

# 2021 floods: will Europe heed the warnings?

## Analysing the challenges exposed in disaster risk management

### Summary

In July 2021, weather system 'Bernd' caused catastrophic damage and inconceivable human suffering in several European countries. Severe flooding, particularly in Germany, claimed more than 230 lives and left many communities in ruins.

Our Post-Event Review Capability (PERC) methodology assesses the impact of weather events in search of practical recommendations for reducing future damage. PERC identified significant shortcomings in the levels of preparedness for the dimensions of this event, as well as the management of the crisis and the reconstruction process.

There is no time to lose in addressing these issues. As climate change intensifies weather events further still, it is a near-certainty that without decisive action, such an event will happen again.



Destroyed house in the centre of Bad Neuenahr-Ahrweiler, Germany, March 2022.  
Photo: Michael Szönyi

### Recommendations

- **Current flood models and procedures require a major overhaul** – reducing calculation times, increasing transparency, and incorporating a more nuanced approach to varying types of flooding. Crucially, flood statistics must also take historic events, as well as future climate change implications, into consideration.
- **An increased distribution of simpler, lower-cost measurement stations for rainfall and river levels will provide real-time updates on developing events.** These could be operated and maintained by the communities where they are installed, with the data then integrated into wider forecasting networks.
- **In many cases, existing disaster law significantly hindered the response to the 2021 flooding.** Guidelines for applying subsidiary principles, and for procurement, training, and operation for natural hazard events must be urgently revised to ensure that all aspects of emergency response plans are fit for purpose. Improved standardization across nations and regions must also be prioritized, including minimum requirements for equipment and personnel capacity.
- **The appointment of a 'Flood Delegate' to oversee the complete reconstruction effort** after a disaster would ensure that a coordinated, climate-smart approach is adopted, reducing future risks. The designation of 'Flood Zones', in which special flood emergency laws can be implemented, will accelerate the timeline for reconstruction.

### Counting the cost

In addition to the lives lost, the Bernd floods had a significant economic impact on multiple countries. Preliminary estimates of the total economic losses in the affected areas across Europe range from €40 bn to €50 bn. For the insurance industry, this event was reported as the largest industry loss for 2021, with estimates of insured losses reported by the market in the €10–13 bn range across Europe, and around €8.2 bn for Germany. This makes the 2021 floods the costliest disaster in German history, and the deadliest in roughly 60 years.

### Authors:

Michael Szönyi, Zurich  
michael.szoenyi@zurich.com

Andrew Duthie, Mercy Corps  
aduthie@mercycorps.org

## The persistence of ‘flood dementia’

Given the high human and economic costs of the ‘Bernd’ weather system’s impact, particularly in Germany’s Ahr Valley, many of those affected described what unfolded as ‘unprecedented’ and ‘unforeseeable’. While understandable given the circumstances, this is also demonstrably wrong.

Records show that a flood event of a similar scale took place in the Ahr Valley in 1804, followed by a flood in 1910 that significantly exceeded the available gauge records. Yet this did not lead to action; far-reaching flood protection plans developed in the 1920s were never realized. According to records in the state archive, the need for such measures was crowded out by different interests and priorities. Indeed, when the Ahr Valley flooded again in 2016, this was widely characterized as a ‘100-year event’. Major flood events have been forgotten or dismissed to such an extent that they have had insufficient influence on today’s decisions. This includes flood statistics which only take into account a shorter, instrumental record.



Flood damage in Bad Neuenahr-Ahrweiler.  
Photo: Bernd Engelen, Zurich Gruppe Deutschland.

Worse still, it is apparent that Bernd was by no means a worst-case scenario. The extraordinary levels of rainfall could have caused even more damage had they fallen elsewhere, or at a different time of year – and with climate change exacerbating extreme weather events, a storm taking place 30 years from now could feature a 10 per cent increase in precipitation.

The 2021 floods must, therefore, be viewed as a warning for the future, not as an exception which will not be seen again. We hope that our findings and recommendations will help to ensure that intense natural events are adequately planned for in the future, and can therefore be better managed.

## Fail to prepare, prepare to fail

Regrettably, there are myriad ways in which individuals, communities, regional authorities, and national governments were insufficiently prepared for the floods. Forecasting was certainly flawed; for example, it was not sufficiently flagged that flood information only meant for major rivers (such as the Rhine and Moselle) was not to be applied elsewhere. Communities therefore didn’t expect the flooding that then occurred at smaller rivers.

While information was passed between weather and hydrological forecasters in the form of raw data, there was no combined effort to share and discuss their interpretations of the unfolding situation. Furthermore, when this information was passed on to local civil protection and first responder units, as well as to the general population, the absence of meaningful messages gleaned from the technical data meant that the desired, tangible actions were not taken, e.g. it was unclear, what a water level of 5 m at a certain gauge station meant.

Most likely as a result of living in a prolonged period of peace and stability, it is apparent that much of European society’s ability to anticipate threats, including those from natural hazards, has waned. Scenarios of what could happen, and therefore would be trained for, have been reduced to smaller-scale events limited in geographic extent and severity. Personnel, equipment, and functional structures have been dissolved (such as sirens) or are underfunded (e.g. professional staffing for first responders). Similar repercussions of such policies were also keenly felt during the efforts to cope with the COVID-19 pandemic, and again in the response to the Ukraine crisis.

## Disaster law not up to scratch

Such omissions in the coordination of essential services and updating of disaster law led to fundamental challenges in the disaster response. Having only prepared for smaller disaster events (such as bus crashes, industrial chemical spills, and fires in nursing homes), responders were ill-equipped to deal with the consequences of large-scale flooding. Moreover, equipment had not been procured with such a scenario in mind, with little consideration given to the size and specifications of equipment required (for example,



the need for off-road or amphibious capabilities). Shelter and medical assistance units were not equipped for the size of the populace in need, nor were they designed to function without critical infrastructures that had been damaged by the flooding. Radio communication for response units was also unreliable, massively hindering the initial coordination of the response.

Despite clearly being inadequate for the task, certain procedures and protocols were adhered to when a more flexible approach by on-site crisis managers would have been preferable. The situation was complicated further still by the federally organized nature of the response. In Germany, for example, individual states bear responsibility for responding, and the Federal Office of Civil Protection and Disaster Assistance can only offer support – and, even then, only where requested by the states. This leads to a wide variety of administrative structures, and inconsistency in the size and quality of disaster response equipment; in 2021, it meant that dispatchers were unable to tell which unit would bring what qualifications and equipment.

In Germany and Belgium, responders were let down by current flood hazard and risk maps. Designed for spatial planning rather than emergencies, these maps do not clearly provide responders with the information they need to determine where the water will go, and whom to evacuate. In Verviers in Belgium, for example, only the straightened river itself was marked as a 'red zone' on the map, while the areas directly alongside its banks were not marked at all. Meanwhile in the Ahrweiler district in Germany, instructions to evacuate were given to those living within 50 metres of the banks of the Ahr. This was a severe underestimation, with lives lost to flooding more than 250 metres from the river.

## Looking ahead

### Preventing the next disaster

Closing the gaps in disaster law, improving coordination, and standardizing procedures are all crucial components for improving the effectiveness of future emergency responses. It must not be forgotten, though, that prevention remains the best approach.

The Bernd disaster exposed the technical limitations of water flow and gauge forecasts in smaller rivers, and of only using a measurement record for flood hazard maps. Historic floods must also feed into the record. By placing gauges more strategically along these rivers, in areas that could provide additional flood information, communities could be better prepared. Additional gauges located upstream of settled areas could provide more data for the calibration of forecast models and could serve, in a flood event, as local warning infrastructure.

There is also a lot of scope for 'low-tech' solutions. In the Ahr Valley, creating a communication chain from upstream to downstream communities would have provided the latter



'Giving up is not an option' – painted façade of a house in Dernau, Germany, April 2022.  
Photo: Michael Szönyi

with an enhanced understanding of what kind of flood situation was about to unfold.

### A climate-smart approach to reconstruction

As we prepare communities across Europe for the next flood event, wherever and whenever it occurs, we must simultaneously harness opportunities to ensure that the regions devastated by Bernd are able to 'build back better'.

Several newspapers in Belgium described the 2021 flooding as a 'once in 100 years' event, leading some to believe that there would not be another occurrence for a century, minimizing the need to prioritize increased resilience. This short-sighted approach must be avoided, but doing so will require significant changes to current practices. As we have observed in the months following Bernd, planning for reconstruction and implementing a forward-looking approach at the same time is nearly impossible, as the affected population wants to get back to normal as quickly as possible.

Opportunities to make significant improvements are therefore often missed. For example, a mix of competing interests, differing funding structures, and fears of increased costs have disincentivized the adoption of newer, more sustainable energy solutions such as district heating. Appointing a 'Flood Delegate' with full overview of the reconstruction process could improve coordination and ensure that a wide vision for reconstruction can be implemented.

## The time to act is now

After conducting exhaustive analysis of the impact of the Bernd disaster, we are confident that our findings are scalable and valid across Europe. Even as the intensity of storms increases, we know what steps can be taken to ensure that communities are better prepared, more capable of responding effectively, and equipped to build back better should the worst happen.

There are some signs of hope already – Luxembourg, for example, is adopting technical guidelines and expertise from Germany – but much more needs to be done if we are to avoid the next crisis, which will be anything but unforeseeable.

## What is the Post-Event Review Capability?

Our Post-Event Review Capability (PERC) methodology provides research into and independent reviews of large disaster events. It seeks to answer questions related to aspects of resilience and disaster risk management. It is a flexible method that analyses what makes events become disasters. It looks at what has worked well (identifying best practice) and opportunities for further improvements.

Since 2013, PERC has been used to analyse various flood and wildfire events and has won two awards. It has provided the framework to engage in dialogue with relevant authorities, and the knowledge gained through PERC is being consolidated and made available to all those interested in progress on disaster risk management.

Additional information can be found at <https://floodresilience.net/PERC>



A destroyed pedestrian bridge in the city of Bad Neuenahr-Ahrweiler, Germany, March 2022.  
Photo: Michael Szönyi

The Zurich Flood Resilience Alliance is a multi-sectoral partnership which brings together community programmes, new research, shared knowledge, and evidence-based influencing to build community flood resilience in developed and developing countries.

We help people measure their resilience to floods and identify appropriate solutions before disaster strikes.

Our vision is that floods should have no negative impact on people's ability to thrive. To achieve this we are working to increase funding for flood resilience; strengthen global, national, and subnational policies; and improve flood resilience practice.

Find out more: [www.floodresilience.net](http://www.floodresilience.net)

The Zurich Flood Resilience Alliance is made up of the following organizations:

