



XL Reinsurance

Disaster Recovery Case Studies Germany Floods 2013

In cooperation with

Centre for
Risk Studies



UNIVERSITY OF
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Judge Business School

2013: The Flooding in Germany

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Introductory Commentary

Jonathan Gale, Chief Executive, Bermuda Reinsurance, AXA XL

The important role of (re)insurance in the speed of physical and economic recovery after a major disaster, especially when there is little to no coverage due to unavailability, insufficient capacity or lack of take up (predominantly because of economic reasons), has not really been studied in detail. The (re)insurance industry tends to focus on the potential for future events and events in the immediate past. However, there is a need for a deeper understanding of the aftermath of disasters over a longer time frame, as well as an understanding of the impact that insurance penetration has on the pace of economic recovery.

Working with Cambridge Centre for Risk Studies at the University of Cambridge Judge Business School (CCRS) we have been examining more than 100 catastrophes across the world over a three-year timeline to compare and contrast outcomes and establish conclusions and recommendations. Our original plan was to have one consolidated report released in 2020 but the case studies (this one covers 2013 Germany floods) produced by CCRS were so interesting and of such quality we thought it would be beneficial to share these as they became available. CCRS will still issue a consolidated report in April 2020. We intend to make available publicly all of the detailed work in an open source database and also to establish a template to study future catastrophes in a structured way.

Our aim is for this work to be used as a tool by policymakers and governments worldwide when evaluating disaster preparedness and seeking to fully understand, from the lessons learned by others, the impact of displacement of populations; increasing personal debt levels; change in economic mix of industry; political upheaval and overall time to recover, among other things.

We also want to explain the marginal increased cost in relation to the value of rebuilding with resilience – what we call “building back better” – over and above the cost of replacement. The (re)insurance industry needs to provide extra limit and contractual stipulations for “building back better” to minimize the impact of future disasters.

Intuitively, we know the speed and scale of protection the (re)insurance industry provides dramatically reduces the recovery time for communities which have suffered through extreme catastrophes. However, we believe that it is imperative that this be demonstrated in more detail with evidence and placed in front of the right people to effect change – particularly governments.

We are starting to see good progress in terms of the increased role of governments in closing the gap between economic loss and insured loss – since we started these papers we have seen the FEMA program in the US placed in the market for the first time; Flood Re in the UK become fully operational and most recently the California Wildfire Fund established by the State of California and managed by the California Earthquake Authority (CEA), at least initially.

We are encouraged by this and will continue to support these initiatives with reinsurance and by sharing our findings from studies such as these.

The views, findings and opinions in this case study are those of the researchers at CCRS and not necessarily those of AXA XL. Notwithstanding this, we are proud to be associated with this project and are sure that by gaining a greater level of understanding, we will ultimately develop more catastrophe reinsurance solutions and, more importantly, show the world the true value and social benefit of (re)insurance.
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Abstract

June 2013 saw major floods across Europe, including the most severe flooding in Germany in the last 60 years, with record water levels along the lengths of the Elbe and Danube rivers. This case study examines the impacts of the floods in Germany – a high-income economy with relatively high non-life insurance penetration – and the subsequent socioeconomic recovery. Particular attention is given to Passau, a city on the Danube that was among the worst affected, and where supportive fieldwork was conducted in 2019. The floods cost the German economy between \$6.7-9.1 billion, with severe and national-scale impacts on economic sectors including transport and critical infrastructure, manufacturing, commerce, and on residential housing. The 2013 event is placed in the context of similarly devastating floods in 2002, when serious deficiencies in flood risk management were exposed, subsequently provoking major changes in the German approach to flood risk management. Therefore, the nation was more aware of and better prepared for flooding, and physical protection measures were widely implemented, so the 2013 event caused comparably lower damages than those in 2002.

Although the scale of the event challenged disaster management capabilities, the response and recovery efforts were generally well managed. Residential flood insurance penetration has remained relatively low in Germany despite slow growth in the market since 2002, and only 32% of buildings across Germany were insured in 2013. Recovery was primarily financed by the state, which allocated a total budget of €8 billion, while the insurance sector covered €1.65 billion (about 20%) of total losses. The recovery effort was generally judged a success as a result of adequate management and available finance, and 93% of households had returned to normal in under two years; although, certain local, severely affected areas were much slower to recover. A negligible macroeconomic impact was felt, and economic activity recovered quickly. Five years after the event, 93% of private sector repairs had been completed, but despite localised successes, the opportunity to incorporate resilience into recovery was not capitalised on. The reliance on state aid in particular hindered progressive measures, although since 2013 regulations have been developed to advance the role of insurance while rolling back reliance on ex-post state aid. There is an increasing emphasis on citizens’ taking responsibility for their own flood preparedness and protection, although the uptake and success of this evolution is yet to be seriously tested in Germany.

Section 1: Event Context



Figure 1: Extent of flooding across central Europe in June 2013 and selected record high-water levels. (Alexrk2/Wikipedia 2013)

Hazard Characteristics

In the summer of 2013, unprecedented flooding occurred throughout central Europe, affecting the western regions of the Czech Republic, Austria, and the southern and eastern German states. Germany was particularly affected, experiencing the most severe large-scale flooding in at least the last 60 years. May 2013 saw precipitation exceed monthly averages by up to 300% throughout Germany, and new soil-moisture records were observed for 40% of the national territory. Flooding progressed along the Elbe catchment (including the Saale, Mulde, and Elbe tributaries), a main artery flowing northwards through Germany in to the North Sea, and Danube catchment (including the Isar and Inn tributaries), flowing west to east through Germany and beyond south-eastwards. Flood stages were the highest ever recorded along hundreds of kilometers of rivers (Figure 1).

Eight of Germany’s 16 federal states experienced some level of impact. Along the Danube river flooding particularly affected the cities of Passau and Deggendorf, and the surrounding areas. Passau, the location of detailed fieldwork for this study, is situated at the confluence of the rivers Danube, Inn and Ilz, and water levels reached the highest recorded level since 1501 (Figure 2). Along the Elbe, the most affected areas included Dresden, Grimma, Leipzig, Halle, and Magdeburg. Munich and Landshut – both major municipalities on the River Isar avoided serious damage due to flood protection measures implemented following previous flooding, namely the Sylvenstein Dam, heightened in 2000 to increase its capacity.

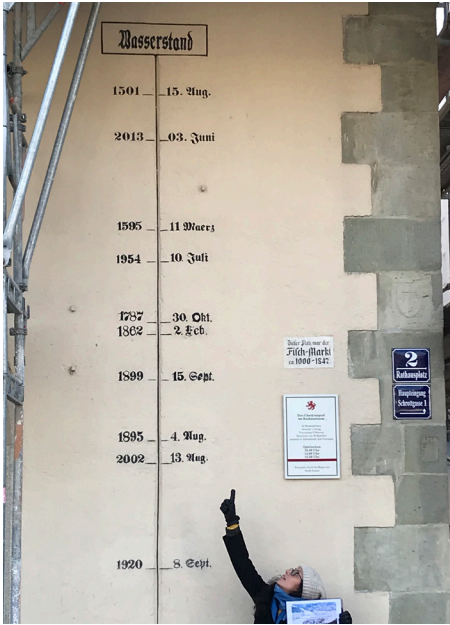


Figure 2: Historical flood levels in Passau, Germany. 2013 saw the highest water level since 1501. (Photo: Farnaz Mahdavian)

Socioeconomic Context

Germany has a highly developed, market-oriented and service-dominated economy. GDP was growing at a rate of 0.5% in 2013.¹ The country is governed as a democratic, federal parliamentary republic. The Federal Office of Civil Protection and Disaster Assistance (BKK) is the primary authority responsible for

coordinating the management of flood risk in Germany, while the Committee for Disaster Reduction (DKKV) provides a national platform for disaster prevention. Further, the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety has authority over environmental issues and policy.

Risk Landscape

Flooding is the most significant and expensive disaster risk in Germany, and localised river and urban flooding occurs frequently. The risk is expected to increase over the coming years due to climate change and human development, as the number and value of exposed assets grows.

The 2013 flood was not the only major to strike Germany in recent history. In 2002, major floods exposed serious weaknesses in German flood risk management, including deficient preparedness measures, missing or ineffective flood warnings, poor maintenance of flood protection structures, and a lack of risk awareness and knowledge. These floods prompted extensive improvements to

reduce flood risk, including the German Flood Protection Act of 2005. This represented a movement from technically-oriented flood defence towards integrated risk management with an emphasis on holistic resilience to floods. The German government also established the Federal Office of Civil Protection and Disaster Assistance (BKK) to coordinate disaster response and provide central access to resources before and during a disaster. As a result, the floods that occurred in 2013 were alleviated by measures implemented in response to the earlier floods in 2002. There were improvements in preparedness after the 2002 floods: 23% of respondents to a survey on the state of preparedness in 2013 reported that they were very well prepared, compared to only 3% in 2002, and 78% of respondents said they were completely unprepared in 2002, compared to only 19% in 2013.² There was also major investment in flood protection and in the Elbe catchment area, dykes were rebuilt or reinforced, and mobile flood barriers were used in various exposed locations.

1 (World Bank 2019)
2 (Ellenrieder 2018)

Research Approach

The Cambridge Centre for Risk Studies conducted extensive research into the impacts of the 2013 floods and the characteristics of flood recovery. This research is comprised of a desk study and fieldwork in 2019. Expert opinion was gathered using an internet-based survey of 21 people who were involved in the disaster recovery process. The response rate was high and offers an expert opinion on the recovery process following the 2013 floods. A reduced form of this survey was subsequently used to gather insights from residents of Passau, Bavaria.

This case study offers important insights into the impact of a large-scale flood event on a community that were on the ‘front line’ of the disaster and offers a representative sample of recovery from a significantly impacted state. Although the case study focuses on a specific community, findings can be understood to be representative of experiences of many people who were significantly impacted by the 2013 flood event, although it is acknowledged that the characteristics of recovery differ across communities depending on a variety of controlling factors.

Section 2: Disaster Impacts

Physical Impacts

Damage to buildings and contents was both widespread and extensive, and there were major losses due to business interruption. In total, more than 32,000 homes were damaged by the floods in 2013. Daggendorf, a town in Bavaria, experienced some of the worst physical damage, as flood water damaged oil tanks and caused spillages. In cases where oil penetrated the masonry, the buildings had to be demolished. This exacerbated the level of structural damage to building stock that had already been done by the floodwater. Five levee breaches occurred in various locations along the Elbe and Danube, flooding settlements behind them, including in Fischbeck, Saxony-Anhalt, where a high risk manoeuvre to plug the gap with barges gathered significant media attention (Figure 3).

Transport networks were significantly disrupted. 700 kilometres of road and 150 bridges were damaged, impending road traffic. Landslides, especially in Baden-Wurtemberg, along with many uprooted trees caused obstructions of road traffic, with many routes needing to be closed in both directions. The German Railways Corporation had to close 60 rail routes in the aftermath of the flood. The destruction of rail infrastructure in Stendal, Saxony-Anhalt, disrupted the important high-speed connection between Berlin and Hannover for five months. This interrupted services between the capital and important cities such as Cologne and Frankfurt.



Figure 3: A levee breach in Fischbeck led to a risky manoeuvre to sink three barges in order to plug the gap.

Social Impacts

Over 600,000 people were affected by the floods in 2013.³ 14 people died and 128 people were injured. Over 80,000 residents in eight federal states were evacuated, with over 40,000 in Saxony-Anhalt alone. The flooding had a significant psychological impact on many of the people affected. In a survey of 710 residents, many reported that the physical damage of the floods was less important than the psychological factors caused by the trauma of disastrous flooding.⁴ Our survey of experts suggests that housing was more severely affected than the local economy (Figure 4).

Economic Impacts

The 2013 floods were the most expensive natural disaster of the year, costing the German economy between \$6.7 and 9.1 billion.⁵ In terms of financial loss, Saxony-Anhalt, Saxony, and Bavaria were the three most affected German states, each constituting 20-30% of the total cost (Figure 5). Private households incurred approximately 22% of all losses, with an average cost per household of \$56,000.⁶ 35% of the costs facing householders were insured, with the remaining cost covered by a combination of private savings, loans, and government aid.

3 (Thieken, Kienzler, et al. 2016)
4 (Bubeck and Thieken 2018a)

5 (Thieken, Kienzler, et al. 2016; Guha-Sapir, Below, and Hoyois 2018; BMVI 2016)
6 (Thieken, Kienzler, et al. 2016)

Disruption to business activities amounted to \$12.9 billion and the most severely affected industries were manufacturing and commercial industries including hotels, restaurants and transportation. 88% of businesses reported losses following the floods. This was primarily due to the impacts of turnover loss, disruption to operations and building damage. Infrastructure and emergency services were also particularly badly affected, constituting almost 50% of the overall cost of the flooding.⁷

A study by Oosterhaven and Többen (2017) used a modelling methodology to estimate the wider, indirect impacts of the event, reporting the percentage inoperability; or in other words, the direct loss of production capacity in regional economies. Bavaria, Saxony, Saxony Anhalt, and Thuringia all experienced a degree of inoperability, although this was way under 1% of state total production. Indeed, as with most major global disasters, the floods resulted in a negligible macroeconomic impact beyond the initial loss. However, the inoperability of Bavaria’s economy was much lower compared to the three eastern affected states, although the absolute size of inoperability was much greater.⁸ There were sectoral differences regarding the nature of business interruptions: manufacturers mostly suffered from their own delivery problems and the delivery problems of suppliers, whereas the service sector was mostly affected by sales reductions.

7 (Thieken, Bessel, et al. 2016)
8 (Oosterhaven and Többen 2017)

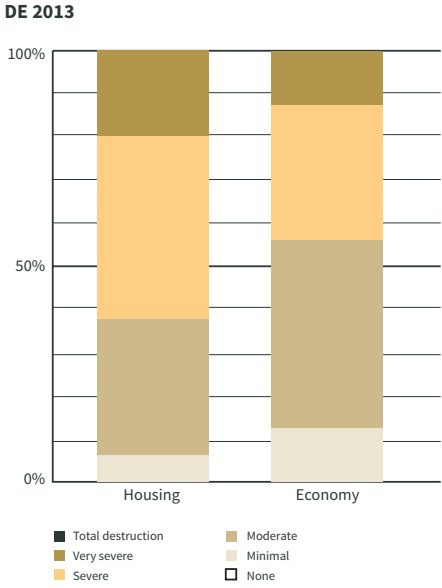


Figure 4: Impacts of 2013 floods on housing and the economy. (Cambridge Centre for Risk Studies survey of German flood experts)

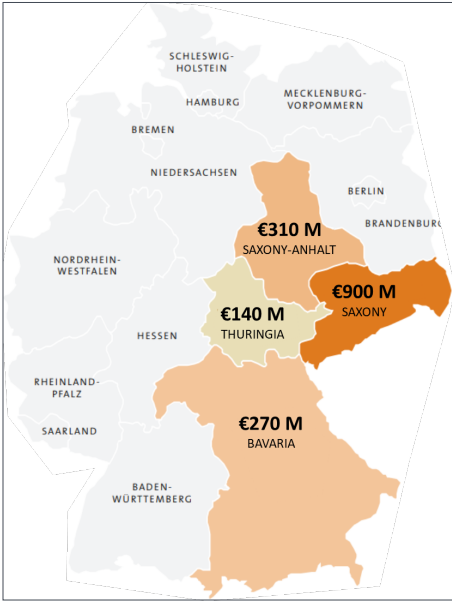


Figure 5: The most affected German states by economic loss. (Die Deutschen Versicherer 2014)

Section 3: Disaster Management and Resourcing

Success of Disaster Management

Response to the flood was coordinated by the Federal Office for Civil Protection and Disaster Assistance (BBK). The BKK organised the distribution of emergency aid to ensure that the system was efficient and non-bureaucratic. In Germany, disaster relief efforts are primarily reliant on voluntary work, and 1.7 million voluntary workers formed the foundation of the disaster response supported by federal government resources. Volunteers were organised into fire brigades, relief and aid organisations, the German Agency for Technical Relief (THW), and other agencies with further functions.

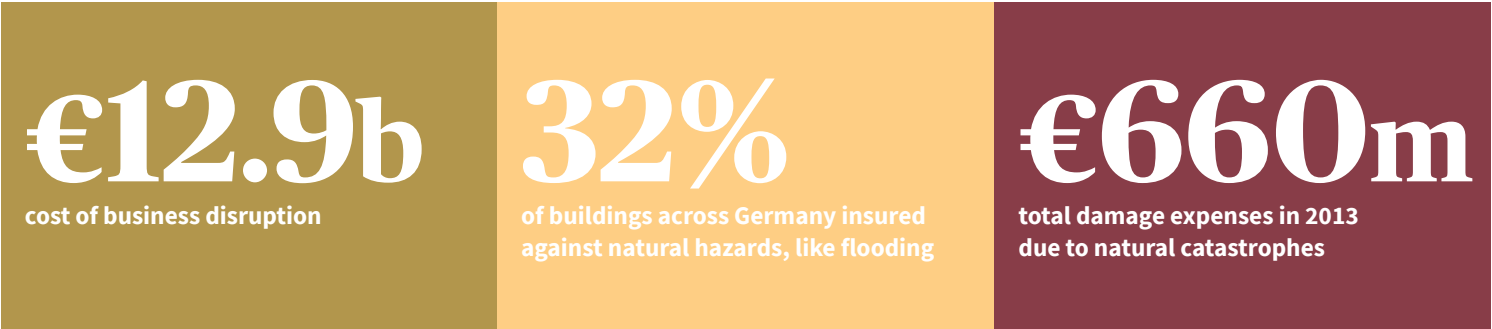
Disaster Financing and the Role of Insurance

Recovery was primarily financed by the state, which allocated a total budget of €8 billion to the relief and recovery effort. Relatively low flood insurance penetration meant that the insurance sector covered only 20% (€1.65 billion) of total economic losses.⁹ Only 35% of the costs facing householders were insured, with all remaining costs covered by a combination of private savings, loans, and government aid. Of the €8 billion in state funding, €1.5 billion was used to repair federal infrastructure. The remaining budget was split evenly between the federal government and the states to support disaster recovery. In addition to federal funding, private donations from major charities and relief organisations amounted to €108 million. In total, the funds that were made

available for reconstruction exceeded the cost of the damage caused by floods.

Following the 2002 floods, losses to private households were compensated up to 80% by the state. The money was not restricted to any specific use and could be used at the homeowner’s discretion. This meant that opportunities to build back better in 2002 were largely missed. In 2013, resources were allocated more carefully to affected residents and businesses. Regrettably, however, the opportunity to combine reconstruction with risk reduction was once again missed. Generous government assistance was found to disincentivise self-provision, such as purchasing flood insurance, because residents believed that the government would cover the cost of damage. After the 2002 floods, the German Insurance Association (GDV) advanced the state of flood

9 (Die Deutschen Versicherer 2014)



risk assessment using geo-information sciences and better data, to produce detailed probabilistic flood models. This meant premiums could be more reliably set and risk transferred from the state to the private insurance and reinsurance sectors.¹⁰

In 2013, 32% of buildings across Germany were insured against natural hazards including flooding. Relative to 2002, insured losses to households were considerably higher on account of growing insurance uptake. In 2013, 32% of buildings and 19% of contents were insured against floods, up from 19% and 8% in 2002, respectively.¹¹ Flood insurance in Germany is available for private households and commercial and industrial enterprises, usually offered as a selectable add-on to property insurance or sometimes automatically included.

However, general policies that cover high-risk areas usually have exclusions. This means that in areas such as Passau and Grimma that are at a high risk of flooding and were severely affected in 2013, there was a lower availability of flood insurance. The state of Baden-Wuerttemberg is an anomaly in terms of insurance penetration relative to the national average, because flood loss compensation was included in compulsory building insurance until 1994, and even though this monopoly insurance was abandoned, insurance penetration remains extremely high at 94%.¹² On the national scale, compulsory insurance schemes have been questioned and then rejected on multiple occasions, notably in 2004 and 2015 in the aftermath of the two discussed major events.

According to monthly claims expenditure statistics, June and July saw the majority of the expenses to the industry associated with the flood event.¹³ Of the EUR 660 million total damage expenses in 2013 due to natural catastrophes,¹⁴ June and July were responsible for EUR 380.8 million and EUR 132.7 million, respectively. The distribution of insured losses were concentrated in Saxony, amounting to EUR 900 million, as well as Saxony-Anhalt (EUR 310 million), Bavaria (EUR 270 million), Thuringia (EUR 140 million).¹⁵

10 (Risk Management Solutions 2003)
11 (Surminski and Thieken 2017)
12 (Die Deutschen Versicherer 2014)

13 (Die Deutschen Versicherer 2014)
14 Including flood/heavy rain, flood, earthquake, subsidence, snow pressure, avalanches/landslides and volcanoes
15 (Die Deutschen Versicherer 2014)

Section 4: Recovery and Resilience

Overview

Recovery is defined as a return to normality and an attempt to bring the post-disaster situation to some level of acceptable performance. However, a post-disaster ‘normal’ may not be a return to the same status as before the event, especially if safety and amenity could be improved to enhance resilience and achieve a new normal. Recovery from disaster can therefore be viewed as a process of resilience building, whereby the capacity of a community to spring back after the initial shock of a disaster is increased. Floods can act as catalysts for human adaptation and there is a ‘window of opportunity’ in the early phase of recovery to improve resilience or ‘build back better’. Therefore, although there is a strong imperative to recover quickly and get people back home and business back in operation, a balance must be achieved between speed and enhanced resilience.

Speed of Recovery

In Germany, our survey of residents showed that 93% of households in Passau had returned to normal in under two years. This is supported by a survey¹⁶ of self-reported recovery of flood-affected residents in Saxony-Anhalt, Saxony, Bavaria, and Thuringia (of which 83% were property owners), which revealed that 52% of respondents had (almost) fully repaired the damage to their building structures, and 16% had (almost) fully replaced damaged or destroyed household contents. In contrast, for some respondents, building structures (13.5% of respondents) or contents (6.2%) still showed considerable deficits. 1% of those surveyed reported that their houses had to be demolished after the event, while 11.3% and 17.9% reported no

16 (Bubeck and Thieken 2018b)
17 (Bubeck and Thieken 2018b)

DE 2013

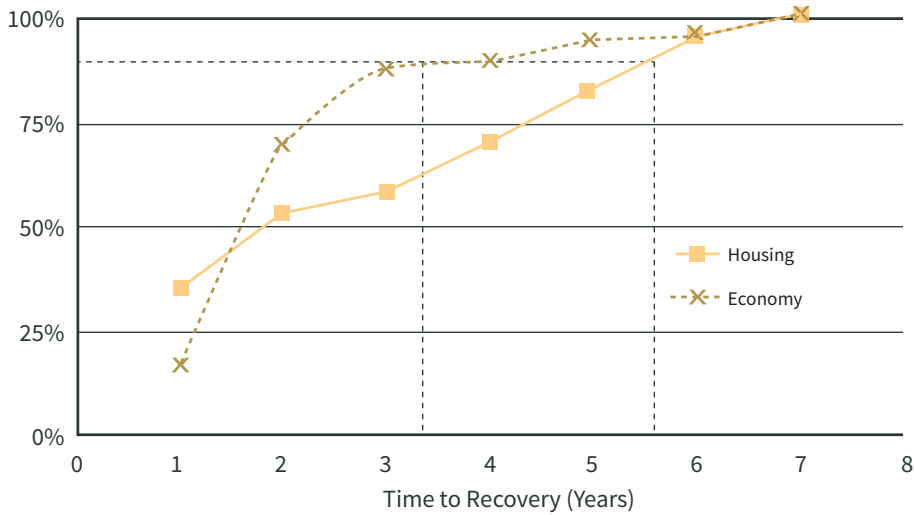


Figure 6: Speed of recovery of housing and the economy. (Cambridge Centre for Risk Studies survey of German experts)

damage to contents or building structure, respectively. 27.9% of respondents indicated that the flood event no longer had any effect, while 14.5% indicated that the flood event still strongly affected them. From this, it can be concluded that social recovery was yet to be completed at this time (according to the definition of recovery to 90% of the pre-event level or to a new stable norm). Some regions took longer to recover than others, controlled by the level of financial aid that was offered by the state to aid recovery. In contrast, our survey of experts suggested that housing took between five and six years to get back to normal compared to three years for the economy to return to normal operation (Figure 6). This significant difference between residents and experts is interesting, and a possible explanation is that residents surveyed included people who were only minimally affected by the flood whilst

experts were contemplating people who were worst affected and were displaced because their homes were severely flooded.

By 2018, five years after the event, lives and livelihoods had mostly recovered and private sector repairs, including repairs to private homes, had been completed.¹⁷ Recovery was adequately financed and damage repair in Saxony was advanced, with most measures completed. However, not all approved flood relief measures had been paid and the recovery of non-critical losses was not complete. State infrastructure was being repaired and losses incurred during the floods were largely resolved but measures to incorporate resilience into recovery and rebuild were relatively slow to be implemented.

Quality of Recovery

As discussed, a return to ‘normal’ may be undesirable if the quality of a system could be improved to enhance resilience. Floods can act as catalysts for human change and there is a ‘window of opportunity’ in the early phase of recovery to improve resilience or ‘build back better’.¹⁸ The ‘window of opportunity’ for accomplishing post-disaster improvements is narrow, in many cases lasting for just 18–36 months after an event.¹⁹ Within this period, governments are required to manage a disaster and restore functionality of critical systems, and so issues relating to an event are pushed high up the policy agenda. Opportunities to ‘build back better’ were missed following the 2002 flood. This was largely due to a lack of regulation concerning the allocation of state aid to homeowners that did not require repair and rebuilding measures to advance the state of resilience. However, our survey of experts indicates a more positive outcome after the 2013 floods. About half the experts surveyed thought the resilience of both housing and businesses improved (Figure 7).

Recovery was also influenced by socioeconomic characteristics and psychological factors. Social inequality and marginalisation affected housing reconstruction, meaning that many lower-income groups and tenants could not recover and had to leave their homes. Those who stayed were mostly uninsured homeowners, the elderly and residents who were in poor health. The latter two groups then experienced marginalisation because they were unable to move to new areas, thereby representing an increase in vulnerability in the recovery process.

18 (Johnson, Tunstall, and Penning-Rowsell 2005)
19 (Platt and So 2017)

DE 2013

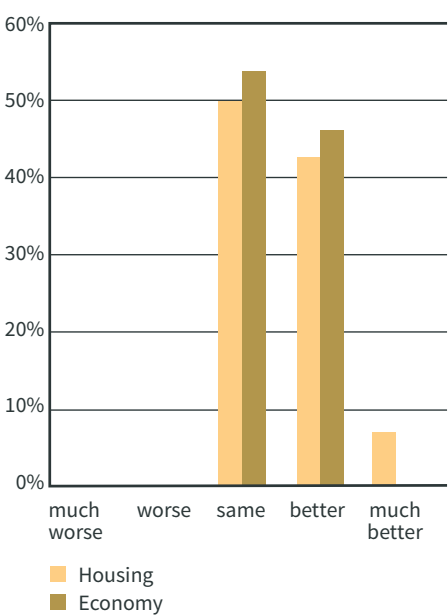


Figure 7: Quality of recovery in terms of changes in safety and amenity. (Cambridge Centre for Risk Studies survey of German flood experts)

Flood affected households that had flood insurance were better compensated than those who were uninsured, but the level of compensation offered by the state was so high (80% of damages) that the speed and quality of recovery was effectively the same for insured and uninsured households. There was also no measurable difference in the quality of recovery in uninsured and insured properties.

Flood recovery was held up by the German approval procedure for construction that legally requires a consultation process (‘Planfeststellungsverfahren’). This allows citizens to demand explanations for all the decisions that are made during the construction process and even gives them the power to halt projects. In Grimma town, citizens opposed a flood protection wall that blocked their view, and in Mühlbeck, property owners blocked an upgrade to a nearby levee. Community involvement in this consultation process prevented the state from making meaningful changes to flood prevention measures and slowed post-disaster recovery.

State of Resilience Today

After the 2002 floods, efforts were made to develop an integrated system of flood management which led to some households being better prepared for the event in 2013. Equally important were the improved warnings and dissemination of information in the run-up to the 2013 flood, which represent improvements in the level of resilience to floods.²⁰ Several legislative changes were introduced, including the German Flood Protection Act of 2005 and the EU Floods Directive of 2007 that considered both structural and non-structural means of mitigating damage. A study evaluated these post-2002 changes that included consideration of flood hazards in spatial planning and urban development, comprehensive mitigation and preparedness measures within properties, more effective flood warnings, a more coordinated disaster response, and better maintenance of flood-defence systems, all helped to

20 (Kreibich et al. 2011)

mitigate damage from the flooding in 2013 and, thus, reduced damage. However, some buildings that were flooded in 2002 were flooded again in 2013 because there had been no improvements to flood resilience and there was a lack of awareness about how structures could be made more flood resistant and little incentive to inform building owners about how this might be done. There was also little financial incentive to rebuild in a better, more flood-resilient way.²¹

After the 2013 floods, the federal government approved a national flood protection programme (the Nationales Hochwasserschutzprogramm), due for completion by the end of 2022, with the aim to develop preventative measures and give rivers more space, while addressing conflicts of interest between exposed or associated stakeholders. The total budget for the programme is €5.4 billion, and includes dyke relocation, controlled flood retention, and projects for the elimination of weak points in existing flood protection.²² Since 2013, federal governments and the insurance sector have worked to increase risk awareness amongst homeowners and businesses in Germany. The German Insurance Association (GDV) provides regularly updates to its flood risk mapping and the authorities in most states have extensive information campaigns.

There is an increasing emphasis on citizens taking responsibility for their own flood preparedness and protection. A survey of households affected by the 2013 floods in Saxony and Bavaria explored ways of encouraging citizens to take responsibility and improve household resilience in partnership with the State.

21 (Zurich Insurance Company 2014)
22 (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit 2019)

€5.4b

The total budget for the [national flood protection programme] includes dyke relocation, controlled flood retention, and projects for the elimination of weak points in existing flood protection.

There is evidence that homeowners are willing to make investments in mitigation and research in Germany but, in order to increase uptake, communication should focus on the potential of flood-mitigation measures to effectively reduce or avoid flood damage and on information about how to implement such measures in practice.

Despite the significant losses in 2013, domestic insurance penetration remains relatively low, at 41% in 2018, and there exists major regional variations.²³ However, the federal government will no longer offer compensation to the uninsured and insurance is therefore expected to rise further. From 2019, Bavaria will no longer provide emergency financial aid to disaster victims who could have purchased private insurance. The insurance industry has now expanded its portfolio, and now offers individual insurance solutions for the ‘Zürs 4’ flood zone. The German Insurance Association (GDV) regularly updates and improves its flood zones and is currently developing a hazard zone for flash floods.²⁴ The combination of improved insurance

23 (Die Deutschen Versicherer 2018)
24 (Ellenrieder 2018)
25 (Ellenrieder 2018)

solutions, increasing risk awareness (particularly in less exposed areas), and a reduction of government assumption of losses, will drive an increased role of risk transfer to the insurance industry.

Although steps have been taken to ensure that houses are no longer built on high risk flood plains, three million people currently live in areas that are considered flood prone throughout Germany, with a 1-in-10-year probability of experiencing potentially damaging and life-threatening floods. Climate change is likely influencing rainfall patterns in Europe, with historical observations and model projections anticipating a declining trend for summer precipitation in central Europe away from the coast, and an increase in winter rainfall. Heavy rainfall events are expected to result in more frequent fluvial flooding in winter, but summer precipitation events, as seen in 2002 and 2013, are capable of triggering extreme losses. There are strong indications that climate change can be attributed for the increase in weather patterns producing intense rainfall and resultant river floods.²⁵ Nevertheless, such phenomena is relatively well understood, and advanced protective mechanisms that have advanced significantly following recent flood events are able to reduce major flood losses. Flash floods are, in comparison, difficult to predict and therefore prepare for; in 2016, over 30 flash flood events occurred in the south and east of Germany (particularly Bavaria and Baden-Württemberg) within a two week period.²⁶ High flow rates caused severe erosion, and in many cases, exposed home and business owners were unprepared for the hazard.²⁷

26 (Davies 2016)
27 (Ellenrieder 2018)

Section 5: Discussion

Recovery Outcomes: Successes and Failures

The flood forecast and warning was much better than in 2002, and this meant that there were fewer fatalities and injuries caused by the 2013 floods. Authorities cooperated effectively amongst themselves and with rescue teams, and there was good coordination between volunteer teams and the city. Prompted by the 2002 flood events, the state was better prepared for flooding, and there was overall a higher level of awareness and preparation. This meant that the damage caused by the 2013 floods was only one third of that caused by the 2002 event, despite the greater magnitude in numerous locations. The response and recovery effort was adequately financed, largely by the state who allocated a €8 billion fund. This state support enabled those without insurance to recover losses, but equally undermines and disincentivises insurance purchase in the first place.

In spite of such improvements made following the 2002 floods, task forces were simply unprepared for and unable to cope with the expansive scale of the flood. Incorrect warnings of flood height and the flood characteristic meant that many residents were surprised by the flooding at night. Differences in mentality caused some coordination problems in the field and interrupted collaboration between response teams. The flooding demonstrated that different communication is needed between the state and affected members of the public, and flood help must become less bureaucratic during a disaster. The 2013

floods demonstrated that dyke defence is not always successful, and this was compounded by slow dyke constructions along the Danube. There were widespread psychological effects after the flood, which persist long after the physical and economic recovery has been largely completed.

Considerations for the Insurance Sector

The geography, frequency, and intensity of intense rainfall events and resultant flooding has shown considerable variability across Europe in recent decades. However, most studies agree that the risk of severe storm events is increasing for northern and central Europe in response to forecast global climate change.²⁸ This increased incidence of flooding presents insurers with a dilemma; they can either carry on meeting repeated large claims from a minority of claimants, or exclude hazardous areas with a high probability of flooding. Insurance penetration, although still low in Germany (41% nationwide in 2018), is set to rise substantially as the federal government will no longer offer compensation to the uninsured. Bavaria has announced that, from 1st July 2019, it will no longer provide emergency financial aid following natural disasters to victims who could have purchased insurance.²⁹

Since 2013, federal states, insurance associations and the insurance industry have adopted numerous measures to increase risk awareness among homeowners and businesses in Germany. The German Insurance Association

regularly updates and improves its flood mapping and state governments have launched extensive information campaigns. Could the insurance sector play a bigger role in ‘building back better’? Risk reflective insurance premium pricing can encourage engagement with mitigation measures, for example through insurance discounts once the measures are installed.³⁰ And insured households in Germany are more likely to undertake risk reduction measures than uninsured, suggesting that flood insurance does set an incentive for policyholders to take action. However, as yet, insurance companies do little to encourage precautionary measures.³¹

Section 6: Key Findings

The flooding that inundated large areas of Germany in 2013 was unprecedented, but in many ways not unexpected. The flood of 2002 had demonstrated that there was an increasing risk of devastating flooding in the country, and some risk reduction measures had already been put in place. Some of these measures, such as the early warning system and increased awareness of flood risk, helped to ensure that the impacts and economic losses were lower in 2013 than it had been in 2002, and reduced the number of people who were severely impacted and to a level that required significant recovery effort. However, the state was still underprepared for the 2013 flood event and some areas that had been flooded in 2002 were once again impacted by flooding in 2013; in certain cases, flood protection measures simply shifted the impacts downstream. This indicates that many of the flood defence systems that were implemented following the 2002 event failed to prevent the catastrophic effects of the 2013 flood.

While insurance penetration increased somewhat following the flooding in 2002, overall penetration in Germany remained extremely low so the majority of disaster funding came from the state budget. Opportunities to build back better were missed in 2002, but following the 2013 flood there was a step change in approach to flood risk management representing reformative recovery and an emphasis on reforming infrastructure and social preparedness to become more resilient to flooding.

Effective state aid allowed some sectors to recover rapidly, however it disincentivised individuals from investing in flood insurance. This has been changed since the 2013 floods through legislation that prevents people accessing state recovery aid if they could have purchased flood insurance. This is likely to dramatically increase overall flood insurance penetration. Ultimately, however, the consultation process that allows residents to interrogate any construction process will inhibit many dramatic improvements to structural flood defences unless the government invests significant time on gaining public support and acceptance for the projects. Improving flood resilience in Germany will therefore have to involve the whole community, not just key decision makers in each area.



28 (European Environment Agency 2017b; 2017a)
29 (Ellenrieder 2018)

30 (Kunreuther and Michel-Kerjan 2009)
31 (Thieken et al. 2006)

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