Surface runoff risk map

Summary

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Umwelt BAFU
Office fédéral de l'environnement OFEV
Ufficio federale dell'ambiente UFAM
Uffizi federal d'ambient UFAM

ASA | SVV
Schweizerischer Versicherungsverband
Association Suisse d'Assurances
Associazione Svizzera d'Assicurazioni
Swiss Insurance Association

VKG Vereinigung Kantonaler Gebäudeversicherungen
AECA Association des établissements cantonaux d'assurance

153-00006/00001/00629/00003/R322-0149

28.06.2018

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Version 1.0

The document will be extended and revised as necessary

Referenz/Aktenzeichen: R322-0149

Contents

1 What is surface runoff?

Surface runoff is that part of the rainwater which runs over the ground into a water body or a low point and collects there, for example during very heavy precipitation. It is characterised by a generally short advance warning time, a water depth of a few centimetres and runoff which is often along roads.

Surface runoff is distinct from flooding caused by streams, rivers and lakes which burst their banks.

2 Problem

Between 30% and 50% of flood damage is caused not by watercourses and lakes overflowing but instead by surface runoff of rainwater. People are in little danger outside buildings, though there is a risk inside buildings, particularly in basements and underground car parks.

The surface runoff risk map shows that around two thirds of buildings in Switzerland are potentially affected by surface runoff. This does not mean that they will all necessarily experience damage.

The flow rate of surface runoff and the possible effects in underground areas are often underestimated. A water depth of a few centimetres at a critical point is enough to submerge low lying structure such as an underground car park or basement in a metre of water.

The ratio of the area affected by surface runoff to the total area of the canton varies from canton to canton between 12% and 24%. High percentages of hard surfacing and buildings or a low watercourse density tend to result in a higher proportion of potentially affected areas.

The phenomenon of surface runoff hardly appears in the flood risk databases (risk and hazard information maps).

3 Surface runoff risk map

The digital online map (see Section 7) with full nationwide Swiss coverage shows the regions potentially at risk from surface runoff and the expected classified flow depths on a scale of 1:12,500.

It represents an important addition to the existing hazard databases. Its main purpose is for awareness raising and preventive action against this natural hazard process, though it is purely informative in nature (see Section 3.3).

The map allows a rapid assessment of the risk due to the surface runoff process.

3.1 Delimitation

The flood areas and flow depths shown on the map were developed by a standardised method for the whole of Switzerland. They are derived from modelling, based on a 1 m grid, but without a plausibility check at the location.

The modelling is as accurate as a hazard information map. This gives an indication of a possible risk. Affected areas and flow depths cannot be used as planning and design parameters without checking at the location.

The map shows those areas which are potentially affected by surface runoff in rare to very rare precipitation events (return period > 100 years).

The modelling does not show the regions affected by flooding from watercourses or groundwater or the effects of urban drainage (see Section 6).

The possibility of surface runoff occurring in areas shown as unaffected on the map cannot be excluded.

In general, the main flow paths on the periphery of urban development, in agricultural areas and on open ground are reliably mapped. Reliability can be lower in urban areas as a result of the many small structures (kerbs, walls etc.) which can affect the flow paths.

3.2 Commissioning agency

The surface runoff risk map was produced on behalf of the Federal Office for the Environment FOEN, the Swiss Insurance Association SIA and the Cantonal Building Insurance Association VKG.

The work was supported by a group consisting of cantonal natural hazards departments, insurance industry representatives, the Federal Offices for Roads, Agriculture and Civil Protection, Swiss Railways, the Swiss Water Association and the Swiss Society of Engineers and Architects.

3.3 Legal status

The surface runoff risk map of Switzerland has no legal force. It is a technical database and is informative in nature.

The cantons can integrate the risk map in their geoportals and define its legal status themselves (e.g. as a hazard information map; binding on the authorities).

In the planning approval procedure, the municipalities are required to include all the information on known natural hazards in the assessment of an application and, if required, to demand additional clarification or proof.

4 Use of the risk map

The surface runoff map is informative in nature. Use of the surface runoff risk map is recommended for the following activities in particular:

1) Planning of new builds or conversions (building protection)
2) Land use planning (planning approval procedure)
3) Development of hydraulic engineering projects (flood protection)
4) Emergency planning
5) Updating of hazard maps, normally every 5-10 years (detailed evaluation of surface runoff)
6) Design of urban drainage

The new map enables architects, developers, planners, authorities and emergency response services to obtain a quick overview of possible hazards and risks and to take suitable prevention measures in good time. Since the map also covers unpopulated areas, it can be useful to famers for soil protection measures.

Because the risk map is purely a modelling product, correct interpretation, with a plausibility check on the local runoff paths, is critical: small structures such as kerbs and edgings, and also underpasses and culverts, are not covered by the model.

5 Responsibilities for surface runoff protection

Protection against natural hazards is a joint task between the private sector, the public sector and insurance companies.

Each canton defines the duties, competencies and responsibilities within it.

For surface runoff protection, building protection measures are at the forefront.

5.1 Private sector

The most important hazard scenarios for surface runoff (see figure 1, left to right are:

- Inflow onto the property from slopes higher up
- Inflow onto the property via a road
- Surface water accumulation at a low point

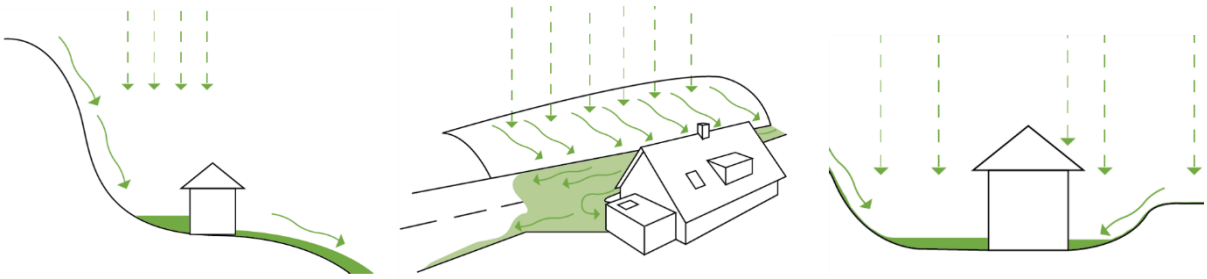

Figure 1: Typical risk scenarios for surface runoff (www.schutz-vor-naturgefahren.ch [Only available in German and French])

Water can infiltrate buildings via entrances and drives, windows and doors or light wells and air vents which are too low or unprotected. Damage to technical installations in basements and underground car parks and to external thermal insulation is very costly. If chemicals escape, the consequences can be serious.

New buildings can usually be effectively protected against surface runoff by simple design and construction measures, generally at low or no additional expense. This is often also possible on conversions. The possible design solutions should be examined as part of the preliminary project study. If conditions are only specified at the time of the planning application, these can result in complex and expensive changes of plan, which should be avoided.

The information platform www.schutz-vor-naturgefahren.ch/wasser [Only available in German and French] shows the range of possible protective measures for buildings and offers planning aids for their realisation. Consultation with an expert for detailed analysis of the risk and to plan protective measures is generally recommended.

If several buildings or a whole area are at risk, it is worth examining coordinated measures (area protection), e.g. by defending the whole area requiring protection and targeted diversion of the inflowing water.

5.2 Public sector

The surface runoff map provides a planning database for spatial planning and natural hazards departments and departments responsible for rapid intervention. They may consult the map for assessment of spatial planning activities and planning applications and to plan suitable temporary or permanent area protection measures.

Structural area protection measures are examined case by case. They are then used if larger numbers of buildings are affected.

The cantons define the principles, framework conditions and requirements for the projects and any subsidies.

In relation to emergency plans, operational concepts are developed which help to reduce the negative impact and therefore the damage caused by an event. Due to the generally short advance warning time, inaccurate localisation and potentially quite extensive geographical extent of a heavy precipitation event, prompt, incident-based intervention will often be difficult without an emergency plan.

5.3 Insurance companies

Insurance companies advise and insure their customers against natural hazards.

The surface runoff map assists awareness raising, assessing the risk situation and planning of further steps. This promotes a sustainable building fabric and therefore reduced damage due to natural forces.

If damage occurs, the insurance companies have means of damage limitation at their disposal.

6 Urban drainage

The effects of urban drainage are not included in the surface runoff modelling.

In Switzerland, urban drainage is normally designed for a 5 – 10 year event. However, the surface runoff risk map was produced for an event with a return period of more than 100 years. The sewers are usually overloaded in such events and are unable to cope with the surface runoff water, which is why urban drainage is not covered by the modelling.

7 Online map availability / technical report

The map is publicly accessible online and the data is free to download (except for the canton of Lucerne):
www.map.geo.admin.ch

The technical report can be downloaded via the following link:
www.bafu.admin.ch/oberflaechenabfluss [Only available in German, French and Italian]

8 Further information

Further information is available on the FOEN website:
www.bafu.admin.ch/oberflaechenabfluss [Only available in German, French and Italian]

An overview of specific measures to protect buildings can be found on the website:
www.schutz-vor-naturgefahren.ch/wasser [Only available in German and French]