FLASH FLOOD AND PLUVIAL FLOODING FROM THE POINT OF VIEW OF THE INSURANCE INDUSTRY

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1. Introduction

Major flood events are not only the cause for high losses, they are also deeply engraved in people's minds.

The risk of flooding in places away from rivers is generally overlooked. Scarcely anybody realises, that even a thundershower is enough, to create losses in order of magnitude similar to river floods. Altogether nearly half of all insured losses do not result from flood events near big rivers but from local events of flooding at small rivers or in places far from rivers.

The insurance industry sees itself as a partner in securing one's livelihood in case of natural hazards and offers solutions as a contribution to the climate change adaptation process.

2. Possibilities of insurance

Insurance solutions developed for the flood cover widely vary across Europe. So does the market penetration (e.g. less than 10% in Greece, 20% in Germany and more than 75% in the United Kingdom), depending on the risk perception and risk exposure.

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Table 1: Flood insurance coverage across Europe; CEA

AT	BE	CH	CZ	DE	DK	ES	FI	FR	GR	IT	NL	NO	PL	PT	SE	TR	UK
O	C	C	O	S	N	P	O	C	S	O	N	P	O	O	O	O	O

Type of insurance cover	Rate of penetration of cover
C= Compulsory cover by law	> 75%
P+Obligatory pool	25-75%
O= Optional cover	10-25%
S= Cover offered but not widely taken	< 10%
N= Non-existent	not known

In the United Kingdom, flood cover is standard in home insurance, including for those buildings located in a high risk area. This results from the flooding agreement between insurers and the government, which expires in 2013. The Association of British Insurers (ABI) is working with the government to ensure a commercially viable and competitive insurance market can offer affordable flood insurance to as many people as possible. In order to achieve this, it is imperative that the Government works on reducing flood risks and improving flood risk assessment.

In Germany it has been possible since 1994 to acquire insurance cover against flooding within the so called "extended coverage for elementary perils" as part of home insurance.

This insurance package is voluntary in Germany. The scope covers approximate 98,5% of inhabited areas. However, due to the general public's lack of risk awareness and expected post-disaster relief from the State, demand is modest. There was about 20% market penetration in 2009, unevenly distributed. In federal states with former insurance monopoly (former east German states until 1990; Baden-Wurttemberg until 1994) market penetration is high while in all other areas it is comparatively low.

Insurers use statistical data and management ratios to calculate premium rates and deductibles.

Since each risk has to be assessed on a case-by-case basis using statistical data, GDV´s zoning system ZÜRS Geo has become an important element of catastrophic hazard insurance in Germany.

3. Tools for risk assessment

In many countries the (re)insurance industry has developed or disseminated zoning tools, sometimes in cooperation with public authorities. This is the case, for example, of the HORA-platform in Austria, which is currently being extended to flash and pluvial floods. In France, the MRN GIS provides insurers all the flood hazard areas produced by public authorities. In the UK, the ABI concluded an informal agreement with the Environment Agency under which insurance companies have access to improved public data sets.

In Germany, ZÜRS Geo[2] provides an online risk assessment tool for the insurance industry as a means of assessing flood risk and offering a risk-related premium.

At the heart of the ZÜRS Geo system there is a geo-database using address information (road network, house number data etc.) to show the risk of flooding for any requested area. ZÜRS Geo is employed as a technical basis also for other automated zoning systems (e.g. environmental liability) and as a viewer for web based services (WMS, WFS etc.) provided by the German authorities.

The varying river flood hazards are depicted in different hazard zones, whereas backwater and torrential rain are uniformly distributed over Germany and therefore also uniformly considered in the calculation of the required premium.

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[2] *ZÜRS shortly means (Z)onierungssystem für (Ü)berschwemmung, (R)ückstau und (S)tarkregen [zoning system for floods, backwater and torrential rainfall], Geo stands for Geographical Information System (GIS).*

In ZÜRS the flood hazard areas are represented by four zones. The hazard zones GK1, GK2, GK3 and GK4 refer to the following periods of return of the event:

- GK4 - high hazard: flooding occurs on average statistically at least once in 10 years
- GK 3 - moderate hazard: flooding occurs on average statistically at least once in 50 years but less than once in 10 years
- GK 2 - low hazard: flooding occurs on average statistically at least once in 200 years but less than once in 50 years (also incorporating the risk of breaching or overtopping of a dike)
- GK 1 - very low hazard: flooding occurs on average statistically less than once in 200 years

In 2006 the GDV added further information on 150.000 km of small rivers (brooks) and thus a new so called "Bachzone" (brook zone) to ZÜRS Geo. Now it is also possible to identify the flood hazard of brooks in Germany.

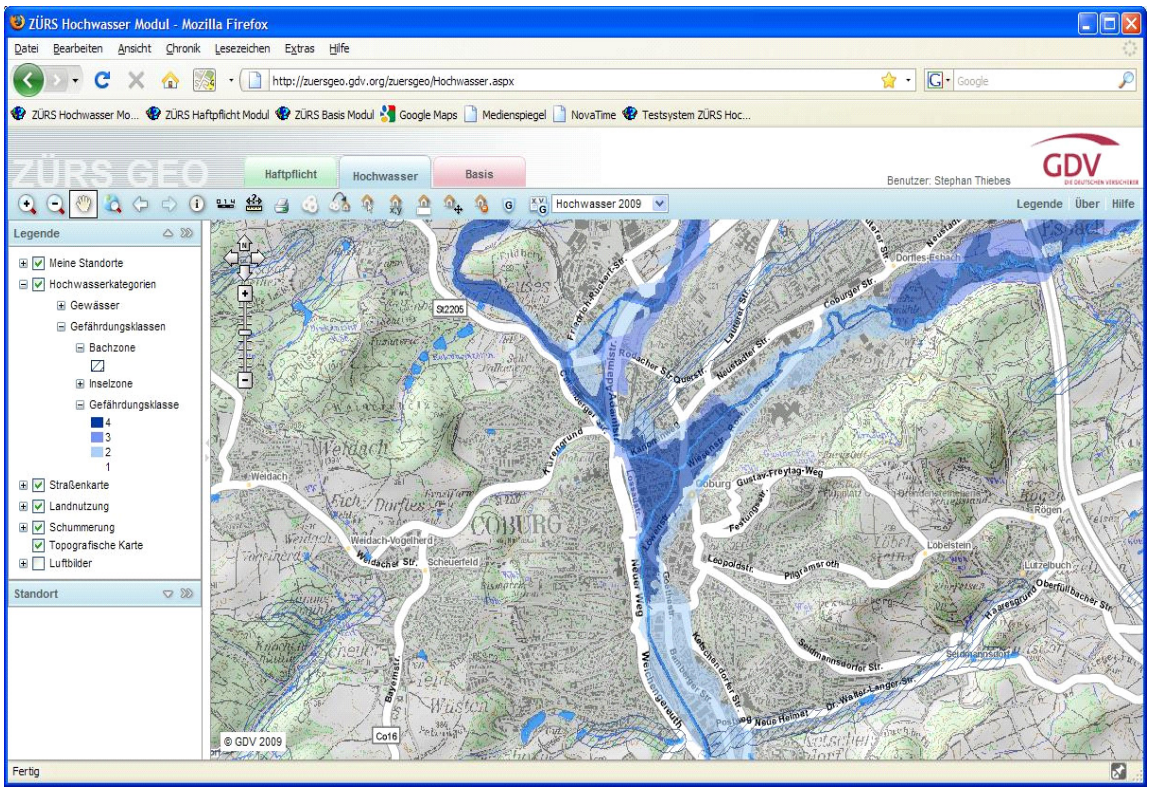

Figure 1: ZÜRS Viewer (river: bright blue, GK4 (10-year flood): dark blue, GK3 (10 to 50-year flood): blue, GK2 (50-200-year flood): light blue, GK1: residual area)

Until now, it is not possible to zone the risk of torrential rain resulting in flash floods and pluvial flooding for actuarial purposes.

Due to an eager demand for research, the German insurance industry works together with the Climate Service Centre (CSC), an initiative of the German Government.

4. Flood losses

There are many reasons for damages resulting from flash floods/pluvial flooding such as, for example, water flowing off along the surface, backwater rising in the urban drainage system, water accumulating in lower-lying areas or landslide as a result of a ground which can no longer absorb water.

The big flood catastrophes in Germany since 1993 resulted in losses of more than 14 billion Euros (Table 2). The many small- and medium-scale floodings all together add losses of several billion Euros.

Since flooding at the main rivers and major tributaries cause only part of the damages, all local losses together account for the remaining large portion of flood damages.

In Table 2 river floods are marked in black, flash floods in red and mixed floods in purple. Altogether nearly half of all insured losses do not result from flood events at big rivers but from local events of flooding at small rivers or in places far from rivers.

Table 2: most expensive flood catastrophes in Germany since 1990, Source Munich Re NatCatSERVICE

YEAR	AFFECTED AREA	TOTAL LOSS [BILLION EURO]	INSURED LOSS [BILLION EURO]	INSURED PART [%]
1993	Rhine area	730	220	30
1994	Saale-Unstrut- area	220	80	36
1995	Rhine area	390	160	41
1997	Oder	320	30	9
1998	All Germany	100	?	?
1999	Danube area	325	65	20
2002	Western Bavaria	100	50	50
2002	Elbe - and Danube area	11 600	1 800	16
2005	Danube area	175	40	23
2006	Elbe	120	20	17
2007	Central Franconia (Baiersdorf)	100	< 5	< 5
2008	Baden-Württemberg (Killertal)	>100	>100	?

Also in other countries, there is an increasing problem of high and increasing flood damages in areas away from rivers.

For example, in Great Britain two flood events in summer 2007 cost nearly 6 billion euro. Here also it was not the river flood which caused massive flooding, but mostly local rain exceeding the capacity of the drainage system. The Environment Agency informed that 80% of the buildings were damaged by water flowing off along the surface, by backwater coming out of the canalization or by water accumulating in low lying areas, some 17,000 in the city of Hull only. Following the 2007 floods the ABI conducted a major research project looking at surface water flood risk in

England. The aim of the research was to highlight the challenges likely to be faced by Local Authorities in preparing surface water flooding strategies and to give an indication of the measures and costs involved in tackling surface water flooding in a typical local area[3].

The tropical storm Allison flooded the city of Houston/Texas including several hospitals and malls; financial loss: 6,5 billion euro.

After a thunderstorm in Beijing in July 2004 the traffic in several areas was interrupted and many subways were flooded. In Taipei, the underground was inundated due to the typhoon Nari in January 2001.

The most dramatic catastrophe beside the flash flood-catastrophe in Madeira in February 2010, was the one in Istanbul in September 2009. Nearly 40 people died, when water came down the streets in the manner of wild brooks.

In the field of loss data it is mostly impossible for the insurance industry too distinguish systematically between individual flood types. Most flash floods in Europe are categorized under "severe storm", in other parts of the world under hurricanes und typhoons. As a result, it is not possible to obtain direct information on events of flash floods and pluvial flooding.

Munich Re, with its database NatCatSERVICE, possesses the most comprehensive database of natural catastrophe losses worldwide. Here it is sometimes possible, to obtain rough flash flood information.

[3] *ABI: Urban surface water management planning - Implementation issues, ABI research paper 13, 2009 http://www.abi.org.uk/Publications/Urban_Surface_Water_Management_Planning_-_Implementation_issues1.aspx*

Table 3: The costliest flash floods in Europe since 1980, source: © 2010 Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE – As at April 2010

Period	Event			Description	Losses (US$ m, original		Fatalities
					overall losses	insured losses	
3.-9.11.1987	C: Flash flood, landslide	Spain	Mediterranean Sea, Valencia, Murcia, Alicante	Floods up to 2,5 m high, torrential rain (1000 mm/38 hours), landslides. Train services disrupted, communication and power lines cut. Damage to citrus crops US$ 30m.	1000	185	16
31.10.-2.11.1990	C: Flood	Croatia	Zagreb area	Heaviest rain for 50 years (220-260 mm/48 h). Landslides. River Savinja burst its banks, bridges washed away, roads blocked, houses flooded. Also affected: Slovenia.	800	0	0
31.10.-2.11.1992	C: Flash floods, severe storm	Italy	esp. Tuscany, Rome, Sicily	Torrential rain. Rivers burst their banks. Houses, cellars flooded. Toskany: worst rain since 1813 (510mm/October). Homeless: 1,000, injured: numerous.	712	2	3
8.-11.9.2009	C: Floods, flash floods	Turkey	Istanbul, Sariyer, Kilyos suburbs; Tekirdag, Kumbag; Canakkale; Bursa; Balikesir; Aydin; Izmir; Antalya	Heavy rain, flash floods up to 4 metres. Worst precipitation for 80 years (220mm), worst flooding in 500 years. Rivers burst their banks. >4,000 houses, several industrial facilities flooded/damaged. 200 cars destroyed. Major damage to infrastructure. Roads flooded, bridges damaged/destroyed. Trees downed. Injured: 20, missing: 5, evacuated: 200.	600	250	38
1.-4.10.1988	C: Flash floods, severe storm, rainstorm	France	Nîmes	Torrential rain (300 mm/24 h), heavy flooding. 18,000 houses damaged. Shops, factories and warehouses affected. Streets flooded. More than 1,000 cars destroyed. Power and telephone lines cut. Affected: 50,000.	500	315	11
12.-14.11.1999	C: Flash floods	France	Tarn, Lacabarede; Aude; Pyrénées-Oriental, Herault; Labastide-Rouairoux, Villedaigne	Torrential rain (240 mm/18 hours, Aude, max. rainfall intensity 112 mm/1 hour), wind speeds up to 100 km/h (worst storm for 50 years in the region), landslides. Houses, businesses flooded, dozens of cars destroyed. Roads, railways, bridges destroyed. Power, communication and water supplies disrupted. Losses to agriculture. Missing: 3.	500	400	33

Table 3 shows as an example of how the information is stored the costliest flash floods in Europe since 1980.

Up to now nearly all big cities in Germany have stayed untroubled by such sudden flood events, mostly small towns and villages were affected. This

fact is not only because of the broad dimensioning praxis, it was simply luck.

However, flash floods following heavy rain can strike anywhere. But we do not know, when and especially where it will happen.

5. Conclusions

Worldwide every year there are high losses caused by flood events. They divide into several quite different types, half of all flood losses result from local floods at small rivers or in places far from rivers.

The insurance industry has a substantial interest in analysing the subject torrential rain/flash floods/pluvial flooding in more detail. The target is to estimate the risk of local flooding, so that the insurance industry can offer risk based products.

Therefore further research is required in this area and easy access to detailed data should be ensured, free of charge, for all stakeholders, including the insurance sector.

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