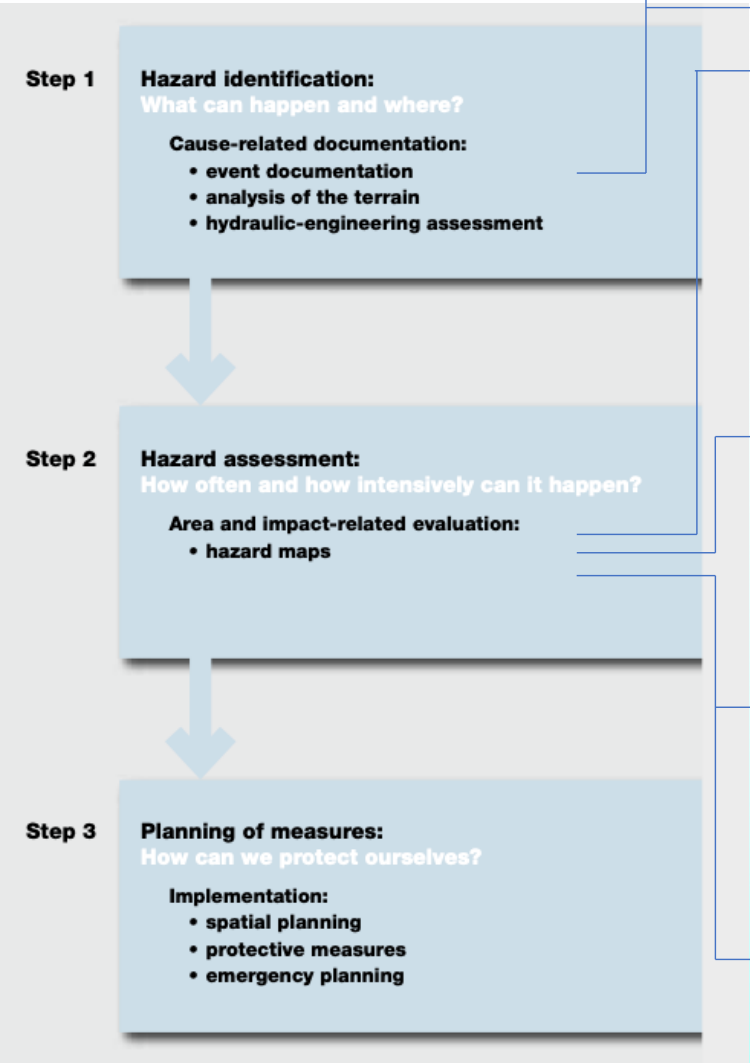
Weak points, protective structures

Analysis of weak points, inventories and assessment of protective structures

Source: pictures and most of the text: BWW, BRP, BUWAL., (1997) – translated in 2008

(Flood) Hazard Mapping

Elaboration - Principles



Event documentation (text and map)

Map of phenomena (1:1000 – 1: 25'000)

Weak points, protective structures

Hazard index maps (1:10'000 – 1:50'000)

Overview of the hazard situation. They provide a comprehensive record of where natural hazards must be taken into account and which ones…In case of flood hazards the extension of the inundation area is shown for the extreme flood event (often assumed to be an event with a return period of 1000 years) *+/- nationwide*

Intensity maps for each process (1:2'000 – 1:5'000)

The intensity map provides the extension of the inundated area, the inundation depth, the flow velocity as well as the direction of flow for a specific scenario of a return period of 30, 100, 300, (1000 years) *confined to settlement areas*

Hazard map for each process (1:2'000 – 1:5'000)

Synthesis of the intensity maps. They form the technical basis for considering the natural hazards when developing municipality zoning plans *confined to settlement areas*

Synthetic map of all natural hazard processes (1:2'000 – 1:5'000)

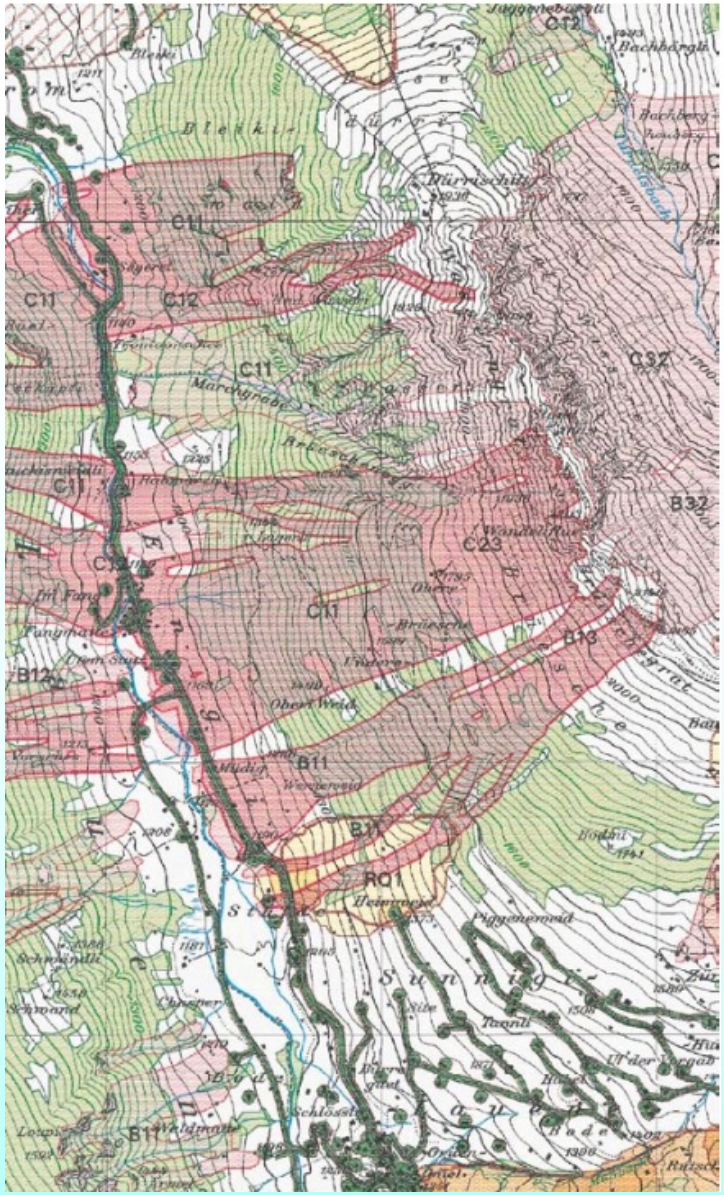
Surface runoff map Switzerland (1:12'500) - 2018

Source: pictures and most of the text: BWW, BRP, BUWAL., (1997) – translated in 2008 and BWG (2001)

(Flood) Hazard Mapping

Hazard index maps

- based on different sources including numerical simulations
- no detailed verification in the field
- no information about intensity and probability of occurrence
- +/- nationwide

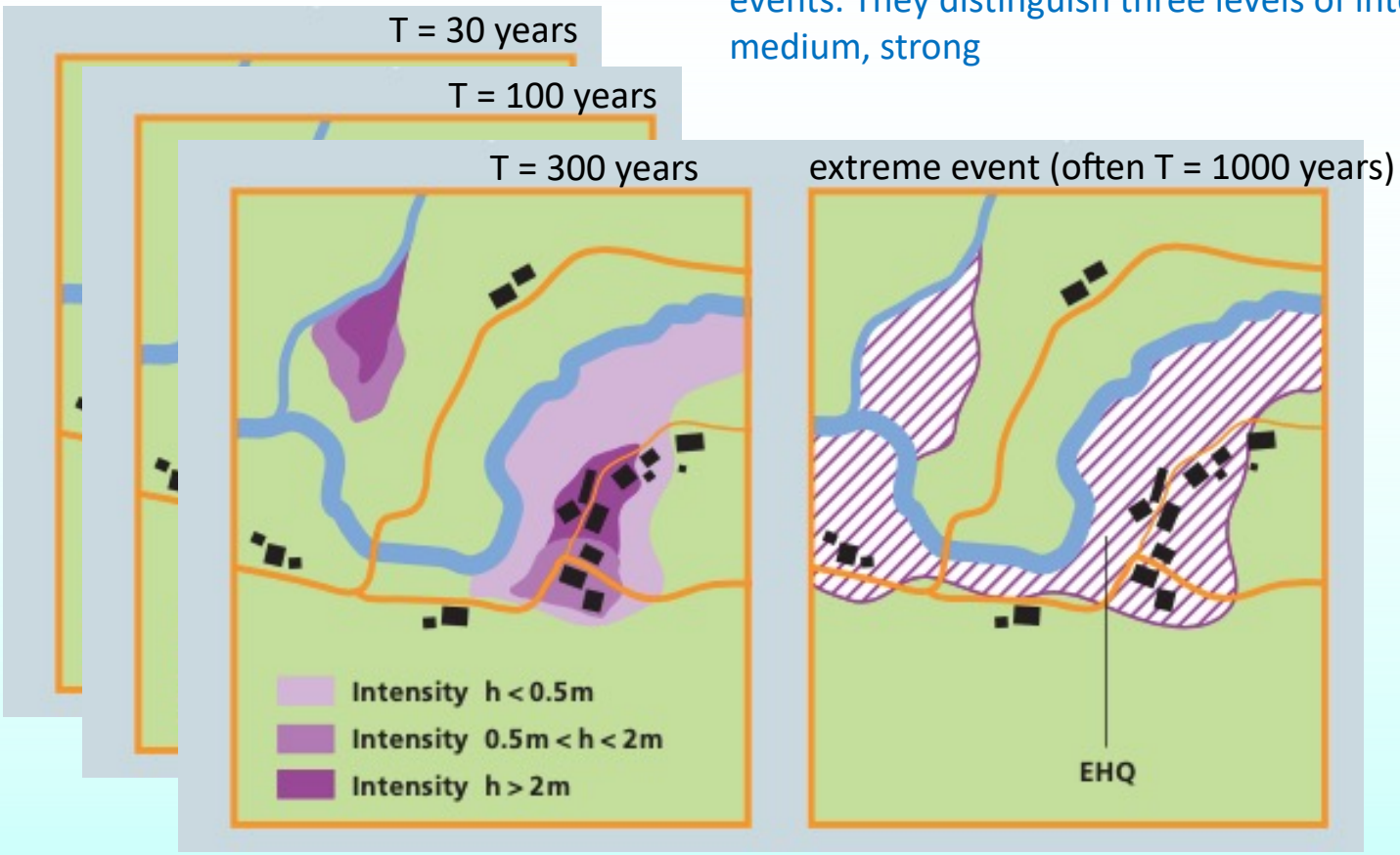


Source: BWG,BRP, BUWAL (2007)

Flood Hazard Mapping

Intensity Maps

Intensity maps show the intensity of inundation, bank erosion and debris flow deposition for possible hazard events with a return period of 30, 100 and 300 years and for extreme events. They distinguish three levels of intensity: weak, medium, strong



Source : BWG (2001)

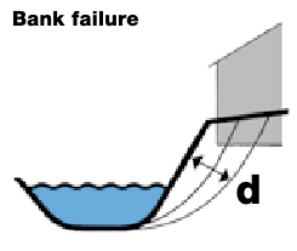
Flood Hazard Mapping

Intensity Maps

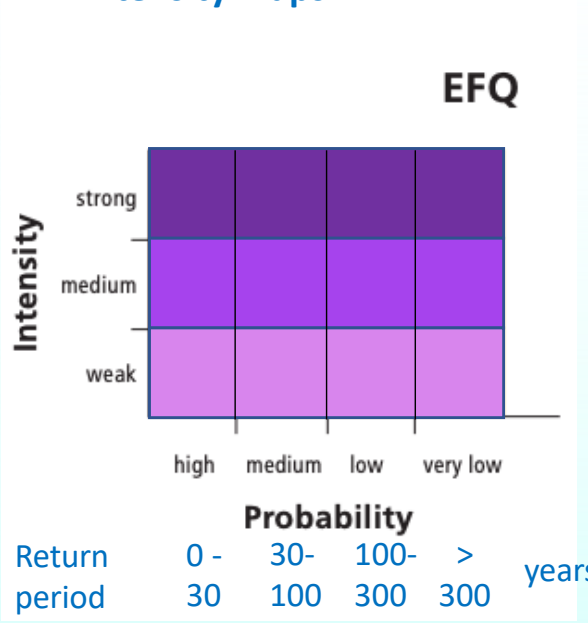
Levels of intensity

Intensity	Hazard		
	Flooding	Bank erosion	Debris flow deposition
strong	h > 2m OR v *h > 2 m^2/s	d < 2 m	h > 1m and v > 1m/s
medium	2 m > h > 0.5 m OR 2 m^2/s > v *h > 0.5 m^2/s	2m > d > 0.5 m	h < 1 m OR v < 1 m/s
weak	h < 0.5 m OR v *h < 0.5 m^2/s	d < 0.5 m	NONE

v = flow velocity of water / debris flow
h = water depth / depth of debris flow deposition
d = average depth of scour



Rules of display on Intensity maps



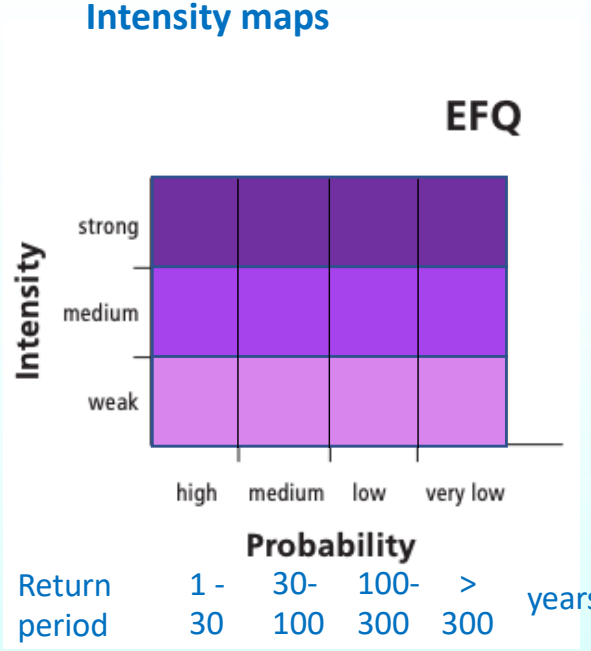
EFQ = extreme flood event

Source: pictures and most of the text: BWW, BRP, BUWAL., (1997) – translated in 2008 and BWG (2001)

Flood Hazard Mapping

Intensity Maps

Rules of display on Intensity maps

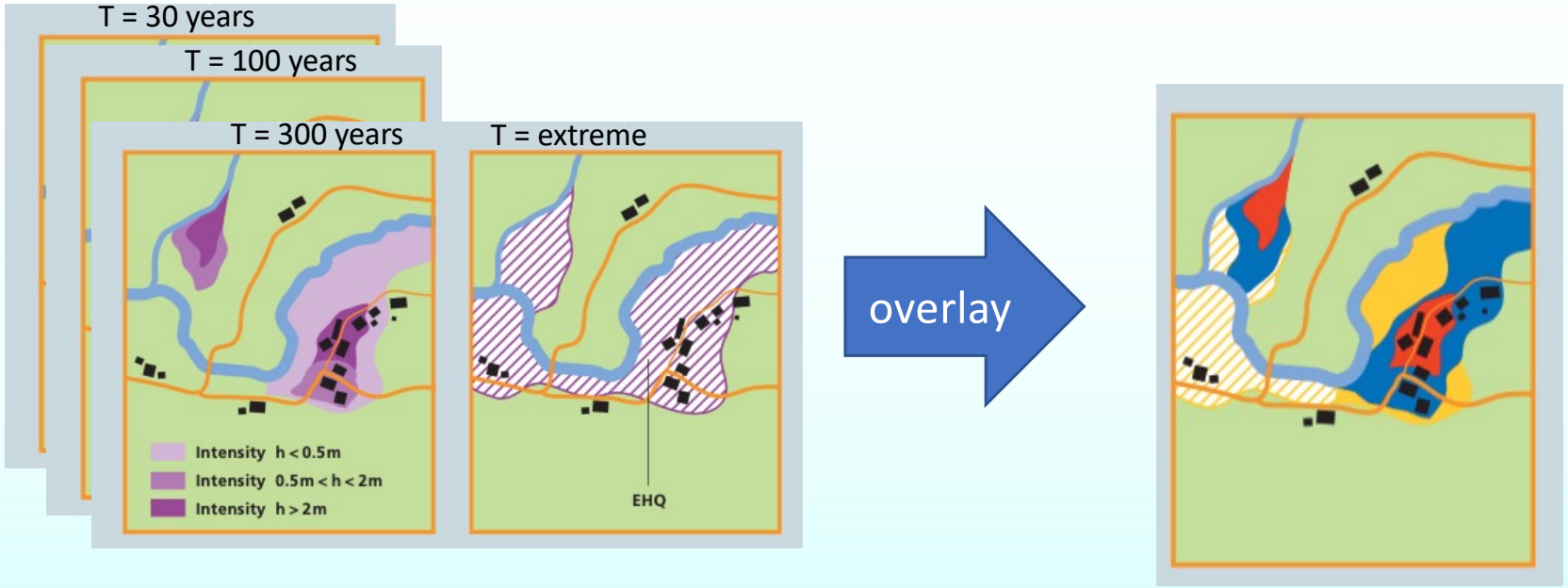


Probability		Return Periode	
Definition	**Probability of occurrence in 50 years**	**Definition**	**Return period in years**
high	100 to 82 %	frequent	1 to 30
average	82 to 40 %	average	30 to 100
low	40 to 15 %	rare	100 to 300

Source: pictures : BWW, BRP, BUWAL., (1997) – translated in 2008

Flood Hazard Mapping

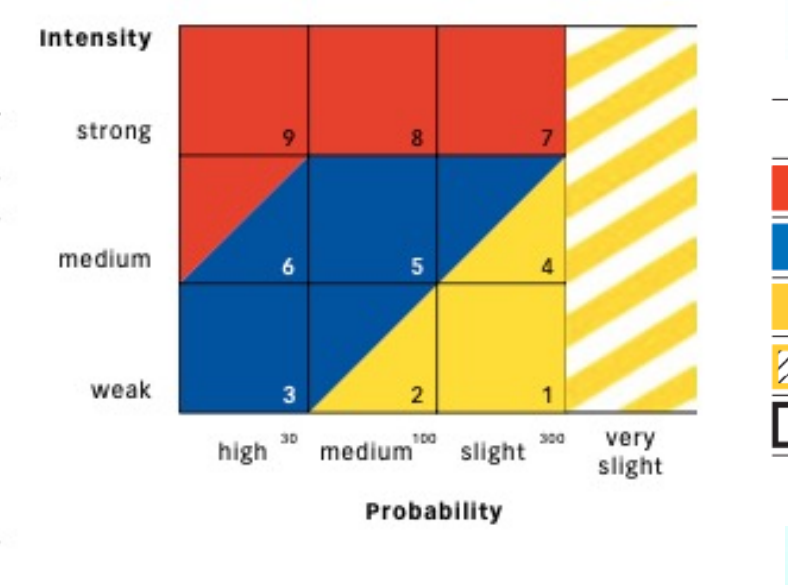
From intensity maps to hazard maps



Source: BWG (2001)

Flood Hazard Mapping

Hazard maps – Hazard level – land-use planning



	Hazard level	Material importance	Importance for land-use planning
	Red	Substantial danger	Prohibition area
	Blue	Medium danger	Conditional-use area
	Yellow	Low danger	Index zone
	Yellow-white	Remaining danger	Index zone
	White	No danger*	No restrictions*

*According to current knowledge

- Hazard maps form the technical basis for considering the natural hazards when developing municipality zoning plans

Source: *pictures and text BWG (2001)*

Flood Hazard Mapping

Hazard maps – hazard level – land-use planning

Red Areas: Substantial hazard

In red areas, **no buildings or installations** intended for occupation by persons or animals may normally be erected or extended. In existing residential areas, where there is a serious protection deficit, hydraulic-engineering measures should, if possible, be taken.

Blue Areas: average hazard

In blue areas , building is permitted but subject to **restrictions.** No highly sensitive objects should be erected, and no new building zones should, if possible, be designated.

Yellow Areas: slight hazard

Landowners must be advised of the **existing hazard,** and be made aware of possible measures to avoid damage. Special (i.e. individual) planning is necessary for measures for sensitive objects.

Residual risk

Emergency planning and special (i.e. individual) measures for **sensitive objects** are required. Installations with particularly high loss potential must be avoided.

Source of the text: BWW, BRP, BUWAL., (1997) – translated in 2008

Flood Hazard Mapping

Surface runoff map

- published in 2018
- 1:12’500
- countrywide
- based on **2D modelling**, not validated on site
- based on a **100 year / 1h rain scenario**

(NB: time of concentration for small catchments may be shorter and the corresponding rainfall intensity higher)

Flow depth (m)

0 < h ≤ 0.1	
0.1 < h ≤ 0.25	
0.25 < h	

Not yet legally binding (federal law), BUT

- cantons / provinces can make them legally binding (cantonal law), issue corresponding guidelines;
- municipalities can consider them in their regulations
- must be considered in all building permits
- The federal law is under revision

Source: pictures: Geo7 (2018)

Protection Goals

Federal recommendation for protection goals

Key

= complete protection	= no intensity permitted	= 0
= protection from medium and strong intensities	= weak intensity permitted	= 1
= protection from strong intensities	= medium intensity permitted	= 2
= lack of protection	= strong intensity permitted	= 3

Object category				Protection goals			
				Return period [years]			
				1–30 often	30–100 rare	100–300 very rare	>300 extreme-ly rare
No	Property value	Infrastructure facility	Nature value				
1		Mountain and ski tour routes (according to SAC map)	Natural landscape	3	3	3	3
2.1		Commercial hiking paths and skiing trails, corridors, conduits of local importance		2	3	3	3
2.2	Unoccupied buildings (sheds, pasture stables, etc.)	Transport routes of local importance, conduits of cantonal importance	Forest with protective function, land useful for farming	2	2	3	3
2.3	Parttime or permanent-ly occupied individual buildings and hamlets, stalls	Transport routes of cantonal or major community importance, conduits of national importance, mountain railways, zones for downhill skiing, and training grounds	Forest with protective function if it protects dense settlements	1	1	2	3
3.1		Transport routes of na-tional or major cantonal importance, skilifts, cablecars		0	1	2	3
3.2	Dense settlements, commerce and industry, building zones, camping sites, leisure and sport facilities	Stations for various transport uses		0	0	1	2
3.3	Special risks or special vulnerability or second-ary damage	Special risks or special vulnerability or second-ary damage		Determination case by case			

Death risk for persons: lower than 10^{-5}

source: PLANAT (2015)

source: BWW,BRP,BUWAL (2007)

(Flood) Hazard Mapping

Cantons – general information

- Between 2000 and 2020 all cantons have drawn natural hazard maps
- By mid of 2021
  - 98 % of all areas exposed to avalanches
  - 97% of all areas exposed to floods
  - 92% of all areas exposed to landslides and rock falls

  were mapped
- Hazard maps are revised at least once every 10-15 years.

Areas: building zones and vulnerable infrastructure

Source of information:
https://www.bafu.admin.ch/bafu/de/home/themen/naturgefahren/fachinformationen/naturgefahrensituation-und-raumnutzung/gefahrengrundlagen/gefahrenkarten--intensitaetskarten-und-gefahrenhinweiskarten.html

Flood Hazard Mapping

Cantons - general Information

Tasks of Cantons

- Create the necessary legal framework
- Prepare a cantonal strategy to deal with natural hazards
- Delineate hazard index maps
- Define protection goals
- Approve the communal hazard maps and zoning plans

Tasks of Municipalities (supported / supervised by cantonal authorities)

- Delineate hazard maps (in certain cantons this is done by the cantonal authorities)
- Transcribe the hazard maps (hazardous areas) into municipal zoning plans (hazard zones)
- Define the building permit procedure in hazard zones

Hazard maps are legally binding for the authorities, hazard zones in zoning plans are legally binding for land owners.

Source of information : BWW,BRP,BUWAL (2007)

Flood Hazard Mapping

Cantons – hazard mapping procedures

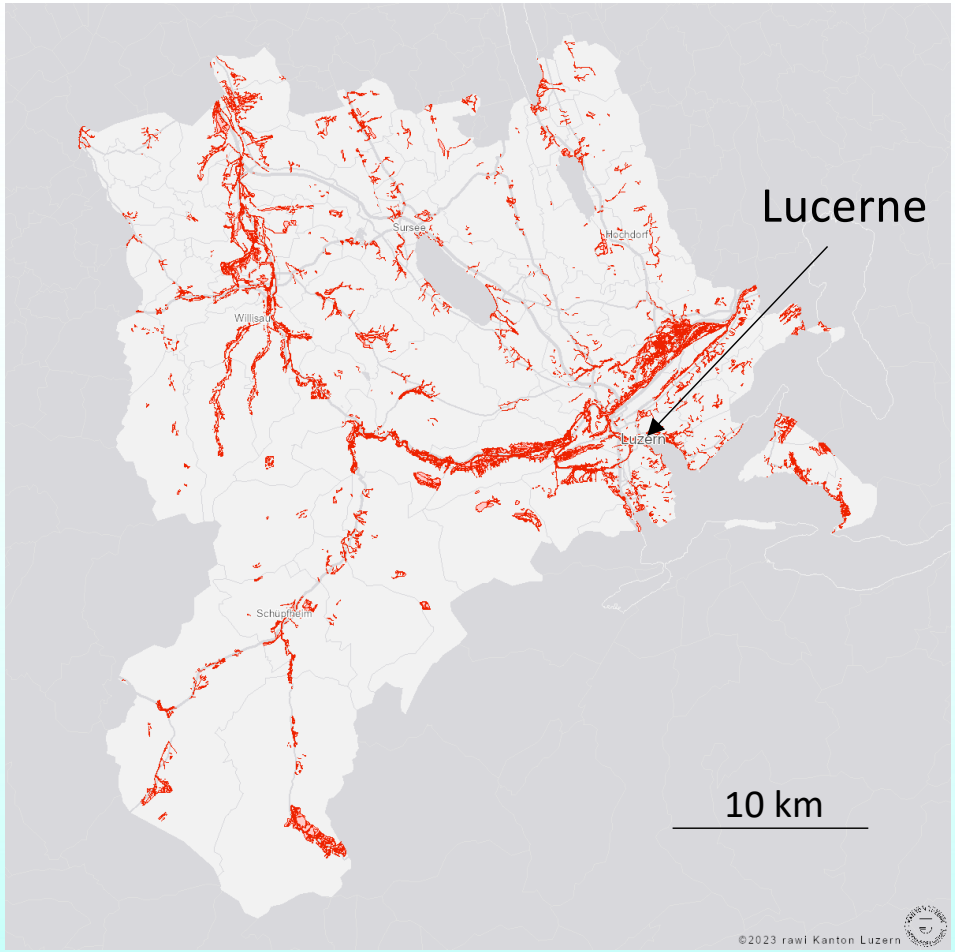
- Switzerland is a federalist country and therefore **each canton** has a slightly **different procedure** to draw hazard maps; the hazard processes to be taken into consideration depend on the topography of the canton (alpine vs. plateau)

- In addition to the maps / inventories discussed earlier and recommended by the federal guidelines some cantons also draw **maps of protection deficits**, flow depth and **risk ma**ps

- In many cantons the hazard mapping process often includes the elaboration of first concepts of **protection measures** (order of priority:
  - land use planning (adaptation of building zones, reduction of building zones, delineation of flood retention zones,…)
  - structural measures (at municipal level e.g. dams)
  - flood proofing measures (at property level))

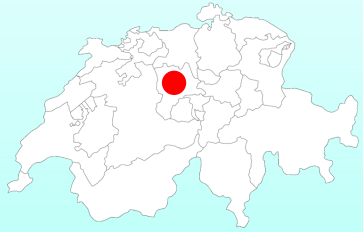
Flood Hazard Mapping

Map of protection deficits (canton of Lucerne)



source: https://daten.geo.lu.ch/produkt/sdefkart_ds_v1

(overlay of land-use maps
with hazard maps)



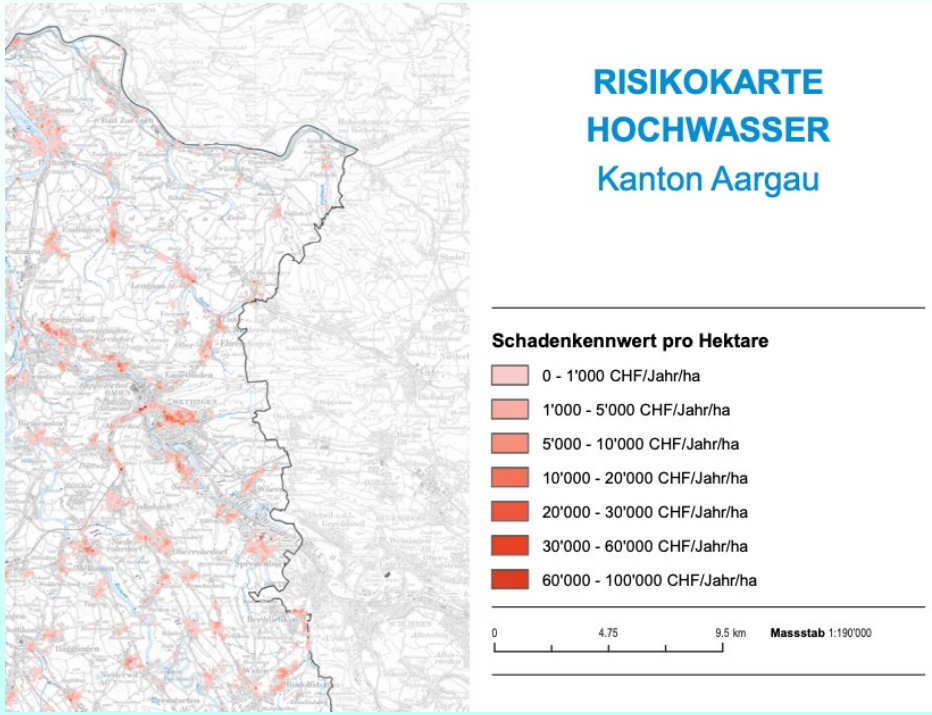
source: https://muster-vorlage.ch

Flood Hazard Mapping

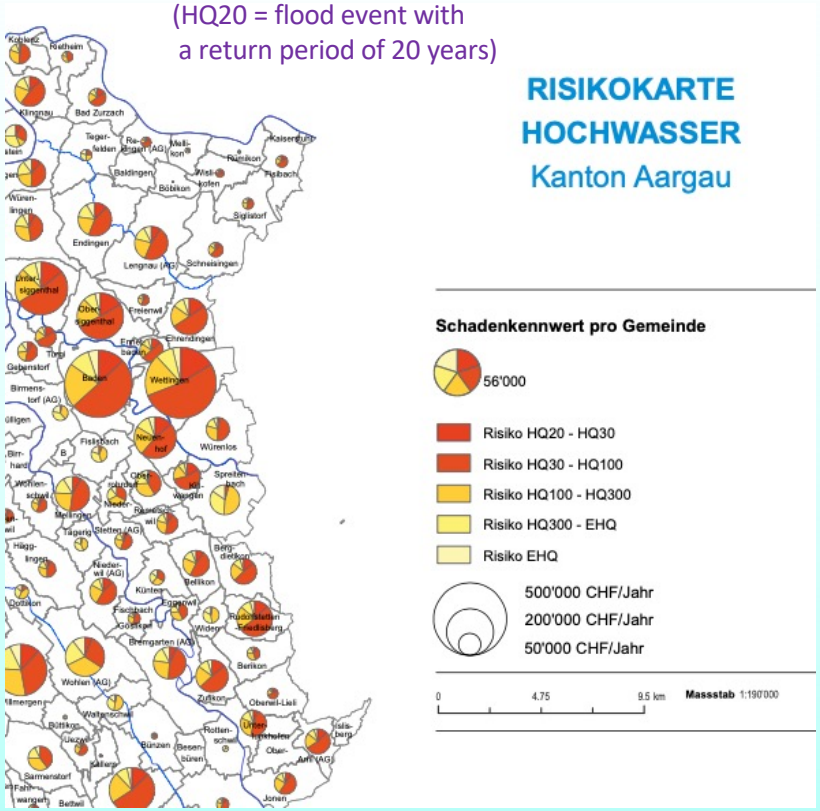
Risk map – canton Aargau

Source: https:// muster-vorlage.ch

potential damage
in CHF / year / hectare



potential damage / year / municipalities for flood events of different return periods
(HQ20 = flood event with a return period of 20 years)



Source: Kanton Aargau, Aargauische Gebäudeversicherung., (2018)

Flood Hazard Mapping

Risk overview, federal guidelines

- **Federal guidelines** for minimal standards for the overview of risks related to gravitational natural hazards (hydrologic-, avalanche-, fall- and slide-processes) at cantonal level have been defined (BAFU 2022a)
- The guidelines aim at ensuring that the data from the different cantons can be compared and aggregated at national level
- The preparation and constant up-dating of an overview of risks related to gravitational natural hazards at cantonal level will be anchored in the corresponding legal base (currently under revision)

Flood Hazard Mapping

Risk overview minimal standards

Minimal dataset on risks for each main hazard process and each municipality

protected property		affected parties		risk		
		in hazardous areas	per scenario	individual	collective, monetarized	
					extent of damage	risk (CHF /year)
persons	residents					
	employees					
considerable material assets	buildings					

Return period (years)

Intensity	*30*	*100*	*300*	*Ext.*
weak	**8**	**16**	**34**	**81**
medium	4	9	24	42
strong	1	3	8	27

# of persons/ buildings

Death risk
(number of persons with risk > 10^{-5})

Extent of damage
(for events with a return period of 30, 100 and 300 years and the extreme event)

Source: BAFU., (2022a)

Flood Hazard Mapping

Cantons – transcription / implementation of hazard maps

There are two basic models

- *Hazard zone model*: the hazardous areas of the hazard maps are transcribed into hazard zones in the zoning plans. Specific regulations are defined for each zone. It's up to the municipality to define these regulations and the degree of detail (supervised by the cantons)

- *Hazard index model*: the hazardous areas of the hazard maps are shown as one layer in the zoning plan. There are general regulations which refer to the hazard map. Specific conditions are only set in the case of building applications

Source of parts of the text: BWW,BRP,BUWAL (2007)

Flood Hazard Mapping

Cantons – transcription / implementation of hazard maps

- The **rules for transcription** / implementation are defined by the cantons based on federal recommendations

- The transcription / implementation basically includes the following **elements**:

    - Adaptation of existing /planned building zones in hazardous areas
    - Regulations in hazard zones in remaining / new building zones

Flood Hazard Mapping

Cantons – transcription / implementation of hazard maps

Opportunities for objection

- All modifications of **zoning plans** are subject to **public disclosure**. Opponents can take appeal-decisions to the cantonal and in the end the Supreme Federal Court.

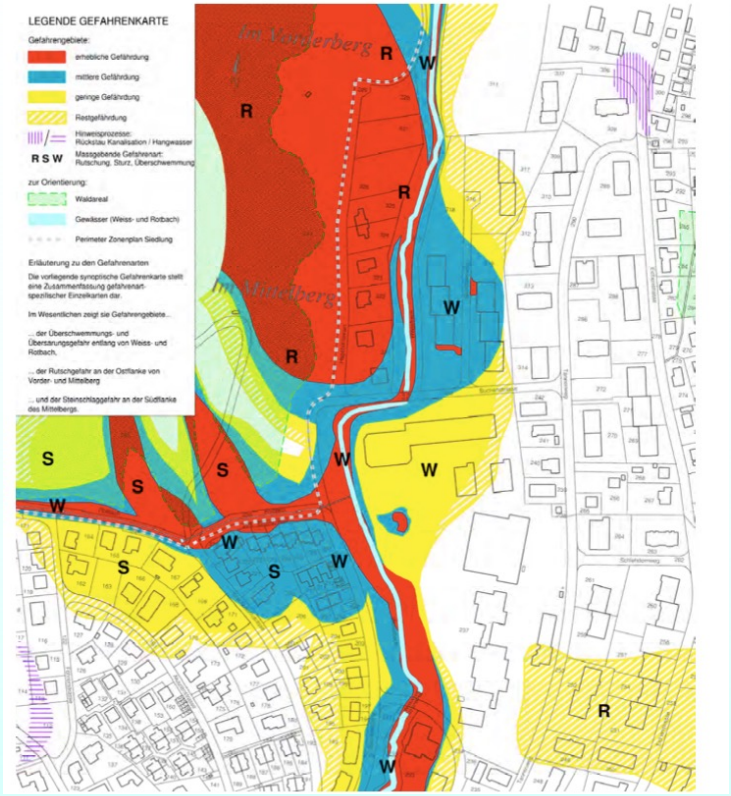
- In one canton (**Schwyz**) the **natural hazard map** (synoptic map) is subject to public disclosure (**opportunity for comments** but no legal action – the comments will be reviewed and if they are justified the map may be adjusted accordingly). Legal action is only possible in respect to zoning plans.

- In one canton (**Wallis**) hazard maps are first transcribed into **hazard zones** (not yet implemented in zoning plans). The hazard zones for each type of hazard are subject to public disclosure. **Legal action** (up to the Supreme Federal Court) is possible.

Source of information:
Kanton Wallis., (2010) and Kanton Schwyz., (2012)

Flood Hazard Mapping

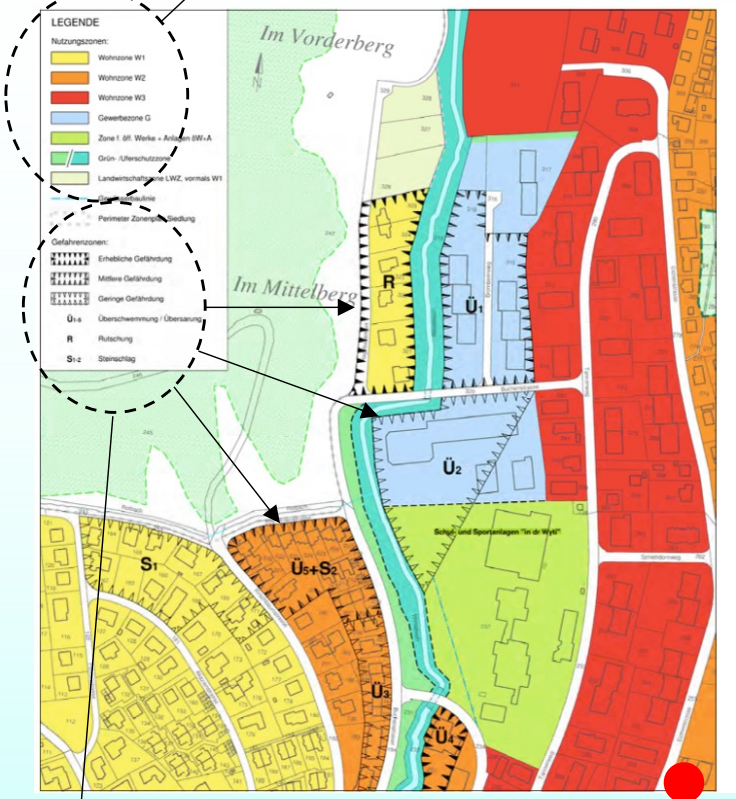
Cantons – transcription / example canton Baselland



Synoptic hazard map

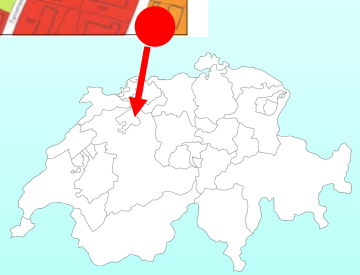
(R: slide S: rock fall W: inundation)

Land use categories



Zoning map

substantial danger
medium danger
low danger



*source of maps: Amt für Raumplanung **Kt. BL.**, (2011)*

Source: https://muster-vorlage.ch

Flood Hazard Mapping

Cantons – transcription / example canton Graubünden

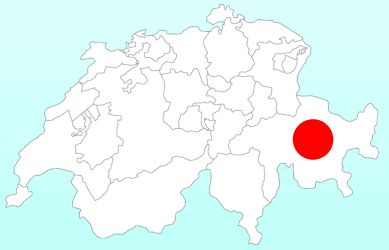
- Graubünden is the largest canton (7105 km^2) and its topography is mountainous. It is exposed to all types of gravitational hazards

- Hazard maps for all types of hazards are elaborated by private companies (supervised by the cantonal authorities)

- A cantonal committee does the overlay of all hazard maps and delineates two hazard zones
    - substantial danger
    - medium danger

  These zones are then copied into the zoning plans.

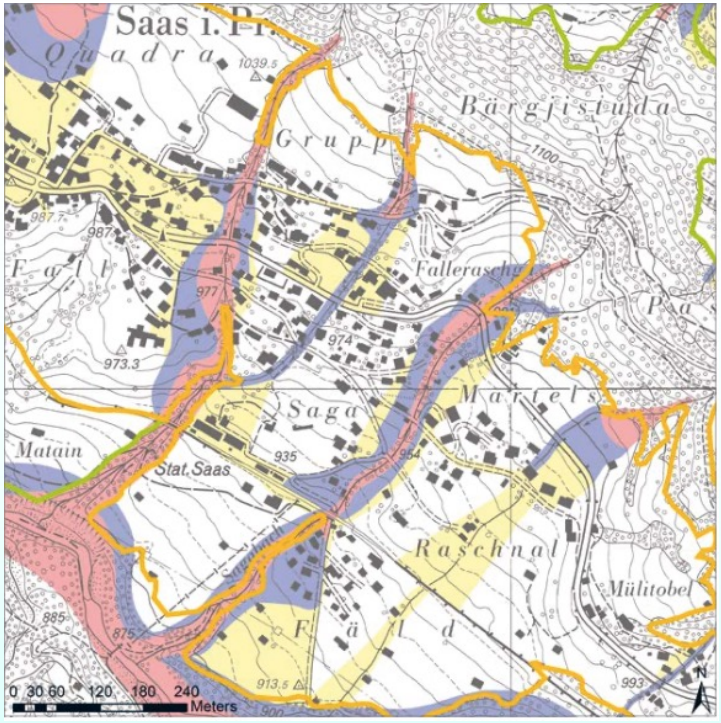
*source of information: Amt für Wald und Naturgefahren, Amt für Raumplanung **Graubünden**, Gebäudeversicherung Graubünden., (2021),*

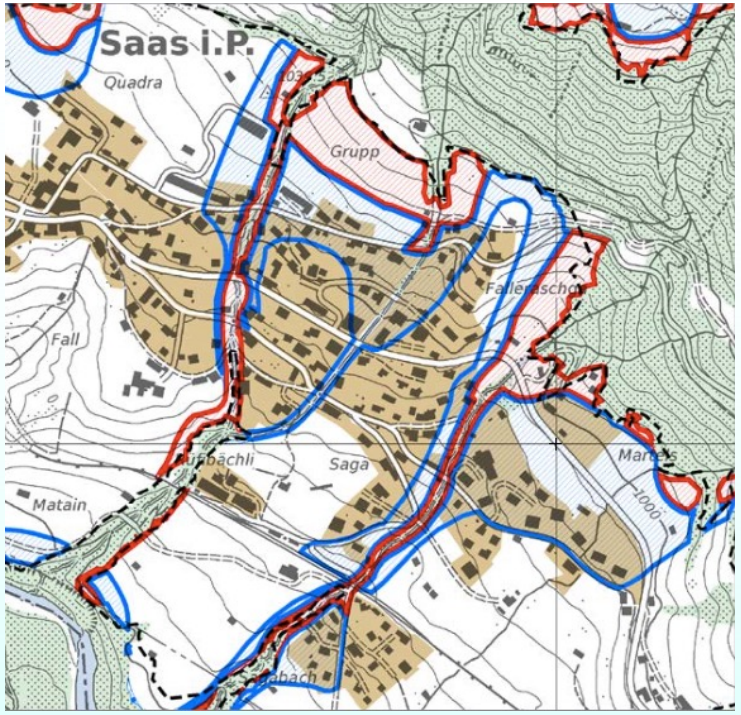


Source: https://muster-vorlage.ch

Flood Hazard Mapping

Cantons – transcription / example canton Graubünden





Gefahrenzonen

- Gefahrenzone 1 (rote Zone)
- Gefahrenzone 2 (blaue Zone)
- Erfassungsbereich

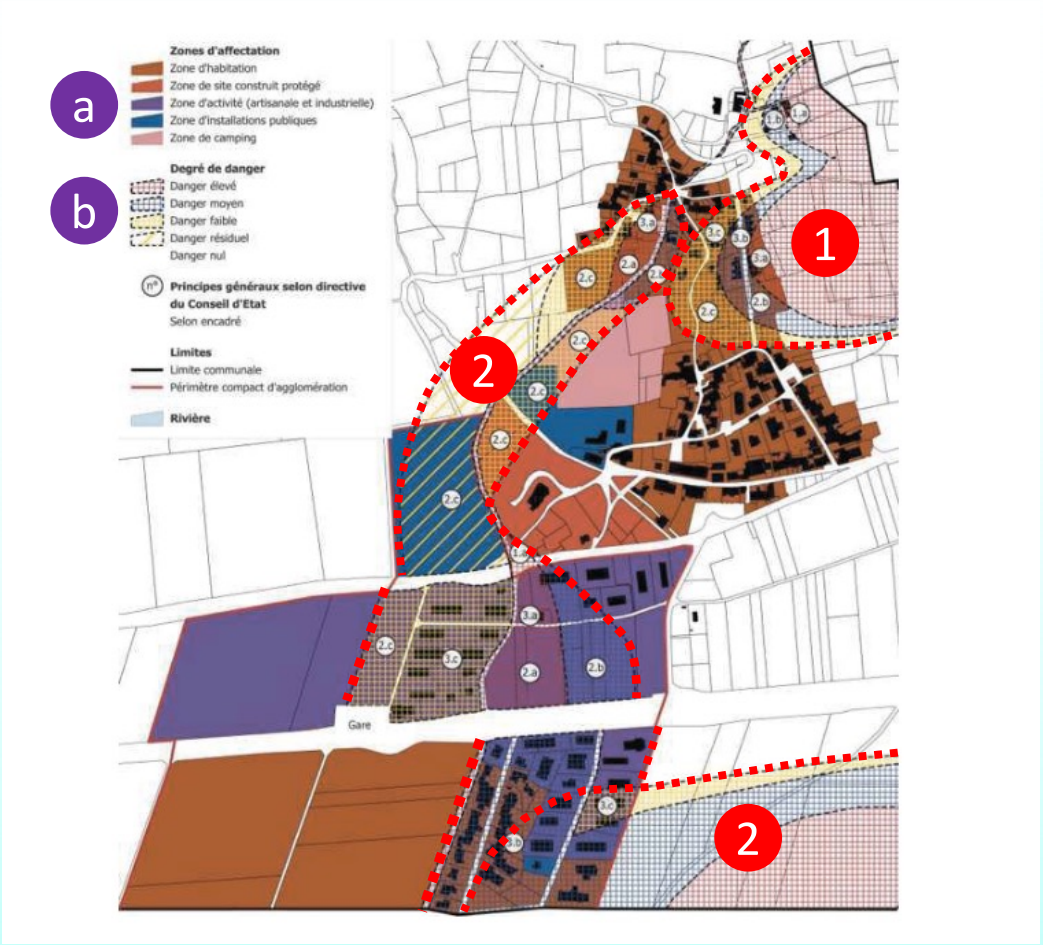
Hinweise

- Baugebiet
- Wald
- Gewässer

*source: Amt für Wald und Naturgefahren, Amt für Raumplanung **Graubünden**, Gebäudeversicherung Graubünden., (2021),*

Flood Hazard Mapping

Cantons – transcription / example canton Vaud



*source: canton de **Vaud**., (2017),*

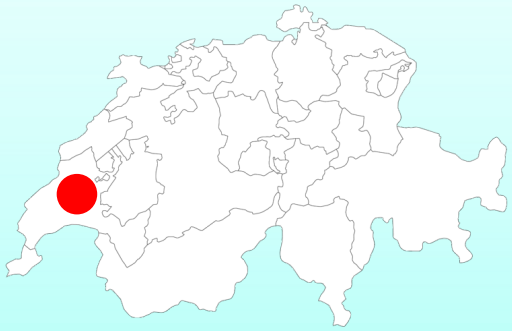
existing zoning plan with hazardous areas

1 Type of natural hazard

Hazardous areas

a Land use categories

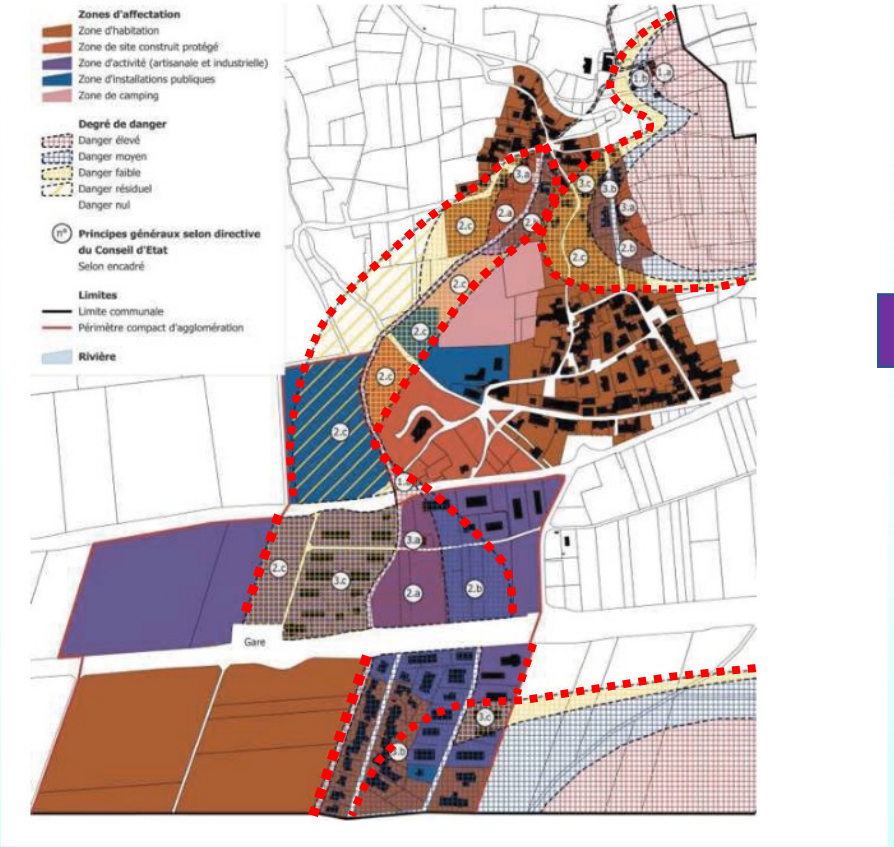
b Type of hazardous areas



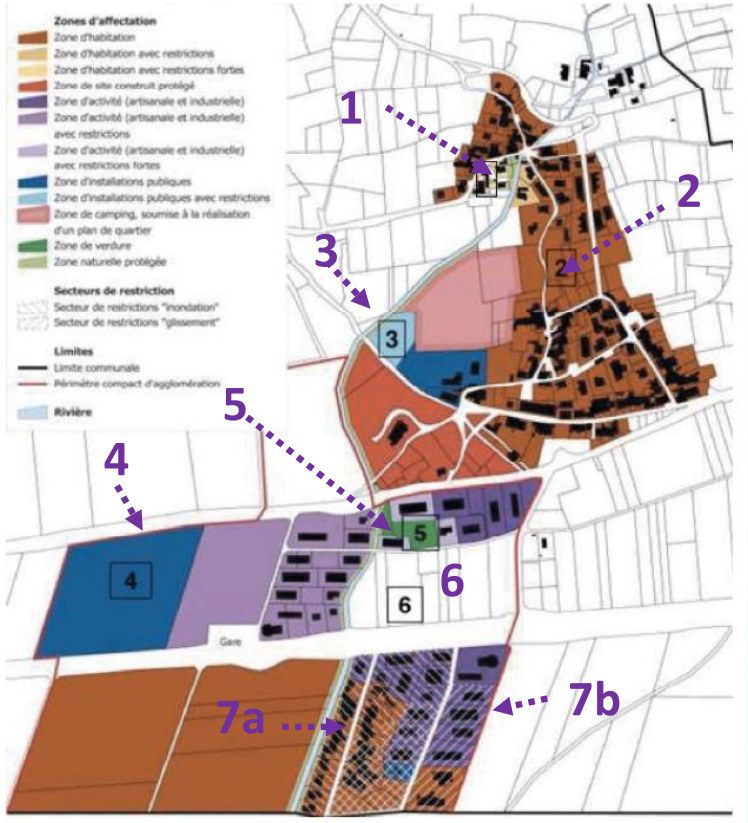
Source: https://muster-vorlage.ch

Flood Hazard Mapping

Cantons – transcription / example canton Vaud



New zoning plan



1: regulations / strong restrictions (village center)
2: area protected by structural measures
3: regulations / restrictions (public land)
4: relocation of a planned hospital
5: built environment: park
6: reduction of building zone
7: restrictions – 7a inundation
7b landslide

*source: canton de **Vaud**., (2017),*

Flood Hazard Mapping

Cantons – building permits

areas with substantial / medium danger

- **Building permits** for the erection of new buildings or substantial modifications of existing buildings located **in hazardous areas** (substantial / medium danger) are only issued if **protection measures** / corresponding **modifications of the architecture** are included in the project

- A **standard form or expert's report** is a mandatory **element of the building application**. (content of the form / report: local hazard situation, protection deficit, protection measures)

- The forms / reports are **reviewed by a cantonal authority** / the cantonal insurance companies for real estate

  The **cantonal insurance companies for real estate** play a key role in the building permit process

- Building permits are issued by the municipalities. They review the implementation of protection measures

- In certain cantons building owners are required to sign a confirmation of compliance (confirms that the protection measures have been implemented) which is also sent to the cantonal authorities / cantonal insurance companies for real estate

Flood Hazard Mapping

Cantons – building permits –

areas with low danger

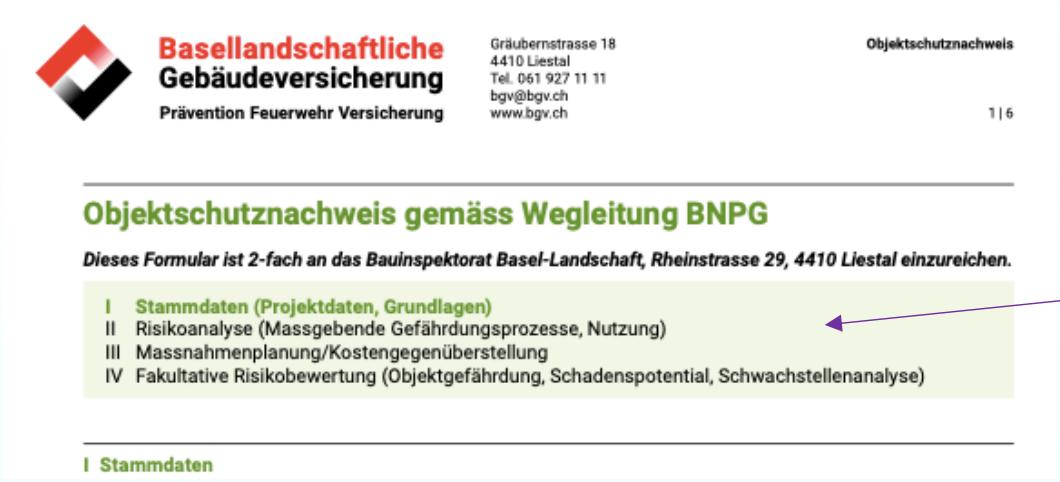
- Some cantons require building owner to sign a declaration where they confirm that they are aware of the danger
- In some cantons the public insurance companies for real estate recommend protection measures and can limit the payout (in case of a damage) if building owner don't comply.

Low danger does not equal low risk (e.g. hospital in a low danger area)
(this fact is sometimes not taken into consideration)

Flood Hazard Mapping

Cantons – building permits – example canton Baselland (flood)

Form of the cantonal insurance company for real estate



Basellandschaftliche Gebäudeversicherung
Prävention Feuerwehr Versicherung

Gräubernstrasse 18
4410 Liestal
Tel. 061 927 11 11
bgv@bgv.ch
www.bgv.ch

Objektschutznachweis

1 | 6

Objektschutznachweis gemäss Wegleitung BNPG

Dieses Formular ist 2-fach an das Bauinspektorat Basel-Landschaft, Rheinstrasse 29, 4410 Liestal einzureichen.

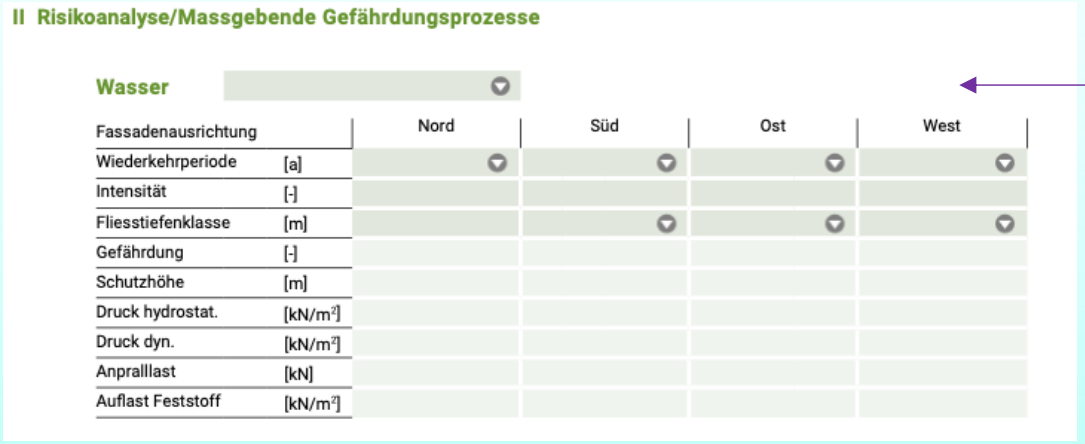
I Stammdaten (Projektdaten, Grundlagen)
II Risikoanalyse (Massgebende Gefährdungsprozesse, Nutzung)
III Massnahmenplanung/Kostengegenüberstellung
IV Fakultative Risikobewertung (Objektgefährdung, Schadenspotential, Schwachstellenanalyse)

I Stammdaten

I Basic data
II Risk analysis
III Protection measures
IV Risk assessment (optional)

I Basic data

- project description, plan



II Risikoanalyse/Massgebende Gefährdungsprozesse

Wasser

Fassadenausrichtung		Nord	Süd	Ost	West
Wiederkehrperiode	[a]				
Intensität	[-]				
Fliesstiefenklasse	[m]				
Gefährdung	[-]				
Schutzhöhe	[m]				
Druck hydrostat.	[kN/m²]				
Druck dyn.	[kN/m²]				
Anpralllast	[kN]				
Auflast Feststoff	[kN/m²]				

II Risk analysis

for each facade:

- flow depth
- pressure (static, hydrodynamic)
- force of impact
- sediment load
- flood protection height

***source: Basellände**ische Gebäudeversicherung., (?),*

Flood Hazard Mapping

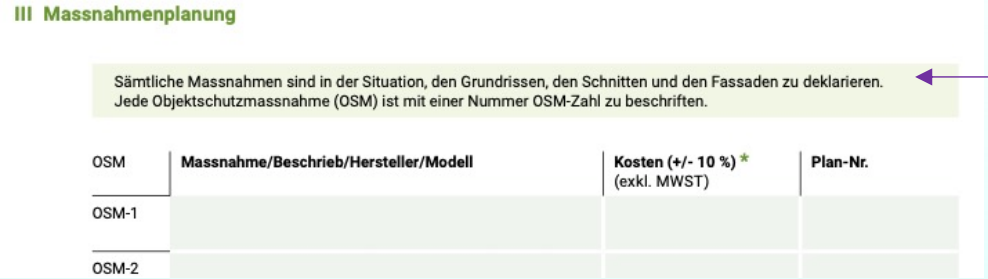
Cantons – building permits – example canton Baselland (flood)

II Risikoanalyse/Nutzung

	Kurzbeschrieb/Aufzählung
Art der Nutzung	
Personenbelegung (Anzahl, Dauer)	

II Risk analysis (continued)

- utilization of the building
- occupancy rate (number, duration)
- hazardous substances



III Massnahmenplanung

Sämtliche Massnahmen sind in der Situation, den Grundrissen, den Schnitten und den Fassaden zu deklarieren.
Jede Objektschutzmassnahme (OSM) ist mit einer Nummer OSM-Zahl zu beschriften.

OSM	Massnahme/Beschrieb/Hersteller/Modell	Kosten (+/- 10 %) * (exkl. MWST)	Plan-Nr.
OSM-1			
OSM-2			

III Measures

- description (type, producer)
- costs
- plan

IV Fakultative Risikobewertung/Objektgefährdung

Prozess	Gefährdungsbilder gem. Wegleitung VKF *Quelle: Wegleitung Objektschutz gegen gravitative Naturgefahren, Vereinigung Kantonaler Feuerversicherungen (Hrsg.), Bern, 2005*

IV Risk assessment (voluntary)

- hazard situation (inundation static / dynamic; scour; bank erosion; ...)

***source: Basellän**dische Gebäudeversicherung., (?),*

Flood Hazard Mapping

Cantons – building permits – example canton Graubünden

hazard zone – substantial danger ( ):

- abridged test-engineer procedure

hazard zone – medium danger ( ):

- **test-engineer procedure**:
  - Preliminary review: definition of local protection measures, the cantonal insurance company for real estate controls the preliminary review.
  - Main review: control during the construction phase
  - Building inspection after completion

hazard areas – low danger ( ):

- cantonal insurance company for real estate evaluates possible economic protection measures

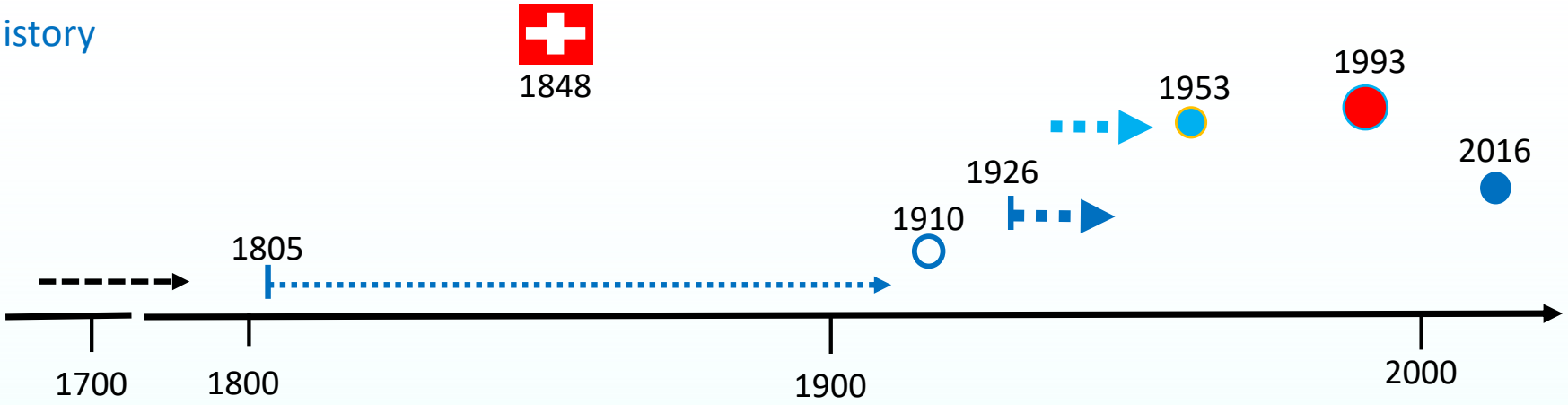
Test engineers are elected by the cantonal insurance company for real estate

*source of Information : Amt für Wald und Naturgefahren, Amt für Raumplanung **Graubünden**, Gebäudeversicherung Graubünden., (2021),*

Flood Insurance

Flood Insurance

History



first fire insurance companies in the US, England and Germany

NB: at that time: loss of house = loss of livelihood

establishment of **public NOT FOR PROFIT** cantonal insurance companies for real estate **(PIRE)** – fire only

establishment of a reinsurance company exclusively for PIRE companies (**NOT FOR PROFIT**)

PIRE companies start to cover natural perils

Association of PIRE companies

private FOR PROFIT fire insurance companies start to cover natural perils

all private fire insurance companies form an Insurance Pool and offer a natural perils insurance

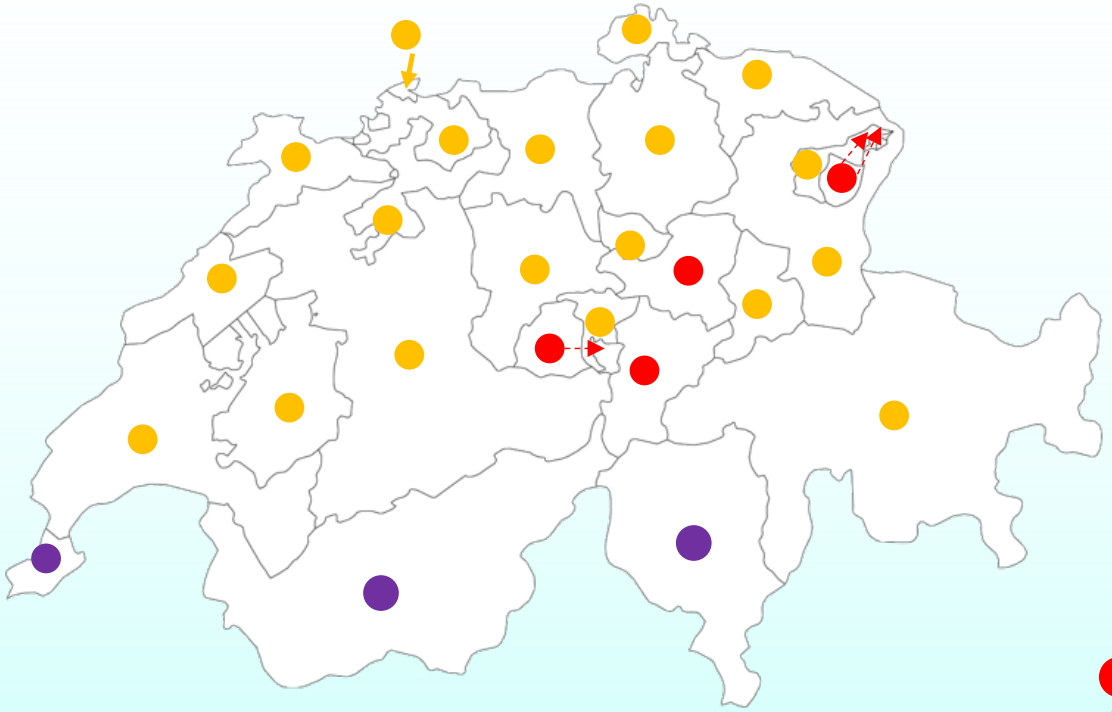
federal legal framework: mandatory coupling of fire insurance with natural perils insurance

Source: Gretener, M., (2010)

Flood Insurance

Peculiarities of the system

DUAL SYSTEM
public / private



Real estate insurance is mandatory
Public Insurance Companies for
Real Estate (PIRE) - Monopoly

Real estate insurance is mandatory
NO PIRE

Real estate insurance is
NOT mandatory
NO PIRE

G - Geneva
U – Uri
S – Schwyz
T – Ticino
A – Appenzell Ausserrhoden
V – Valais
O - Obwalden

Source (basic map):
https://muster-vorlage.ch

Flood Insurance

Peculiarities of the system

Double solidarity

- **Solidarity amongst the policyholder** as the policy is independent from the hazard level (compliance with building codes and regulations in hazard zones is however a prerequisite for any insurance payout)

- **Solidarity amongst the insurance companies** as they are pooling the risk.

Flood Insurance

Real estate insurance

1000 M CHF / event (real estate)
25 M CHF / event and policy holder
May be lowered in order for all payouts not to exceed 1 billion

Comparison – Public vs. Private Insurance

	Public Insurance Companies for Real Estate (PIRE)	Private Insurance Companies
System	Compulsory coverage with legal monopoly for fire and elemental perils; for real estates; no risk-selection (obligation to cover)	Open market competition for fire and elemental perils (not mandatory everywhere) Risk-selection possible (refusal to insure)
Legal Status	Public law entities; governed under cantonal law; non-profit oriented	Private stock entities or mutuals; profit-oriented
Mission	Provide insurance cover / fire protection / prevention for natural perils / supervision fire brigades	Provide insurance cover
Instruments to execute mission	PIREs powered to enact; subsidies for taking loss prevention measures ; cost-free consulting & services	Marketing
Hazard Coverage	Replacement value; no self-retention; unlimited cover	Mainly replacement value; with self-retention; limited coverage
Average Insurance Rate	Ø 36 cts./1'000 CHF insured value	Ø 110 cts./1'000 CHF insured value
Base for prime calculation	Given by cantonal law (risk-based and financially self-supporting); no public guarantee	Fire cover: free competition Elemental perils cover: single price set by the national regulator

2nd april 2020 Association of Public Insurance Companies for Real Estate APIRE 5

Source of slide: Brunner, J-M., (2020),

Flood insurance

Public insurance companies for real estate (PIRE)

- The 18 PIREs[1] provide insurance coverage for 1.9 millions buildings, against damages due to fire and natural perils
- The insured values represents approx. CHF 2'000 billions (70 % of the total real estate values)
- PIREs are public institutions, governed under cantonal public law
  - with mandates to enforce fire protection, natural perils loss prevention, fire brigades and insurance coverage,
  - which offers an compulsory insurance coverage, with legal monopoly and an comprehensive coverage ("Triple Protection"),
  - and financially self-supporting and non-profit oriented
- Investments in prevention (fire & natural perils) of approx. CHF 80 millions/year and investment in fire brigades of approx. CHF 240 millions/year, reduce the loss ratio, lead to an increased level of protection for human lives and properties. All this at most favourable premium terms compared to the private insurance market

2nd april 2020 Association of Public Insurance Companies for Real Estate APIRE 8

Source of slide: Brunner, J-M., (2020),

(1) 18 of the 19 PIRE are members of the Association of PIREs

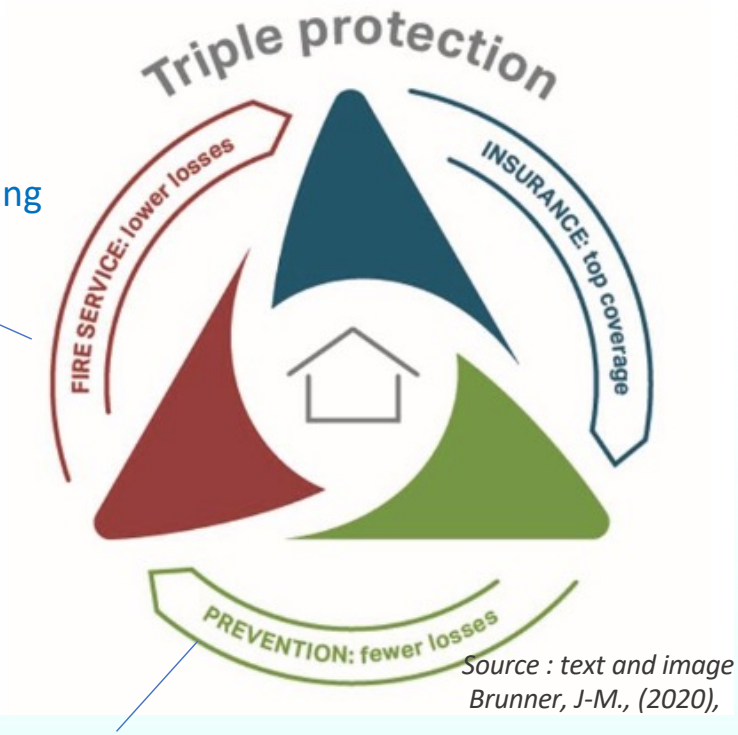
Flood insurance

Public insurance companies for real Estate (PIRE)

- **Managing the fire brigades**
- Extensive infrastructure financing
- Training of firefighters

Integrated risk management

Source : Federal Office for Civil Protection (2019)



Source : text and image Brunner, J-M., (2020),

- Fire protection (develop and enforce regulations, training,..)
- Nat Haz damage prevention (**standards for building protection**,..information material, internet platforms, weather alert,..
- Education and training of prevention experts

Triple protection system of the PIRE

Outlook

Outlook / Trends (Natural hazard mgmt.)

Challenges to be addressed:

- Protection of existing infrastructure (often only taken into consideration after a damage occurred)
- Hazard maps not yet fully transcribed into municipal land-use planning
- Surface runoff and rise of groundwater table not yet fully included in the hazard analyses. These processes still cause significant damage – **the corresponding legal bases and guidelines are currently under revision**
- Coordination flood protection – urban drainage (progresses have been made lately, with concepts like ”sponge city” – (BAFU, ARE 2022))
- Focus still mainly on hazards instead of risks (see next slide). There is no comprehensive countrywide information about risks.
- There is no supra-cantonal planning at catchment level which allows to efficiently secure retention zones
- There is no mandatory earthquake insurance and no organizational capacity to cope with large earthquakes
- Hazard / risk awareness among public institutions / private companies / the population is low / not sufficient
- There is a potential to further strengthen the role of **Nature based Solutions** in planning processes (subjective observation / opinion of the author)

Source of information: Bundesrat / BAFU 2016

Outlook / Trends

- Change of focus from hazard towards risk (the highest risks are often in the zones with little threat / residual threat) … **still a long way to go but the legal bases and the corresponding federal guidelines are currently under revision**

Threat level		Current focus of action
Substantial threat	red	>Planning measures (conditions, building ban) >Technical defence measures
Moderate threat	blue	
Little threat	yellow	>Advisory notices, no restrictions >Individuals encouraged to take indep. precautions
Residual threat	yellow/white	

Threat level		Future focus of action
Substantial threat	red	>Planning measures (conditions at all threat levels, relocation, building ban) >Explore technical defence measures >Encourage individuals to take indep. precautions
Moderate threat	blue	
Little threat	yellow	
Residual threat	yellow/white	

source of figures: Camenzind, Loat (2014)

References (not exhaustive)

National level

- BAFU., (2022a), Minimale Standards, Kantonale Risikoübersichten für gravitative Naturgefahren, Bern
- BAFU/ARE., (2022), Regenwasser im Siedlungsraum. Starkniederschlag und Regenwasserbewirtschaftung in der klima- angepassten Siedlungsentwicklung. Bundesamt für Umwelt (BAFU); Bundesamt für Raumentwicklung (ARE). Umwelt-Wissen Nr. 2201: 115 S.
- BAFU (Hrsg.)., (2017), Raumnutzung und Naturgefahren. Umsiedlung und Rückbau als Option. Bundesamt für Umwelt, Bern
- BAFU (Hrsg.)., (2016), Schutz vor Massenbewegungsgefahren. Vollzugshilfe für das Gefahrenmanagement von Rutschungen, Steinschlag und Hangmuren. Bundesamt für Umwelt, Bern. Umwelt-Vollzug Nr. 1608: 98 S.
- BAFU., (2011), Leben mit Naturgefahren, Ziele und Handlungsschwerpunkte des Bundesamtes für Umwelt (BAFU) im Umgang mit Naturgefahren, Bern
- Bründl Michael (Ed.)., (2009), Risikokonzept für Naturgefahren - Leitfaden. Nationale Plattform für Natur- gefahren PLANAT, Bern. 420 S.
- Brunner, J-M., (2020), Conference: Natural Catastrophes and Insurance, Prevention is the best insurance – the Swiss model, ppt-presentation, Association of Public Insurance Companies for Real Estate APIRE
- Bundesamt für Bevölkerungsschutz (BABS)., (2014), Integrales Risikomanagement. Bedeutung für den Schutz der Bevölkerung und Ihrer Lebensgrundlagen, Bern
- Bundesrat / BAFU., (2016), Umgang mit Naturgefahren in der Schweiz, Bericht des Bundesrates in Erfüllung des Postulats 12.4271 Darbelley vom 14.12.2012, Bern
- BWG., (2001), Flood Control at Rivers and Streams, Wegleitung des BWG, Bern
- BWW, BRP, BUWAL., (2007), Natural Hazards, Recommendation, Spatial Planning and Natural Hazards, Bern
- BWW, BRP, BUWAL., (1997), Natural Hazards, Recommendations, Consideration of Flood Hazards for Activities with Spatial Impact, Bern
- BWW, BRP, BUWAL (1997), Naturgefahren, Empfehlung 1997, Berücksichtigung der Massenbewegungsgefahren bei raumwirksamen Tätigkeiten, Bern
- Camenzind, Reto; Loat, Roberto., (2014), *Risk-based spatial planning: Synthesis report on two case studies at communal land use planning level*. National Platform for Natural Hazards / Federal Office for Spatial Development / Federal Office for the Environment, Bern. 21p
- Geo 7., (2018), Gefährdungskarte Oberflächenabfluss Schweiz, technischer Bericht, Bern
- Gretener, M., (2011), Die Versicherung von Elementarschäden durch die privaten Sachversicherer in der Schweiz, Schweizerischer Versicherungsverband, Bern
- https://www.planat.ch/de/wissen/chronik
- Kantonale Gebäudeversicherungen., (2006), Wegleitung, Objektschutz gegen meteorologische Naturgefahren, Bern
- Kantonale Gebäudeversicherungen., (2005), Wegleitung, Objektschutz gegen gravitative Naturgefahren, Bern
- PLANAT, National Platform for Natural Hazards., (2018), Management of Risks form Natural Hazards, Strategy 2018, Bern
- PLANAT., (2015), Sicherheitsniveau für Naturgefahren - Materialien. Nationale Plattform für Naturgefahren PLANAT, Bern. 68 S.
- PLANAT., (2013), Sicherheitsniveau für Naturgefahren. Nationale Plattform für Naturgefahren PLANAT, Bern. 15 S.
- PLANAT., (2007), Gefahrenkarten aus dem rechtlichen Blickwinkel, Merkblatt der Nationalen Plattform Naturgefahren PLANAT, Bern
- PLANAT., (2004), Sicherheit vor Naturgefahren, Vision und Strategie, Bern
- Schweizerische Eidgenossenschaft., (1991 / 2022), Bundesgesetz über den Wasserbau 721.1
- Schweizerische Eidgenossenschaft ., (1991 / 2022) Bundesgesetz über den Wald, 921.0
- Swiss Agency for Delopment and Cooperation., (2005), VADEMECUM, Hazard maps and related instruments, the Swiss system and its application abroad, capitalisation of Experience, Bern
- Swiss Financial Market Supervisory Authority., (2022), Elementarschadenversicherung in der Schweiz (ES-Versicherung) – Historie und Anwendung, Bern
- Eidgenössisches Departement für Umwelt, Verkehr, Energie und Kommunikation UVEK: Departementsstrategie **UVEK** 2012, Bern 2012
- Vischer, D, L., (2003), Die Geschichte des Hochwasserschutzes in der Schweiz, Von den Anfängen bis ins 19. Jhdt., Berichte des BWG, Serie Wasser, Nr. 5, Bern

References (not exhaustive)

Cantons

- Kanton Aargau, Aargauische Gebäudeversicherung., (2018), Umwelt, Risikokarte Hochwasser Aargau, Aarau
- Kanton **Aargau.,** (2018), Umsetzung der Gefahrenkarte in der Nutzungsplanung, Empfehlung für die Nutzungsplanung, Aarau
- Kanton **Appenzell Ausserrhoden.,** (2022), Leitfaden Objektschutznachweis gravitative Naturgefahren, Version 2.3, Herisau
- Arbeitsgruppe Naturgefahren des Kantons **Bern.,** (2011), Achtung Naturgefahr, Verantwortung des Kantons und der Gemeinden im Umgang mit Naturgefahren, Bern
- **Baselländ**ische Gebäudeversicherung., (?), Objektschutznachweis gemäss Wegleitung BNPG, Liestal
- **Baselländ**ische Gebäudeversicherung., (2017), Wegleitung Schutzmassnahmen gegen Schäden durch gravitative Naturgefahren, Liestal
- Amt für Raumplanung **Kt. BL.,** (2011), Umsetzung der Naturgefahrenkarte in die kommunale Nutzungsplanung, Kommunale Nutzungsplanung, Grundladgen, Liestal
- République et Canton de **Genève.,** (2011), Gestion des dangers naturels, risques liés aux crues, Genève
- Gebäudeversicherung **Graubünden.,** (2022), Richtlinien für baulichen Schutzmassnahmen und für den angemessenen Objektschutz bei Bauvorhaben in Gefahrenzonen, Chur
- Amt für Wald und Naturgefahren, Amt für Raumplanung **Graubünden**, Gebäudeversicherung Graubünden., (2021), Leitfaden Gefahrenzonen in Graubünden, Chur
- Office de l'environnement. (**JU**), Etablissement Cantonal d'assurance immobilière et de prévention., (2016), Notice d'information, Dangers Naturels, Mesures de protection, des bâtiments Delemont
- Kanton **Luzern.,** (2012), Richtlinie Gefahrenkarten im Kanton Luzern, Teil A Gefahrenbeurteilungen, Luzern
- Kanton **Luzern.,** (2009), Wegleitung, Naturgefahren im Kanton Luzern, Umsetzung der Gefahrenkarten in die Nutzungsplanung
- Canton de **Neuchâtel.,** (2010), Note explicative de la cartographie des dangers naturels, Neuchâtel
- Kanton **Schaffhausen.,** (2018), Richtlinien 2018, Information und Empfehlungen zur Gefährdungskarte Oberflächenabfluss an kommunale Baubehörden, Schaffhausen
- Kanton **Schaffhausen.,** (2017), Leitfaden, Umsetzung der Gefahrenkarte "Hochwasser und Massenbewegungen" Im Kanton Schaffhausen, Schaffhausen
- Kanton **Schaffhausen.,** (2017), Leitfaden Objektschutznachweis gravitative Naturgefahren Hochwasser Rutschung Steinschlag, Schaffhausen
- Kanton **Schwyz.,** (2012), Naturgefahren im Kanton Schwyz, Integrale Naturgefahrenkarten im Kanton Schwyz, Schwyz
- Kanton **St. Gallen** Naturgefahrenkommission, Gebäudeversicherung St. Gallen., (2022), Gravitative Naturgefahren im Kanton St. Gallen, Leitfaden Objektschutznachweis, St. Gallen
- Naturgefahrenkommission des Kantons **St. Gallen.,** (2021), SIA 261.1 Einwirkungen auf Tragwerke – Ergänzende Festlegungen, Prozess Hochwasser, Extremereignis (EHQ) Kommentar und Empfehlung
- Kanton **St. Gallen.,** (2015), Wegleitung zur Naturgefahrenanalyse, St. Gallen
- Departement für Bau und Umwelt / Gebäudeversicherung **Thurgau.,** (2019), Leitfaden Objektschutznachweis gravitative Naturgefahren, Frauenfeld
- Departement für Bau und Umwelt / Gebäudeversicherung **Thurgau.,** (2015), Ausscheiden der Gefahrenzonen, Umsetzung Naturgefahren im Kanton Thurgau Präzisierung der Gemeindeaufgaben, Frauenfeld
- Departement für Bau und Umwelt / Gebäudeversicherung **Thurgau.,** (2013), Umsetzung Naturgefahren im Kanton Thurgau, Frauenfeld
- Kanton **Uri** .,(2001, 2020), Richtlinie zur Ausarbeitung und Umsetzung von Gefahrenkarten und Gefahrenzonenplänen, Altdorf
- Canton de **Vaud.,** (2021), Règles de base, Réalisation du rapport ERPP et transcription des dangers naturels dans les plans d'affectation, Lausanne
- Canton de **Vaud.,** (2020), Dangers naturels, Cartes indicatives des dangers naturels (CID), Memento, Lausanne
- Canton de **Vaud.,** (2019), Prévention des dangers naturels, Standards et objectifs cantonaux de protection, Directive cantonale du 30 octobre 2019, Lausanne
- Canton de **Vaud**., (2017), La transcription des dangers naturels dans les plans d'affectation, Actes du colloque du 1er décembre 2017 à Ollon, Ollon
- Canton de **Vaud.,** (2014), Cartographie des dangers naturels, Vade-mecum, Lausanne
- Canton de **Vaud.,** (2014), Prévention des dangers naturels, Transcription des données relatives aux dangers naturels (DDN) dans l'aménagement du territoire (en zone à bâtir)
- Canton de **Vaud.,** (2014), Prise en compte des dangers naturels dans l'aménagement du territoire et les permis de construire, Guide pratique, Lausanne
- Kanton **Wallis.,** (2010), Richtlinie zur Erarbeitung von Gefahrenzonen und zu den Baubewilligungen innerhalb dieser Zonen vom 7. Juni 2010, Sitten
- Amt für Abfall, Wasser, Energie und Luft (**ZH**)., (2021), Pflichtenheft Gefahrenkarten, Version 1.2, Zürich
- AWEL, Gebäudeversicherung Kt. **Zürich.,** (2003), Leitfaden zur Umsetzung der Gefahrenkarten Hochwasser, Zürich