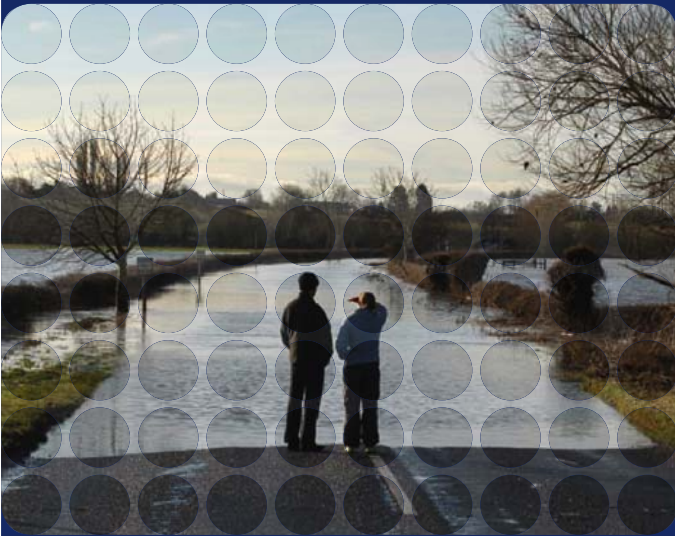


European floods: using lessons learned to reduce risks



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I. Executive summary

Just over a decade ago, Central Europe was hit by severe flooding. In June 2013, this scenario repeated as Germany, Austria, the Czech Republic, Slovakia and, to a lesser extent, Switzerland, again suffered devastating floods. Besides over 20 deaths, thousands of people were forced to seek temporary shelter as the Danube, Inn and other rivers overflowed their banks. Early estimates anticipate property damage resulting from these floods of about EUR 17 billion.

Zurich Insurance Group risk engineers who were on the ground and witnessed the effects of 2013 flooding first hand believe that the extent of damage need not have been so high if some of the lessons learned in 2002 had been better applied. Based on their observations, the following points deserve closer attention in efforts to make communities more flood resilient:

- Greater risk awareness is needed, especially as flood hazard maps have proved their value as reliable indicators of where damage is likely to occur. Flood maps should be widely available, and used in planning new construction.
- Physical barriers such as levees and flood walls can help but do not offer complete security. Other means of protection should be considered, such as flood water retention areas along rivers.
- It makes little sense to rebuild structures without improving flood resilience. The insurance industry can play an important role by providing expert advice on adapting structures to make them able to withstand floods, and mitigating risks.
- In countries such as Germany, where due to low insurance penetration for natural hazards, only a fraction of flood losses were covered, the government has offered EUR 8 billion to compensate property holders who suffered flood damage. In light of the huge costs, governments may wish to consider the advantages of creating better incentives for mitigation of losses before events occur.
- New alliances among insurers, governments and civil society could encourage risk reduction and risk financing in both the public and private sectors. Alternative financing means, including cat bonds, could also play a role.

It is crucial in this context that what was learned in 2013 is put into practice before the next major floods occur. Ignoring these lessons will mean that next time around, the scale of the tragedy, and the costs could be even higher.

II. Introduction

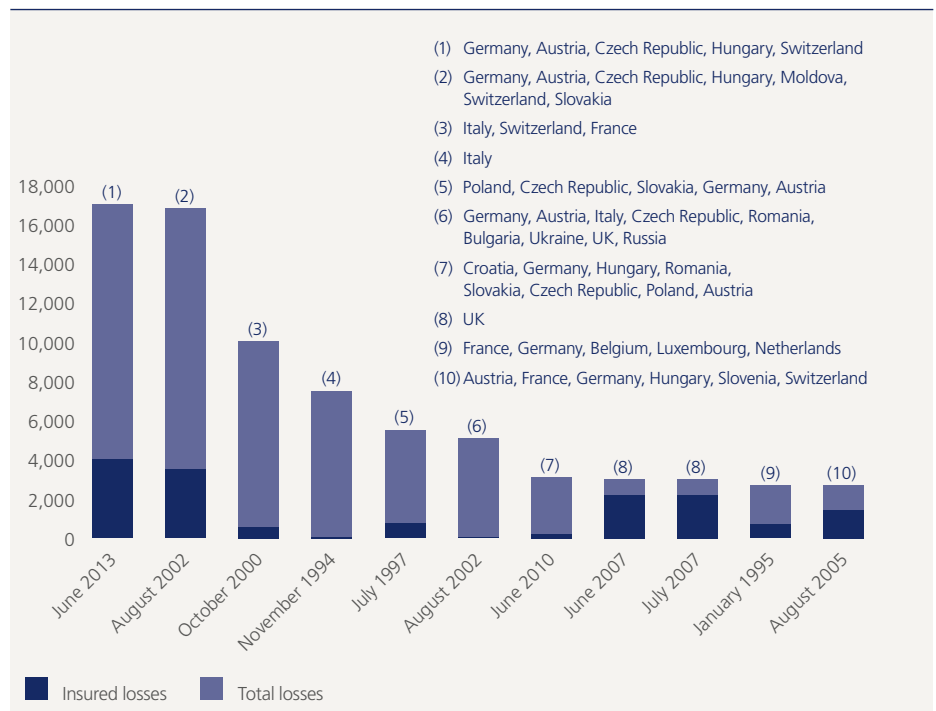
From late May to early June 2013, long-lasting, stationary low pressure systems across Central Europe brought exceptional rainfall, especially across the northern arc of the Alps. After a very wet spring, the stage was set for imminent flooding. In early June severe flooding did indeed occur. Damage was extensive, in particular along the Danube and Elbe main watersheds, a situation that led to some of the worst floods in at least a decade in parts of eastern Germany, Austria, Hungary and the Czech Republic. In some cases floods reached levels never recorded since measurements began.

Damage assessment and repairs are still underway. Yet even at this early stage, it is possible to draw some preliminary conclusions and offer ideas on how flood resilience can be improved. The insights and recommendations in this paper are based on an on-the-ground assessment by Zurich Insurance Group risk engineers. Against a backdrop of increasing flood losses, it is critical to learn from these latest events. After the floods in 2002, the opportunity to build better, more flood-resilient structures was largely missed. The opportunity should not be missed a second time. In addition, more effort should be made to forge multi-stakeholder alliances in order to build long-term resilience.

III. European flood losses are increasing

In terms of probability, an event such as the latest floods in Central Europe in some locations may exceed a return period of one in 100 years.¹ In certain areas, water levels exceeded even those previously set by record floods in 2002. In addition to an estimated loss of 23 lives, early estimates of total damage to property stands at EUR 17 billion, of which EUR 4 billion are estimated to be insured. Germany was hardest hit, facing a potential loss of EUR 12 billion (CEDIM, 2013). If these estimates are confirmed by further, more in-depth assessments, this would make it the most costly Central European flood event in decades (see figure 1).

Figure 1:
Most costly floods in Europe (EUR millions)



Source: Munich Reinsurance Company, Geo Risks Research, NatCatSERVICE, CEDIM.

¹ A return period of 100 years implies that, based on a long term average, one such event will occur on average every 100 years. This is equivalent to an event probability of 1 percent per year. It is important to note, however, that this does not exclude the possibility that several such events could happen within a 100-year period.



Even by historic standards, the June 2013 floods were extreme. Here the severe damage to Passau's City Hall can be compared with levels of previous major floods. (Photo: Michael Szönyi)

Germany

The floods in June 2013 had a severe impact, especially in Germany. In the southern state of Bavaria the cities of Passau and Deggendorf saw the worst damage. The area around Passau where the Inn river flows into the Danube experienced the worst floods ever recorded, after the Inn crested at a record of an estimated 12.75 meters (CEDIM, 2013).

Fischerdorf, across the Danube from Deggendorf, was inundated after a levee collapsed on June 5 when the river rose to a level of eight meters, over half a meter higher than what was recorded at the same spot during the 2002 floods. Another levee failed in a section up to 500 meters long, leaving the entire town of Fischerdorf including a significant number of small industrial and commercial businesses under as much as three meters of water. Traffic was also interrupted for an extended period after the A3 and A92 highways were flooded. Many residents lost all their property and some 2,000 people needed to be evacuated.

Along the Elbe the flood intensified as the river flowed north, joined by tributaries that were also at record high flood levels. The peak was reached in Dresden and Torgau on June 6, barely below 2002 record levels. Downstream at Barby, Magdeburg and Tangermünde, 2002 flood levels were topped in some places by almost one meter (Pegelonline). The event along this section of the Elbe was estimated as having a return period that would suggest an event happening less often than every 100 years on average. Magdeburg was badly hit on June 9, nearly one week after the original rainfall that triggered the flood, and extreme levee failures near Fischbeck, which could not be repaired for several days, allowed water to flow out of the Elbe, flooding populated areas and agricultural land over many square kilometers. Flood waters were still receding and losses being assessed as this report was written.

III. European flood losses are increasing

continued



Damage from the June 2013 flood along the Inn river, shown at a stage when it still exceeded flood warning levels. (Photo: Michael Szönyi)

Austria

Along the Saalach, Salzach and the entire upper Danube, flood levels exceeded those measured in the 2002 flood. The Danube entered Austria from Bavaria at levels never before observed (Austrian government/Ministry of Life). Early estimates of the total damage, both insured and uninsured, in Austria are as high as EUR 3 billion (CEDIM).

Switzerland

Switzerland experienced extreme rainfall in a few areas and damage was, with very few exceptions, limited. This indicates that new prevention measures and technical interventions worked as they were supposed to. Well-organized emergency services also functioned effectively. That said, river flows were not as high as those recorded in 1999 and 2005, thus these flood defenses were not subject to extreme tests.

IV. Key lessons from the latest floods

Zurich risk engineers on the ground provided the following insights, based on their observations.

Flood hazard maps are reliable and should be mandatory when planning for new construction

Comparing locations of losses with existing flood maps reveals that these flood maps are, in most cases, reliable. The bulk of the latest losses were registered in high hazard zones with significant flood probability. Some occurred in extreme flood zones with return periods of one in 10 years, and some in zones with a one in 50 year probability.

Flood maps should be used more widely to enhance awareness of flood hazards. Zurich's investigations in the areas where floods occurred revealed that some insurance customers affected by floods already had forgotten about the damage that occurred in the 2002 floods and, faced with renewed flooding in 2013, many believed they had exposure to only infrequent flood losses. Thus, there is a need for greater awareness regarding flood risks. Flood maps should be brought into more active use, and they should be made more widely accessible.

Flood maps and risk awareness are only effective if they are included in the planning process for construction projects and risk mitigation policies. Currently, however, there seems to be a lack of political will to limit new construction in flood-prone areas by using flood maps. In Germany, for example, legislative proposals after the 2002 floods to limit new settlements in flood-prone areas were weakened to a significant degree by making provisions for numerous exceptions (WWF 2007). The EU flood directive requires that new flood hazard and risk zones be established at the member-state level. These should serve as a basis for mandatory flood protection, land zoning and restrictions placed on developments in areas where flooding poses a hazard.

The latest floods also clearly show that a multitude of different interests compete with each other where land use is involved. Flood protection measures may interfere with protection of ecosystems, for example. Therefore, difficult trade-offs need to be considered by involving all relevant stakeholders, including the public sector, businesses and the insurance industry.

“Physical, permanent protection by levees and flood walls is a viable and important option, but one that does not provide complete safety.”

Natural flood prevention is a better solution than technical intervention

In Germany, flood awareness has greatly improved since 2002 – especially at the official level – and in those areas around Dresden most affected by the floods, flood protection structures in the intervening years have been significantly upgraded. In many cases this worked well, such as along the Elbe river, including in the area around Wittenberg, where the most severe levee breaches occurred in 2002 (15 in total). Damage here was low or almost completely avoided.

Nevertheless, severe levee failures occurred along both the Danube and Elbe where flood protection structures had not been completed or were not upgraded. Once levees fail, closing the gaps is extremely difficult, as events around Fischbeck demonstrated, and there was no contingency planning for such complex failures. It is very difficult to develop emergency plans for handling potential levee failures, and the authorities had to improvise by sinking river barges to reduce water flows at the places where levees failed. The levees' length, complexity and relative protection levels meant that planning for failures could, at best, be done on a case by case basis, taking into account the risks such a failure would pose to the most vulnerable or densely-populated areas. In addition, higher flood walls and levees worsen the situation downstream, increasing flow speed and volumes. This could expose weak levee sections to even more stress. Physical, permanent protection by levees and flood walls is therefore a viable and important option, but one that does not provide complete safety.

IV. Key lessons from the latest floods

continued



Temporary flood protection barriers near Deggendorf (top) versus natural retention areas along the Elbe river near Wittenberg (bottom). (Photos: Michael Szönyi)

In addition to technical measures, new flood water retention areas are being created. This included widening areas where rivers flow and creating designated flood plains to hold excess water during floods. Such areas allow significant volumes of water to be stored, in turn helping to lower flood peaks and reducing the velocity of water downstream. They have proved to be more reliable and less prone to failure than artificial flood protection measures, such as flood barriers. However, in reality they are difficult to realize, as using land along rivers to reduce flooding is an expensive proposition. Then too, such land is often not available and/or frequently co-opted for agricultural, residential or commercial purposes. That said, innovative compensation schemes for land owners in these areas could still create sufficient incentives to encourage the use of land along rivers available for flood retention purposes.

Lacking better alternatives, temporary barriers can work in combination with good emergency plans

Temporary structures erected to keep out flood waters can also offer a reasonable defense if no other solutions are available or affordable. Such systems are removed once flood waters recede. They require pre-installation and sufficient early warning to set them up. These types of mobile barriers have proven effective in Austria and along the Rhine, and the Aare river in Switzerland. However, careful planning and training is necessary for their deployment, as well as reliable early warning systems, and adequate emergency planning. Depending on the type used, they may also require a significant investment.

At several locations along the Danube and the Elbe rivers, inaccurate and/or late warnings, along with inadequate or inoperable equipment – for example, electric water pumps in areas that lost power causing the entire system to fail – underscore that emergency planning and regular training is needed for these measures to work.

As these systems affect runoff speeds and flood peaks downstream, other considerations as well must be weighed when deciding whether or not to use them.

Now is the time to enhance flood resilience

In many areas, those buildings affected by 2013 floods already had been damaged by 2002 floods. In most cases, no improvements to flood resilience had been carried out. The most vulnerable installations and parts of buildings that were flooded in 2002 were repaired, or brought back into use, only to be flooded again in 2013. Two factors seem to be influencing the process. There is a lack of awareness as to how structures can be made more resilient to flooding and there is very little incentive to inform building owners about how this might be done. There are also few rewards for doing so. In some cases, legal hurdles even block efforts to rebuild in a better, more flood-resilient way.

There is an opportunity to increase flood resilience by rebuilding better this time, and it should not be wasted. There is an urgent need to create appropriate incentives to mitigate the impact of floods. This could be achieved, for example, by making government-sponsored relief payments only if repairs have improved standards. The insurance industry could play an important role in this process by providing advice to reduce risks.

V. New alliances could strengthen flood resilience

Insurance in Germany covers only a fraction of flood losses. The 2002 floods in Germany resulted in economic damage on the order of EUR 15 billion (FLOODsite, 2009), of which only about 15 percent was covered by insurance (RMS, 2003). It is reported that insurance penetration for natural hazards may be only about 35 percent (GDV) in Germany, and potentially even lower in the most-affected areas. The German government has offered in total EUR 8 billion in flood relief for those people and businesses most affected with no insurance, as well to repair damage, particularly washed-out or damaged levees and vital infrastructure such as roads.

Establishing an emergency fund is an important step in providing relief. But increased funding prior to any catastrophe to reduce future losses is clearly the preferred route. Post-event relief may reduce incentives for people in high risk areas to have adequate insurance, and/or discourage investments to mitigate damage. Even when post-event relief is provided, it may be insufficient to cover all losses of those affected. As a final point to be considered, providing post-event relief exposes public finances to considerable risk given the uncertainties and relatively unpredictable nature of such events, even apart from the high costs that they engender.

There is thus an urgent need to improve participation in the ways in which various stakeholders are engaged in pre-event mitigation and measures to enhance flood resilience. Experience shows that collaboration between insurance operators, government authorities, and other key stakeholders is crucial when it comes to encouraging risk reduction in both the public and private sectors (Amendola et al., 2013).

The Swiss Natural Perils Pool offers an example of how a public-private partnership can work to provide natural hazard coverage.² Flood insurance is mandatory in most Swiss cantons. As a result, more than 70 percent of losses between 1990 and 2012 were insured (authors' calculations based on EMDAT).

However, such mandatory insurance programs have several significant drawbacks. They often rely on premiums that do not adequately reflect risks, and involve cross-subsidies among consumers and/or business lines, discouraging mitigation efforts and leading to inappropriate land use. It is therefore vital that risk prevention measures be a prerequisite for obtaining coverage in any insurance program. Compliance with building standards and appropriate mitigation measures should be required for obtaining insurance coverage.

Floods frequently result in severe damage to public infrastructure, which typically is not insurable in the private insurance market. There is a European Union Solidarity Fund (EUSF) that provides post-event compensation to member states for non-insurable losses, but its capacity is limited. One approach might be to revamp this fund to provide for effective pre-event mitigation incentives by taking mitigation efforts of member countries into account. Where traditional insurance solutions are lacking, alternative risk transfer instruments such as, 'cat bonds' should also be considered as a way to enhance protection of public infrastructure.

Zurich cooperates with community partners, the Internal Federation of Red Cross and Red Crescent Societies (IFRC) and Practical Action, and academic partners, the Wharton Center for Risk Management and Decision Processes in Pennsylvania, U.S., and the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria, to develop new and innovative approaches to enhance flood resilience (see Box 1).

² Switzerland has a dual system of insurance against natural hazards with mandatory insurance provided by a pool of private insurers in some cantons and public monopolies in other cantons.



In Bangladesh, where frequent flooding is a fact of life, making communities more resilient is helping to overcome the devastating effects caused by seasonal rains. (Photo: Elisabeth Real)

Box 1: Zurich’s flood resilience program

Zurich Insurance Group (Zurich) has committed to a multi-year global flood resilience program, which aims to enhance community flood resilience by finding innovative ways to increase the impact of disaster risk reduction efforts at the community, national and global levels.

Zurich’s flood resilience program focuses on developing and disseminating knowledge and expertise on flood resilience. It has an impact at the local level through strategic long-term alliances with the public sector, humanitarian and development organizations, private sector organizations and academia, and will also look at the contribution insurance can make when it comes to flood risk.

To maximize the community impact of the program, Zurich has committed to a long-term strategic alliance on flood disaster risk reduction with the International Federation of Red Cross and Red Crescent Societies. Together with the IFRC, Zurich will enhance community flood resilience through the development and application of innovative disaster risk reduction solutions.

To support Zurich’s flood resilience program, Zurich has entered a multi-year academic cooperation with the International Institute for Applied Systems Analysis (IIASA) in Austria and the Wharton Risk Management and Decision Processes Center (Wharton) in the U.S. Together with these institutions, Zurich will identify and address research gaps on flood resilience and community-based disaster risk reduction, demonstrate the benefits of pre-event risk reduction over post-event disaster relief, and improve public dialogue around disaster resilience.

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