Emmental, Switzerland floods of July 2014

On a hot, sunny day, a flood alert!

Flood Resilience Review 07.14

At a glance

- An intense local thunderstorm caused severe flooding in many villages in the Emmental valley in Switzerland on July 24, 2014. Bumbach, Schangnau and Kemmeriboden were the communities most affected.
- Public infrastructure, especially roads and bridges, was severely damaged.
- Thanks to a good alarm system and appropriate action by authorities along the Emme and Aare rivers, no lives were lost.
- Downstream losses could be reduced or avoided through effective communication among cantonal authorities and well-coordinated river flow regulation, which reduced the Aare's flow from approximately 1,000 cubic meters per second (m^3/s) to 755 m^3/s, below levels that could cause damage. New flood protection measures put in place since 2005 proved effective.
- The situation could again become dangerous; more rain is forecast for the region.



Damaged covered bridge and riverbank showing scouring on the Emme river in Emmental (Photo: Zurich)

The event unfolds

On July 24, 2014, an intense local thunderstorm in the Bernese Alps led the Emme river in its upper catchment region to burst its banks. Resulting floods caused devastation in the villages around Schangnau in the Emmental region. As this was happening, several dozen kilometers downriver where the Emme empties into the Aare, the weather was hot and sunny. Authorities received a flood alert and immediately began to issue public warnings. No one in the area was yet aware of the approaching danger. Many people were cooling off along the riverbanks. In just a few hours, however, the Emme would become a raging torrent transporting sediment, rocks and tree trunks with ferocious energy into the Aare. It would become a life-threatening situation for anyone in the path of the water's destructive force. But thanks to a good monitoring and warning system, and lessons learned from previous floods in 2005 and 2007, no lives were lost in what might otherwise have been a tragic event.

The thunderstorm was stationary and dumped intense rain for five hours. Some rain gauges registered a total of 100 mm of precipitation during the period.[1] In a matter of few hours, the gauge station at Eggiwil on the Emme river registered an increase in the water level of more than four meters. The discharge reached roughly 280 m^3/s, the highest ever recorded, breaking even the 1997 record of 245 m^3/s.[2] Based on records, such a flood has an occurrence probability of approximately 0.3 percent in any given year, equivalent to a return period of approximately 300 years.[3] The table shows how this extreme event grew increasingly less severe further downstream, and how measures taken along the Aare reduced the return period to approximately a three-year event at the next gauge station in Murgenthal (Aare).

[1] http://www.meteoschweiz.admin.ch/web/de/wetter/tagesaktualitaet/alle/2014/07/24_stationaere_gewitterzellen.html
[2] http://www.hydrodaten.admin.ch/lhg/sdi/hq_statistics/2409hq.pdf
[3] http://www.srf.ch/news/regional/bern-freiburg-wallis/millionenschaeden-im-emmental-nach-unwetter

Station (from upstream to downstream)	Eggiwil (Emme)	Emmenmatt (Emme)	Wyler (Emme)	Murgenthal (Aare)
Discharge July 24, 2014*	280 m^3/s	~425 m^3/s	455 m^3/s	755 m^3/s
Return period	~300 years	~30 years	~10-30 years	3 years
Previous record high	245 m^3/s (1997)**	n/a	n/a	1262 m^3/s (2007)

* Provisional values ** Some uncertainty due to river gauge failing above certain values

The raging water was capable of extreme destructive force, washing boulders the size of small trucks downstream. Roads, bridges and trees were swept away to be deposited in heaps of debris. In the popular tourist destination of Kemmeriboden, hotel guests and day visitors were cut off from the rest of the world, and forced to stay in the region for days before they could get out. The soil was completely saturated. Landslides blocked access, gouging huge scars in the surrounding countryside. After the devastation, the main priority is now to carry out a thorough, quick clean-up to restore the riverbed to its former capacity before the next thunderstorm. If blocked when another torrent comes, the river will burst its banks again, flooding the village once more. Rain and flood warnings remain in effect.



Driftwood and improved river banks at the Emme near Biberist (Photo: Zurich)

Insurers and authorities assess the damage

Losses will be in the millions of Swiss francs. In the canton of Berne, property owners are required to insure buildings through a cantonal insurance ('Gebäudeversicherung Bern,' or GVB). Its coverage includes natural perils. It provides insurance at a fixed-rate premium based on the total value of the insured property. There is no supplementary cost to cover greater hazards. The area affected in this part of the Emmental region has been hit by floods in the recent past, in 2008 and 2012. Even though this is the third time that large property losses have occurred in just a few years, insurance will cover the losses, and continue to provide such coverage in the future.[4] Insurers are working with authorities to review the risks. Only the authorities, not the insurers, are in position to order properties vacated if they are located in areas that face major hazards. One thing is clear: it will take years to complete repairs. In any case, the opportunity should be used to reduce the risks and lessen the dangers posed by the river.

Successful flood protection at Biberist

The Emme river is approximately 80 kilometers long from its source to its mouth in Biberist, where it empties into the Aare river. There are no lakes or retention basins along the river's course. It is a purely natural, wild river. In the upper catchment around Schangnau, it has the characteristics of a mountain torrent, rising quickly when it rains in the surrounding hills and mountains. It would be very hard to build any flood protection structures here, and such structures in these areas would offer little benefit.

But the situation is different downstream. In August 2005, the city of Biberist was badly affected by devastating floods. Since then, the water authorities of the canton of Solothurn finished a large river restoration and flood-protection project along a 1.5-kilometer stretch of the Emme, which gives it sufficient room to rise in high-water periods, reducing the water's velocity and peak flows. In this latest episode, flood levels could pass through its channel even though there was more water flowing through than in 2005.

[4] http://www.srf.ch/news/regional/bern-freiburg-wallis/erneute-unwetter-zahlt-die-versicherung-auch-in-zukunft

Coordination and communication reduced losses

The authorities in the canton of Solothurn, learning of the critical situation in the Emmental region, first doubted that a crisis was imminent. In Biberist, people were out enjoying the sun along the river. They assumed at first that it must be a false alarm. The Emme river empties into the Aare river and would carry the flood peak downstream to the densely populated areas along its banks towards Olten. The canton has its own share of flood history and authorities soon understood the urgency. They took immediate action to try to reduce the approaching flood peak. In the weirs of the Emme and Aare river, they ensured that all driftwood and debris – a significant cause of problems in the 2005 floods – was collected and removed to allow the water to flow freely. Since 2005, major improvements have been made in managing driftwood in many Swiss rivers. The authorities also notified police and firefighters to issue warnings to people in the area and told those along the river to evacuate to safe ground.

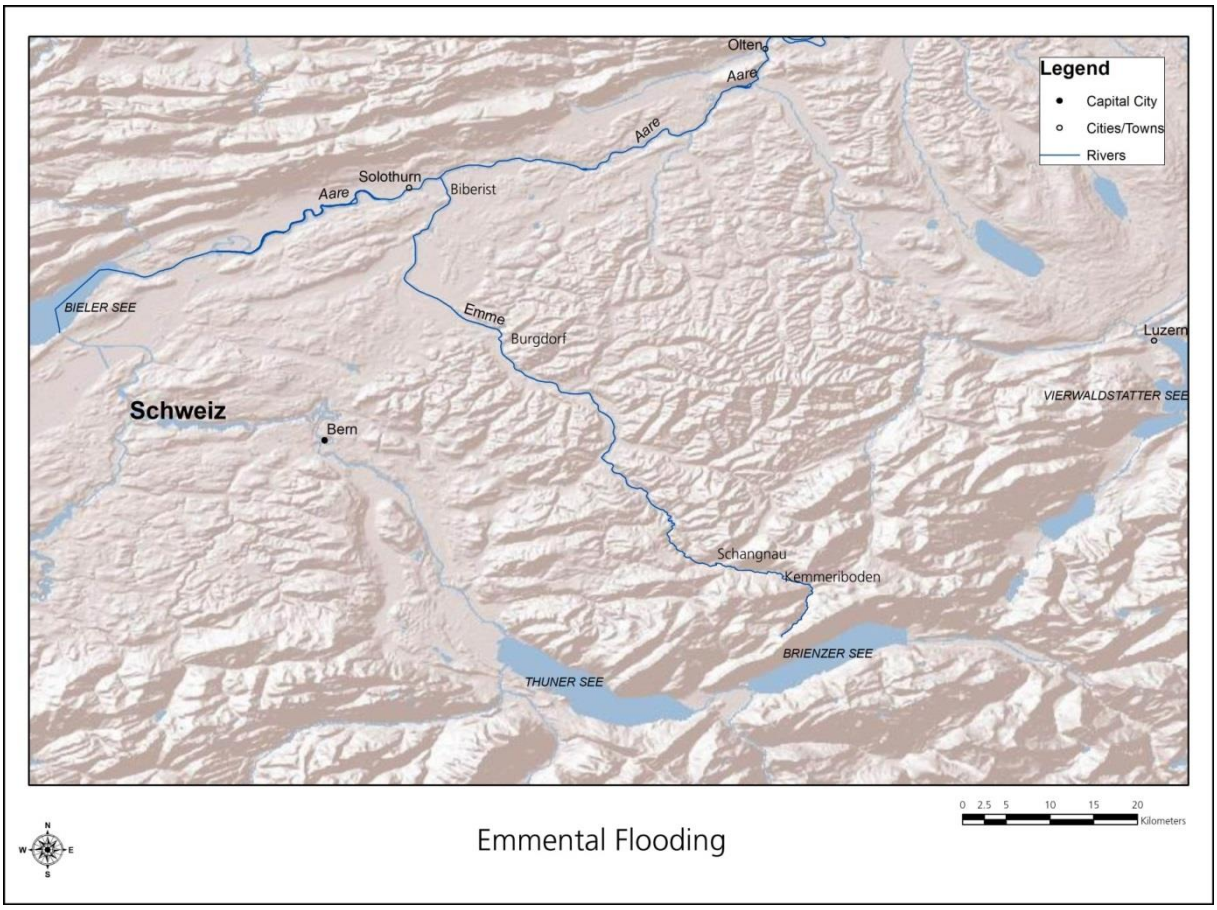
The Solothurn authorities also got in touch with the Bernese authorities regulating the outflow of the Aare of lake Biel. In Switzerland, all major lakes with the exception of Lake Constance can be regulated, which proved this time to be of great advantage. Once the authorities regulating Lake Biel were informed of the situation, they could reduce the volume of water flowing out of Lake Biel into the Aare by closing the gates. The river was thus able to take up the high discharge of the Emme. Water levels were still high along the Aare from its confluence with the Emme at Biberist downstream past Olten, flooding some local pastures and requiring some areas to be protected using mobile protection installed by local crews including the fire brigade and civil defense workers. But there were no significant damages on the Aare this time. Thanks to the canton of Berne, many important industrial and societal assets in Solothurn were saved.[5] [6]

Lessons learned and implemented since 2005

Following the floods of 2005 Switzerland significantly improved its flood protection and flood risk management structures. Across cantons, the goal was to better harmonize the regulations governing the flow of the rivers and lake levels to achieve maximum protection where needed most, including in large towns along rivers.[7] This was already put to the test in 2007 when all major tributaries of the Aare river were affected by floods. The regulation upstream was important to protect the so-called 'Water Castle of Switzerland' ('Wasserschloss') near Brugg in the canton of Aargau, where major tributaries, the Limmat and Reuss, flow into the Aare. For various reasons, in 2007 the regulation was still not optimal. As a result, there was significant flood damage in the area around Brugg when three flood waves arrived simultaneously.

Since 2007, regulation has been improved and today it works well. Unlike 2007, in the latest floods, Lake Biel was not threatened by floods this time, and could provide ample retention space, withholding water from the Aare, increasing that river's capacity to take up water from the Emme. Without Lake Biel to reduce the Aare flow before the Emme empties into it, instead of the 755 m^3/s measured, water levels might have reached damaging levels of around 1,000 m^3/s, according to water experts in the Solothurn environment office. This meant that costly damage in the Swiss plains and along the banks of the Aare in Olten and Niederamt could be avoided.

[5] http://www.srf.ch/news/regional/bern-freiburg-wallis/solothurn-dankt-bern-nach-dem-hochwasser
[6] http://www.srf.ch/player/radio/audioembed?id=08ee4054-8395-427f-8b58-65196abd230b&mode=inline&autoplay=true&html5playersize=small
[7] http://www.bafu.admin.ch/dokumentation/medieninformation/00962/index.html?lang=de&msg-id=25822



About the Zurich flood resilience program

An increase in severe flooding around the world has focused greater attention on finding practical ways to address flood risk management. In response, Zurich Insurance Group launched a global flood resilience program in 2013. The program aims to advance knowledge, develop robust expertise and design strategies that can be implemented to help communities in developed and developing countries strengthen their resilience to flood risk.

To achieve these objectives, Zurich has entered into a multi-year alliance with the International Federation of Red Cross and Red Crescent Societies, the International Institute for Applied Systems Analysis (IIASA) in Austria, the Wharton Business School's Risk Management and Decision Processes Center (Wharton) in the U.S. and the international development non-governmental organization Practical Action. The alliance builds on the complementary strengths of these institutions. It brings an interdisciplinary approach to flood research, community-based programs and risk expertise with the aim of creating a comprehensive that will help to promote community flood resilience. It seeks to improve the public dialogue around flood resilience, while measuring the success of our efforts and demonstrating the .benefits of pre-event risk reduction, as opposed to post-event disaster relief.

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