4th International Symposium on Flood Defence

Flood Insurance

From Clients to Global Financial Markets

Wolfgang Kron
Geo Risks Research
Munich Reinsurance Company

Topics

Recent flood disasters and disaster statistics

Disaster risk management

Flood insurance

Cat bonds

Micro-insurance

Final remarks

Recent flood disasters and disaster statistics

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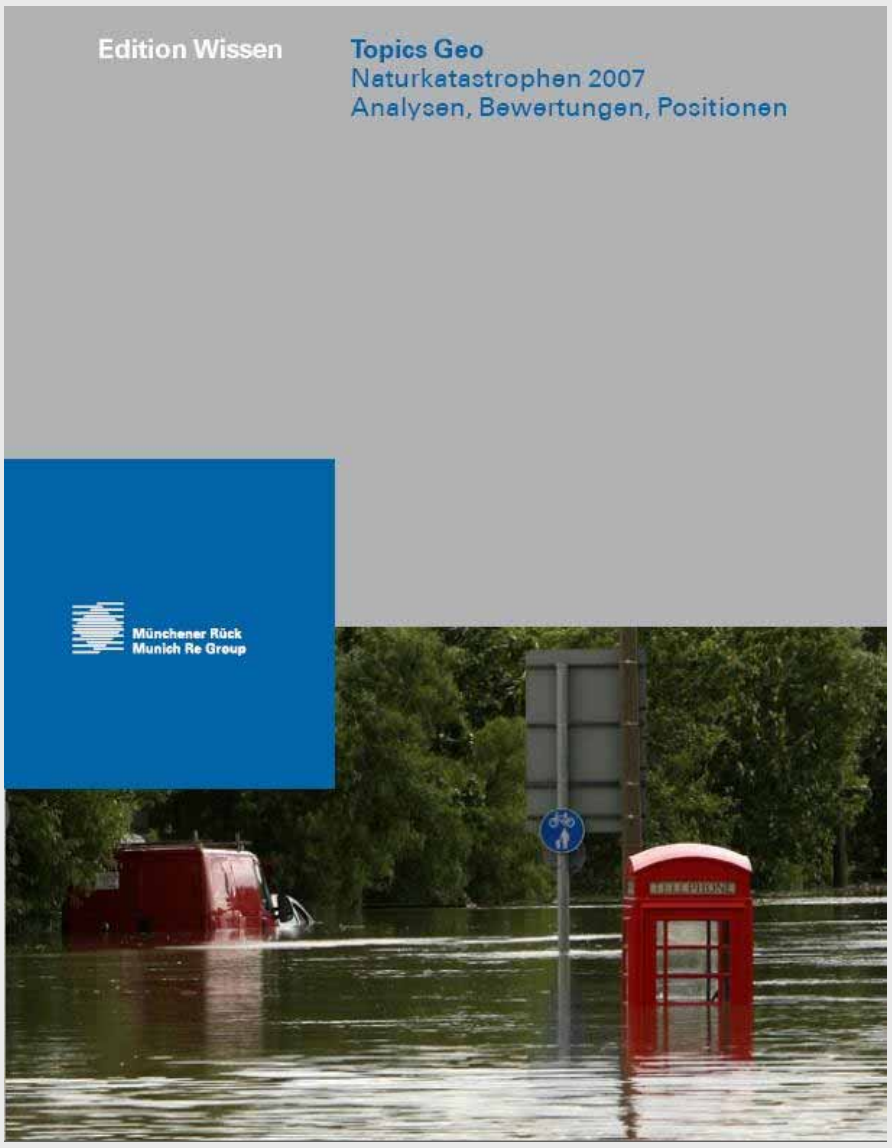
The costliest floods in the 21st century

(original values in US$ million, not adjusted for inflation)

* including wind-storm losses)

			losses in m US$:	total	insured	[% ins]
2000	Japan: Typhoon Saomai			1,400	1,050	75
2002	China (Yangtze)			8,200		<1
2003	China (Yangtze, Huai)			7,890		<1
2004	China (Yangtze, Yellow, Huai)			7,800		<1
2004	India, Bangladesh, Nepal			5,000		<1
2005	China (Pearl)			5,000		<1
2005	India (Mumbai)			5,000	770	15
2006	India (Gujarat, Orissa)			5,300	400	8
2007	Indonesia (Jakarta)			1,700	410	24
2007	Tajikistan			1,000		<1
2007	India			2,600		<1
2007	Oman: Tropical Cyclone Gonu			3,900	650	17
2007	China (Huai)			6,800		<1
2007	Pakistan: Tropical Cyclone Yemyin			990		<1
2007	Bangladesh: Tropical Cyclone Sidr		*	3,775		<1
2000	Italy (north), Switzerland (south)			8,500	470	6
2000	United Kingdom			1,500	1,100	73
2002	Central Europe (Elbe, Danube)			21,500	3,400	16
2003	France (Rhone)			1,600	900	56
2005	Romania, Bulgaria			2,440	15	<1
2005	Switzerland, Austria, Germany (Bavaria)			3,300	1,760	53
2007	United Kingdom			8,000	6,000	75
2001	USA: Tropical Storm Allison (Houston,TX)			6,000	3,500	58
2001	Argentina			750		<1
2005	Canada (Alberta)			860	190	22
2005	USA: Hurricane Katrina (Gulf Coast)		*	125,000	61,600	49
2007	Mexico (Tabasco)			2,500	350	14
2007	Australia (East Coast)		*	1,300	680	52
2008	*Australia (Queensland)*		*?*	*2,000*	*1,600*	*>80*
2000	Mozambique, Zimbabwe, South Africa			715	50	7
2007	Madagascar		*	240		<1
2007	Sudan			300		<1

Topics Geo - Annual review of natural catastrophes



First edition in 1994

Now available in 5 languages :

- German
- English
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- Spanish

As at: February 2008

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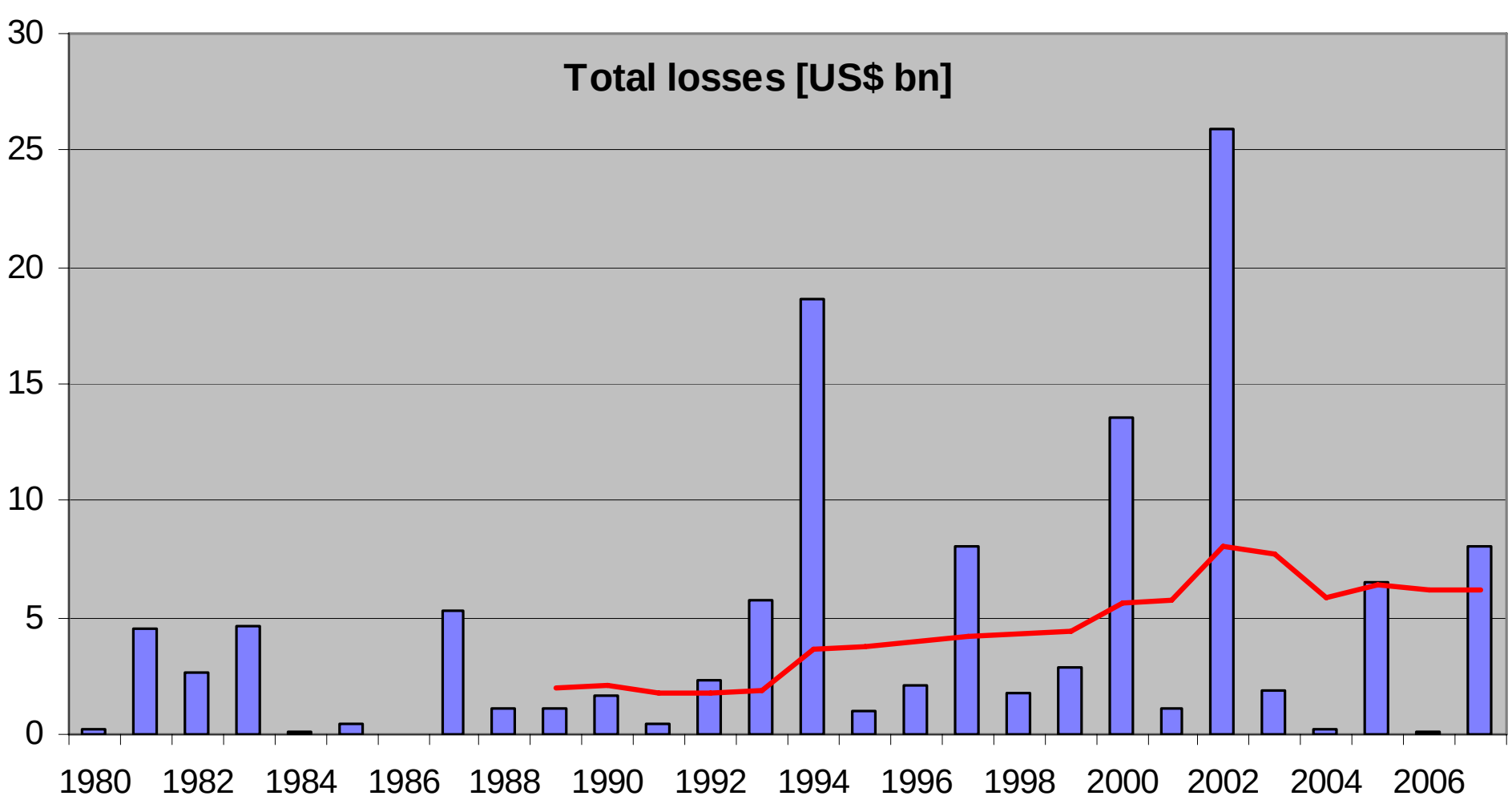
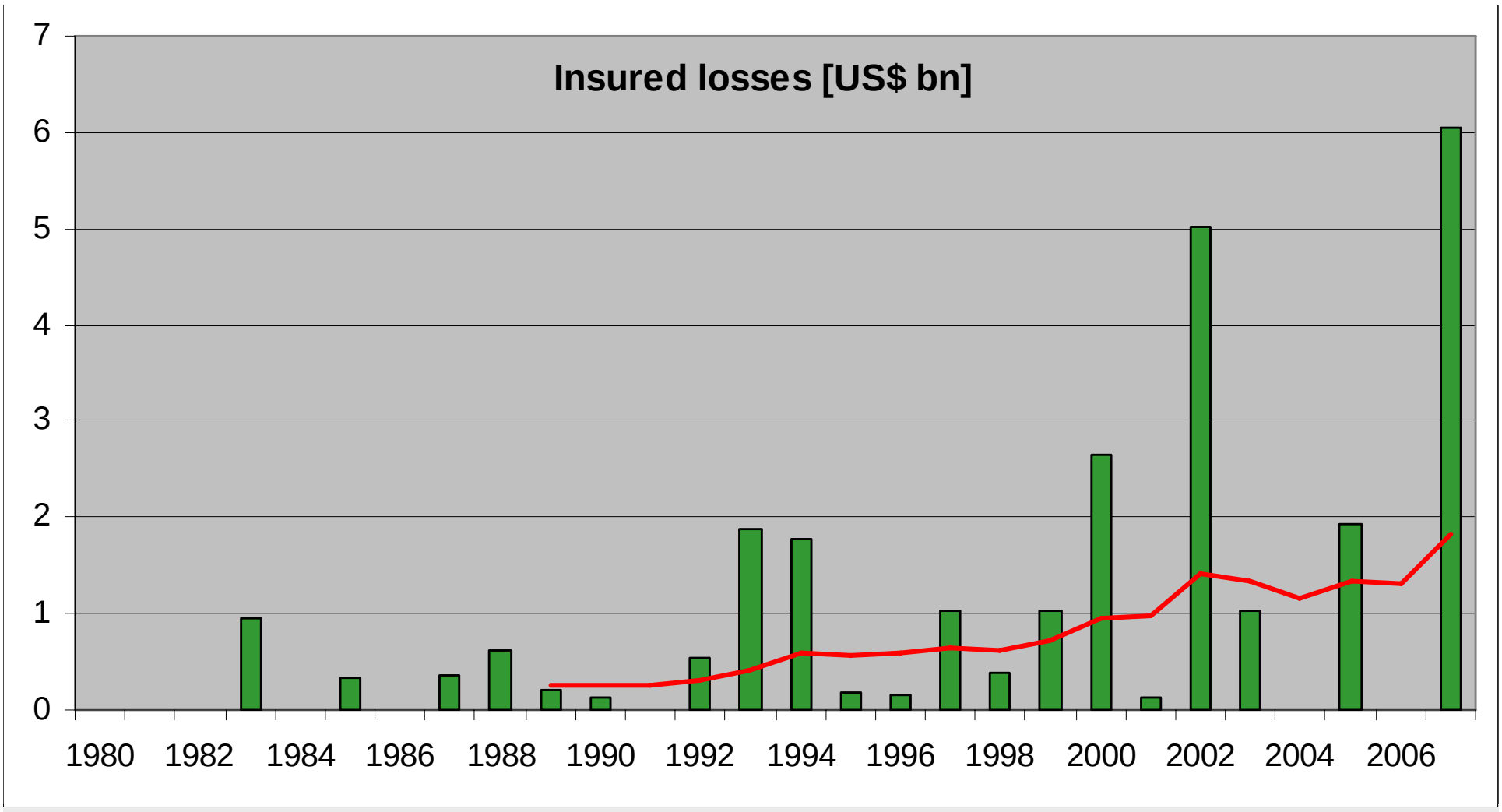
Flood losses in Europe



As at: February 2008

Flood losses in Europe



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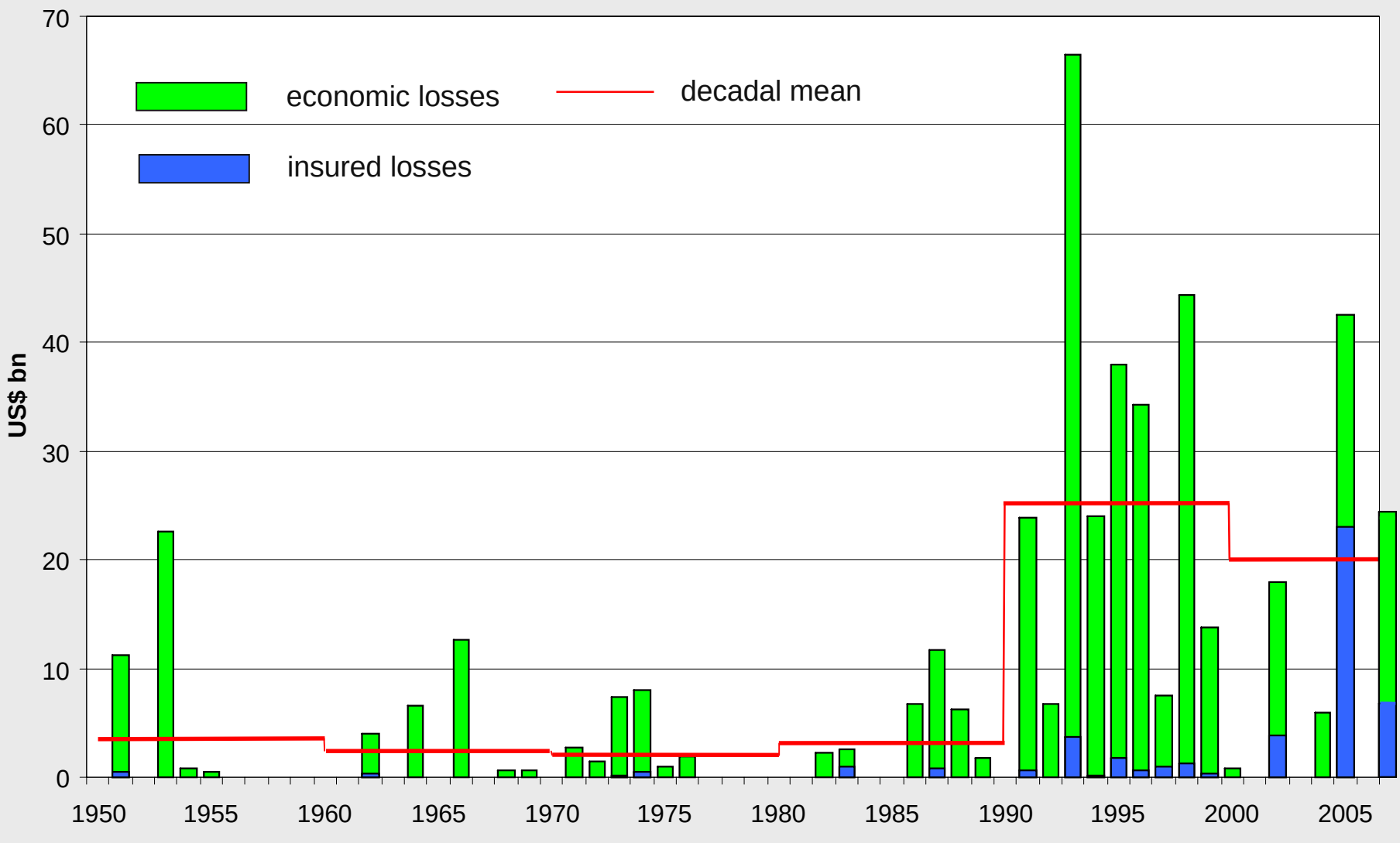
Great Flood Disasters 1950 – 2006

Overall and insured losses

(2006 values)



What are “great natural catastrophes“?

The affected region's ability to help itself is distinctly overtaxed

- **Interregional or international assistance is necessary**
- **Thousands are killed**
- **Hundreds of thousands are made homeless**
- **Substantial economic losses**
- **Considerable insured losses**

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Why only “great natural catastrophes“ ?

. . . because neglecting the development
in worldwide communication activity
during the past decades
extremely biases the statistics
of ALL loss events.

It may even lead to wrong trends.

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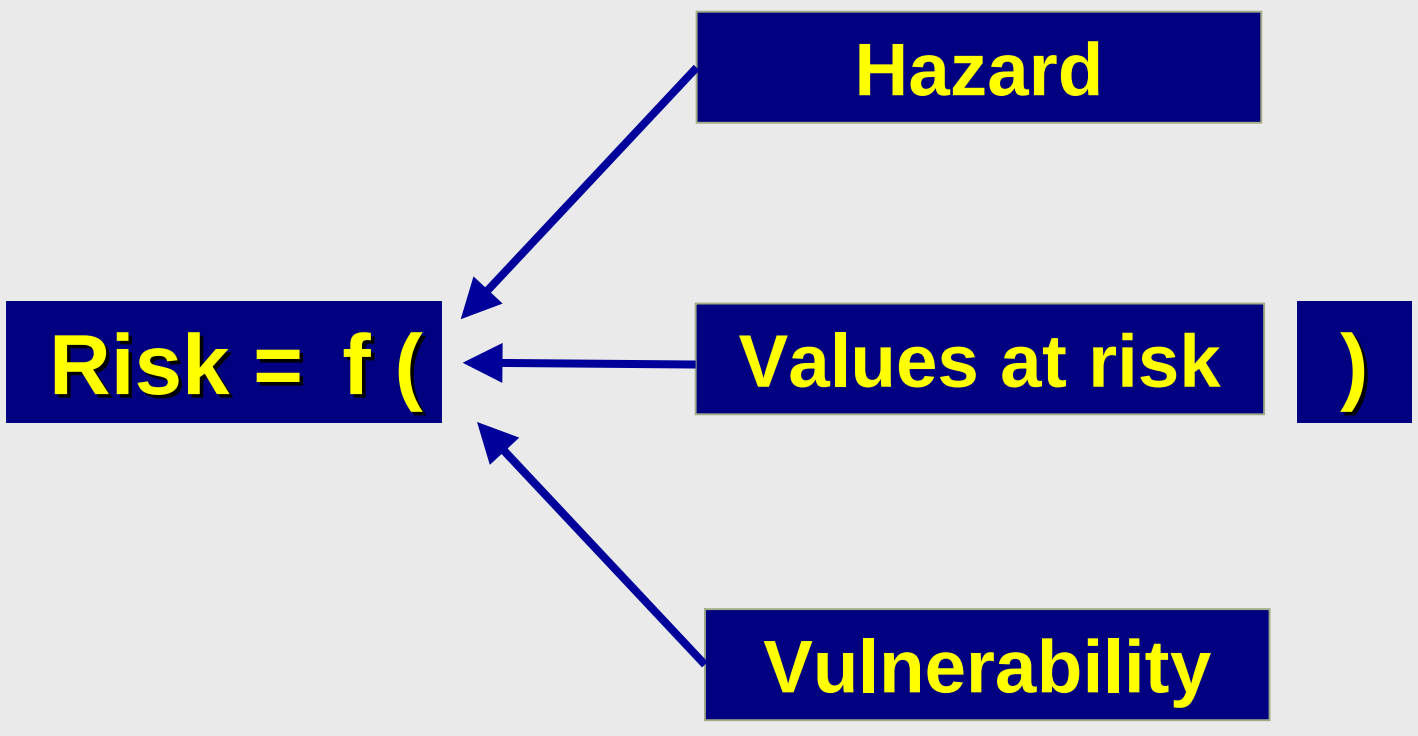
Risk reduction



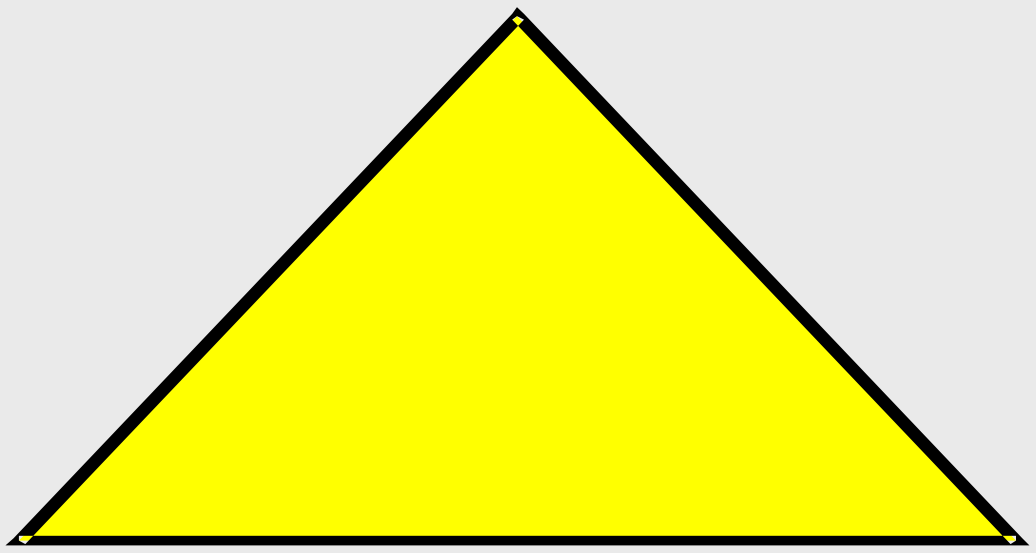
How can we reduce the risk?

by reducing one or more of these influencing factors

Risk reduction

requires a risk partnership between

Public authorities



People concerned

Insurance industry

Main tasks of the partners

Public authorities/organisations

→ basic prevention measures :

- land-use regulations
- technical flood control
- observation networks
- forecasting and warning
- flood retention
- providing information

- avoiding frequent losses
- mitigation during rare events

Main tasks of the partners

People concerned/affected

→ **actions during rare events: loss prevention/reduction/limitation**

- **proper construction**
- **spot protection**
- **appropriate behaviour** **(alarm plan, checklist)**
- **seeking/receiving information**
- **maintaining risk awareness**

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Main tasks of the partners

Insurance industry

→ **securing existence, prevention of ruinous consequences for personal/business property**

- **assuming part of the risk**
- **proper risk assessment**
- **adequate contracts**
- **providing information**
- **accumulation control**

→ **Make sure that the commitments towards the insureds can be fulfilled.**

Risk partnership

in a more holistic way . . .

Insureds ⟷ **Insurers**

State ⟷ **Reinsurers**

International donors, Development banks ⟷ **Capital market, Banks**

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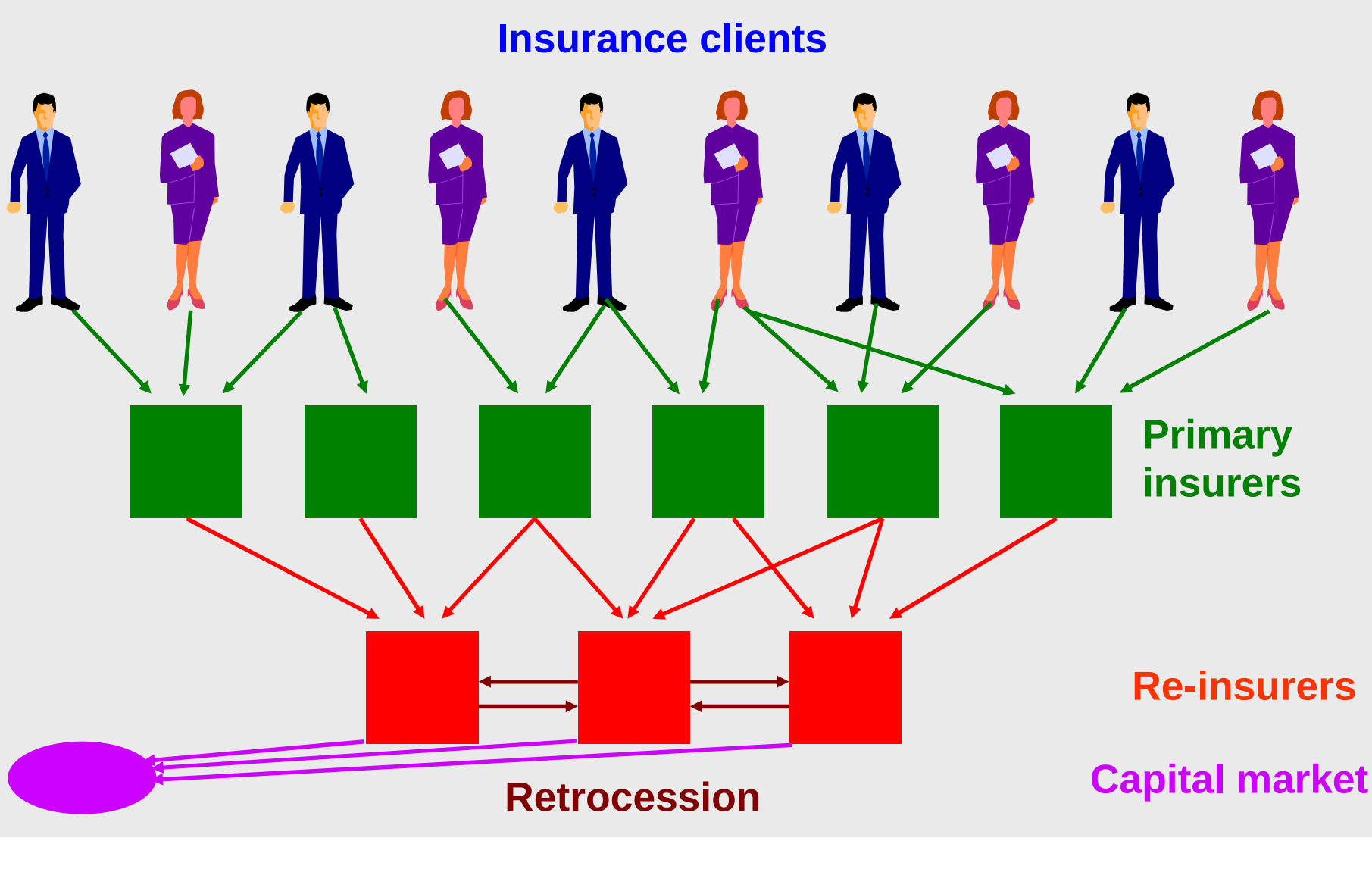
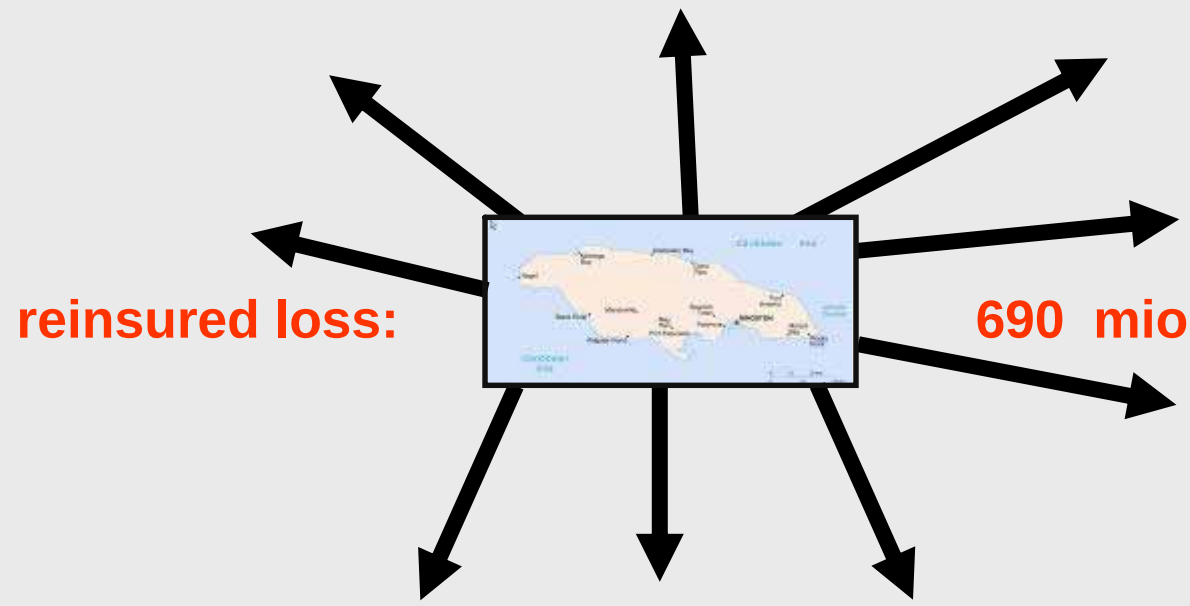
The international risk spreading system



Example of reinsured losses

Hurricane Gilbert (Jamaica 1988)

economic loss: 2 000 mio US$
insured loss: 700 mio US$



typical percentages of reinsured losses: weak markets: >90%
strong markets <50%

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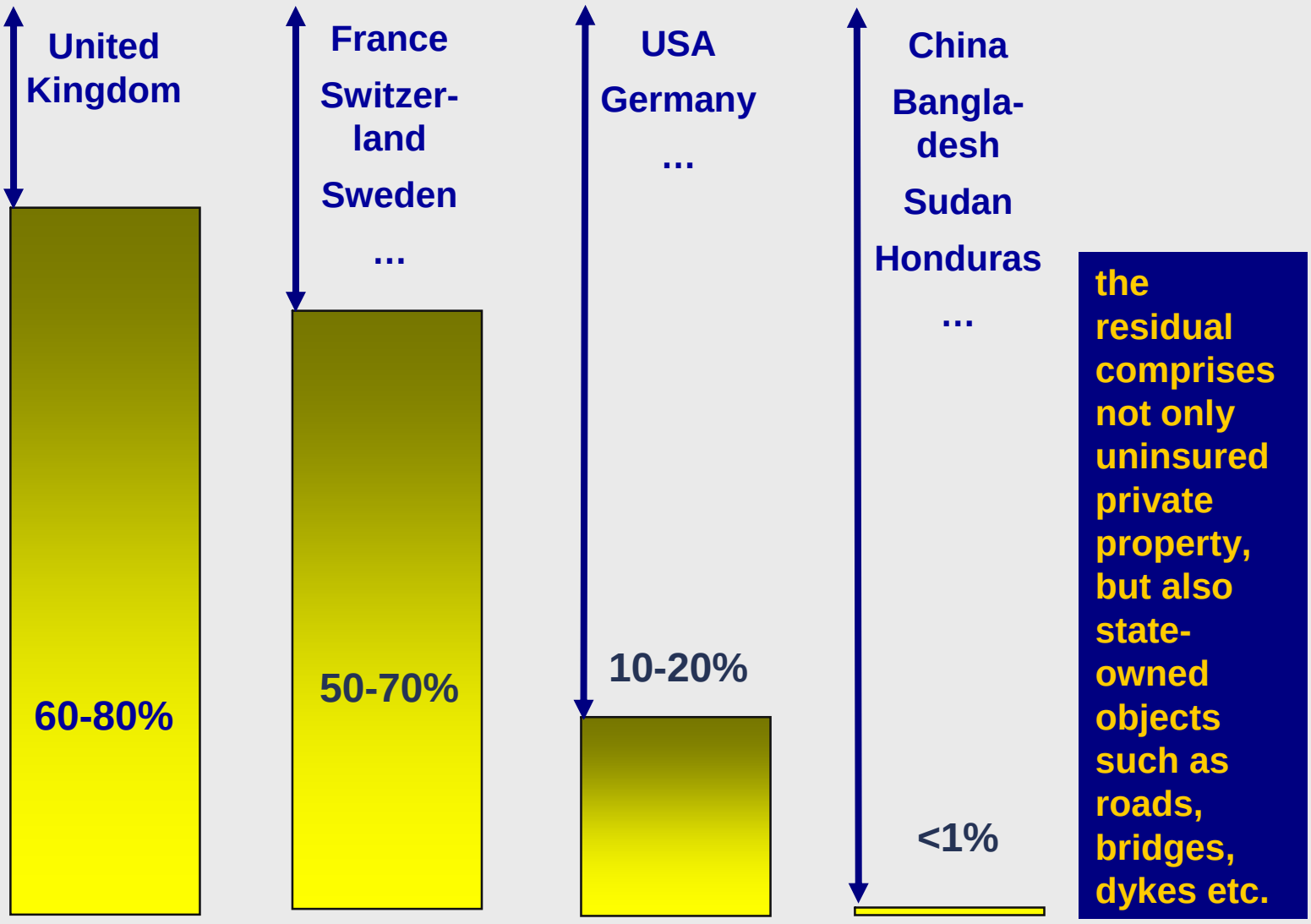
Insured share of flood losses



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Flood insurance

General problems

- large loss potential
- linear rather than area impacts
- high variation of exposure within short distance
- high influence of local factors
- flood control structures (e.g. dykes) make floods rare, but have almost no effect during extreme events
- loss of awareness and feeling of security
- anti- or adverse selection

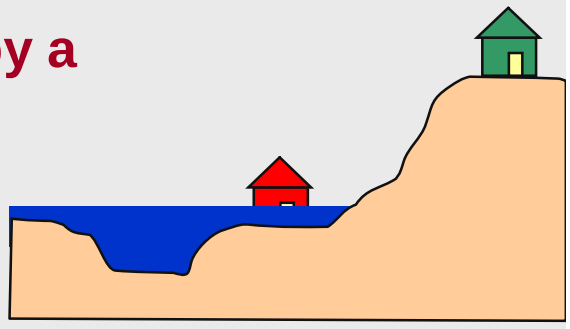
Flood insurance

Principle of the insurance

sum of premiums from all clients (+ yields)	**=**	**sum of payments to the affected clients (+ administrative costs + profits)**

Adverse selection

A **Only those, who subjectively feel threatened by a flood, have interest in insurance cover; a large portion of them is in fact exposed to a high risk and experiences losses more or less regularly.**



B **The others feel safe and do not want to get insured.**

If the portfolio mainly consists of members of group A, the spatial and temporal risk compensation is not guaranteed anymore.

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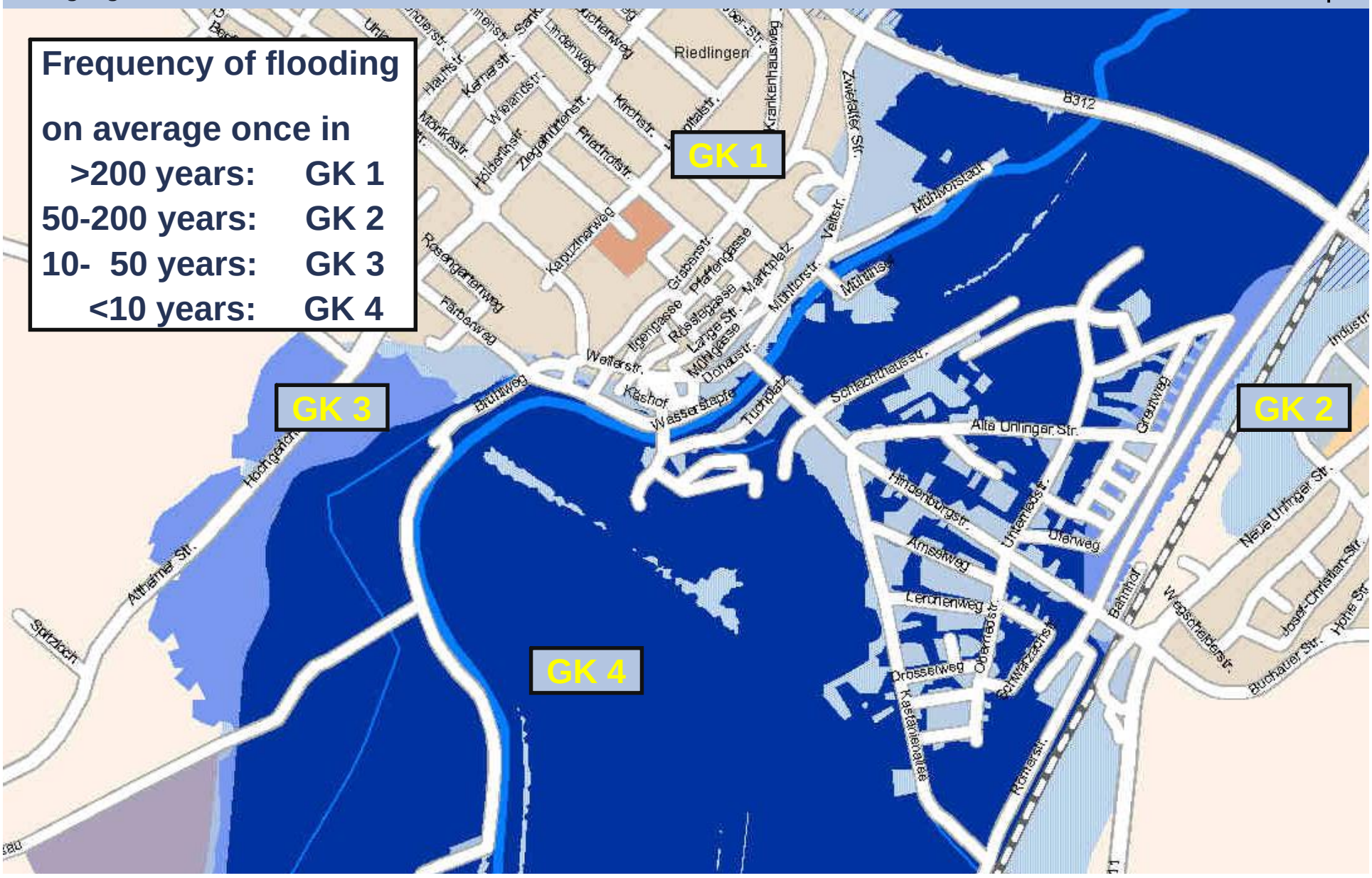
Flood insurance

Approaches to a solution

- information about the individual exposure
- definition of zones according to exposure level (country-wide for all areas)
- exclusion of particularly exposed areas
- insurance package including coverage for other natural hazards (geographical spread of risk)
- adequately structured insurance contracts including deductibles and limits
- encouragement of measures for individual loss reduction



German Flood Insurance Zonation

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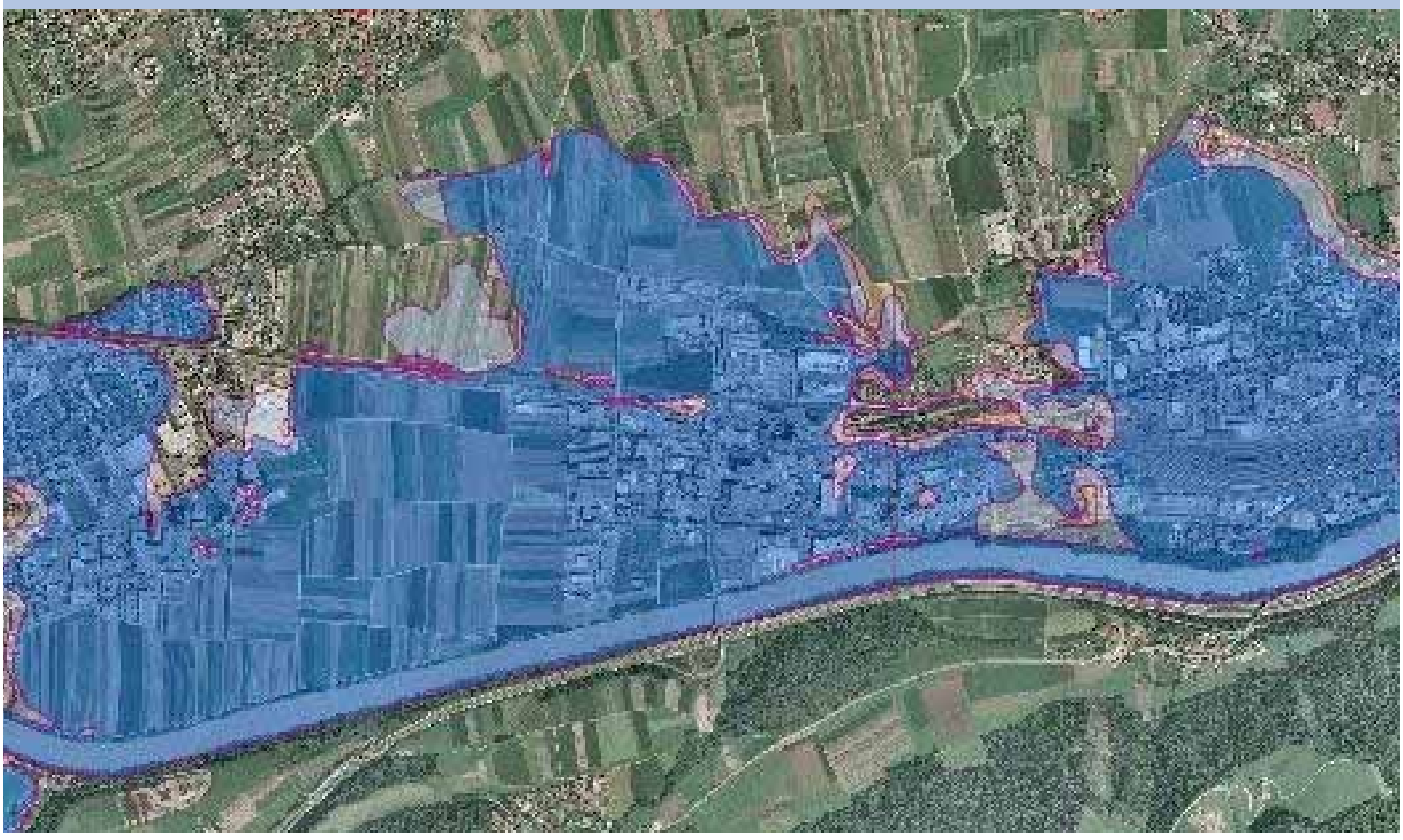
Flood insurance

Hazard zonation: Flood risk classes in the Austrian system HORA



Flood insurance

Insurance packages including:

- earthquake
- volcanic eruption
- landslide
- subsidence
- flooding
- storm surge
- backwater
- groundwater infiltration
- avalanche
- snow pressure
- frost
- heat
- wildfire
- windstorm
- tornado
- hail
- lightning strike
- . . .

are often separated from the others

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Flood insurance

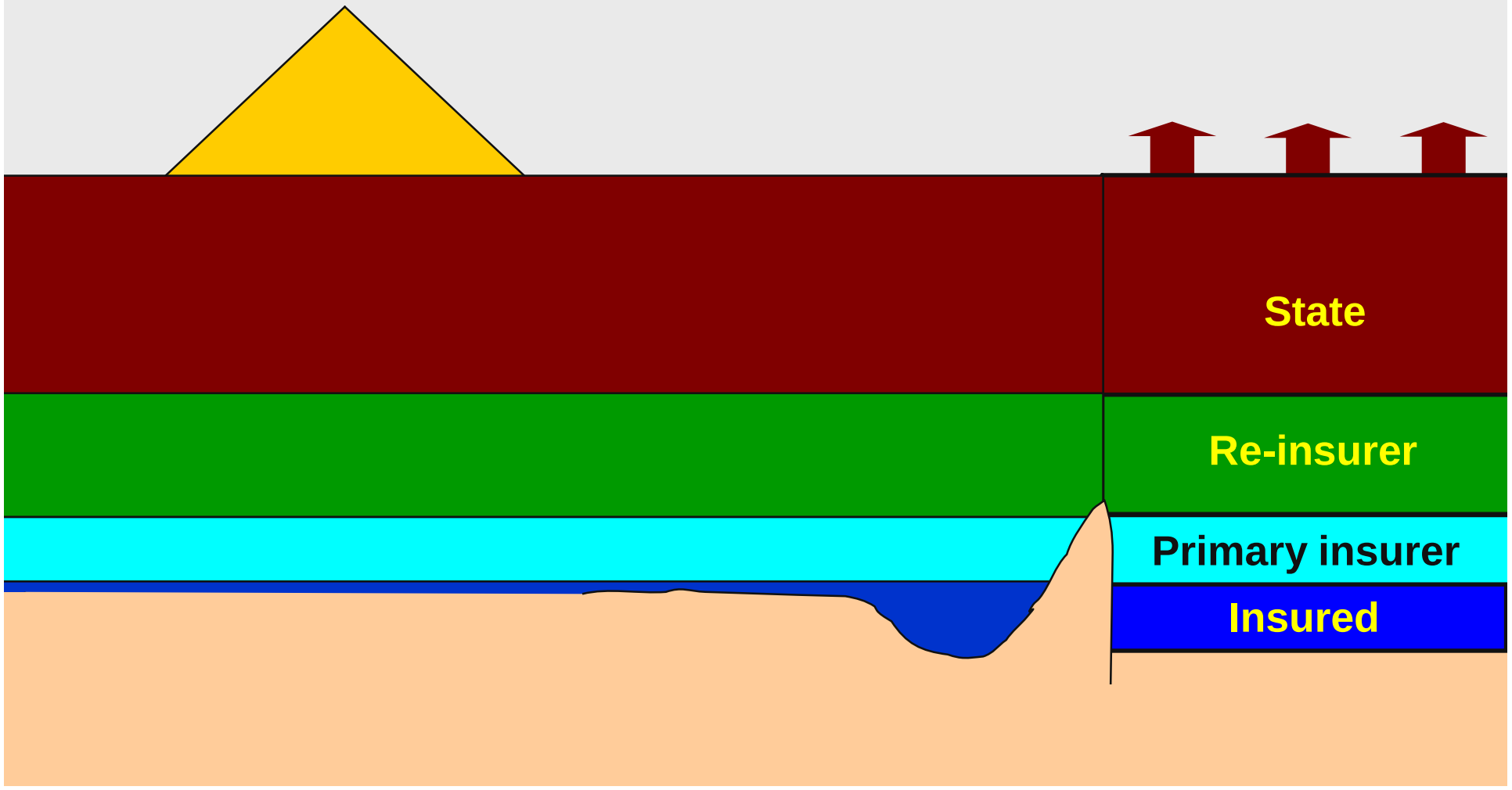
"Full" natural peril insurance packages:

Examples:

East Asia:	**STF (Storm-Tempest-Flood) covers**
United Kingdom:	**All-Natural-Peril covers**
France:	**Catastrophe pool**

The principle of risk partnership

Who pays when?
(simplified, classical approach)



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Flood insurance

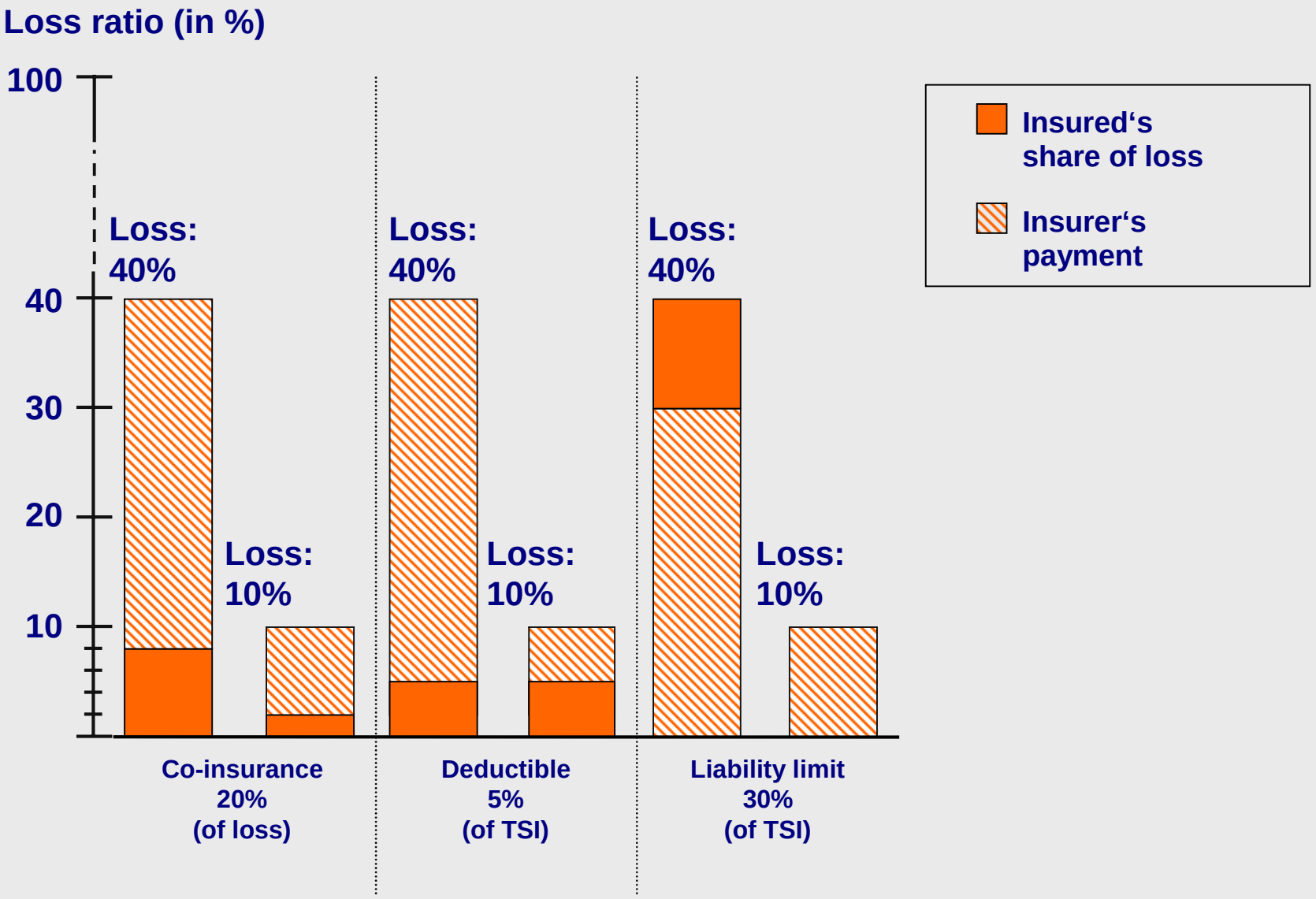
Self participation

The insured bears a part of the loss, e.g.

- **a fixed amount**
- **a percentage of the loss**
- **a percentage of the sum insured**

Forms of loss participation

Co-insurance, Deductible, Liability limit



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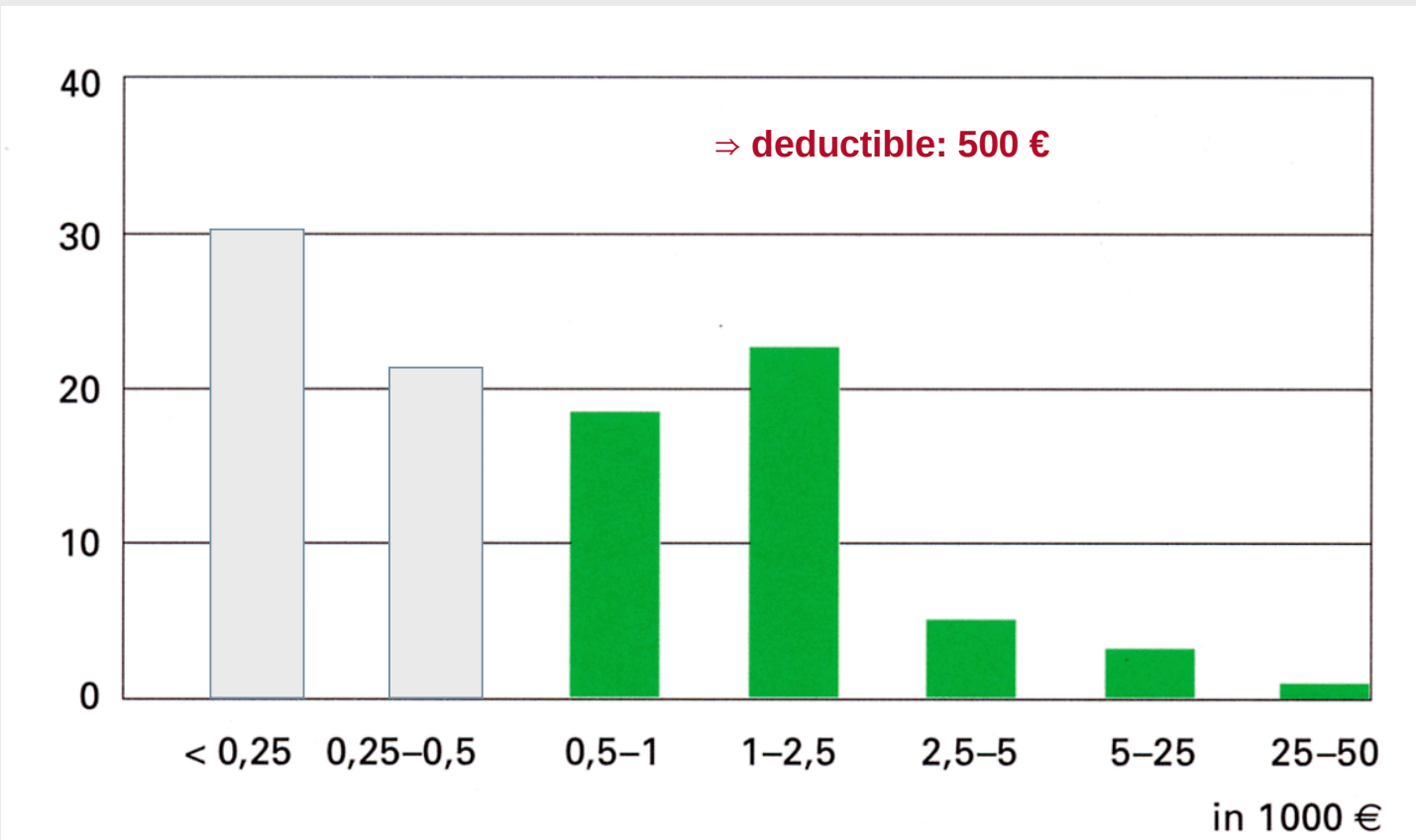
Deductibles

example: Windstorm "Lothar" 1999 - Germany

Percentage of the total number of losses (buildings)

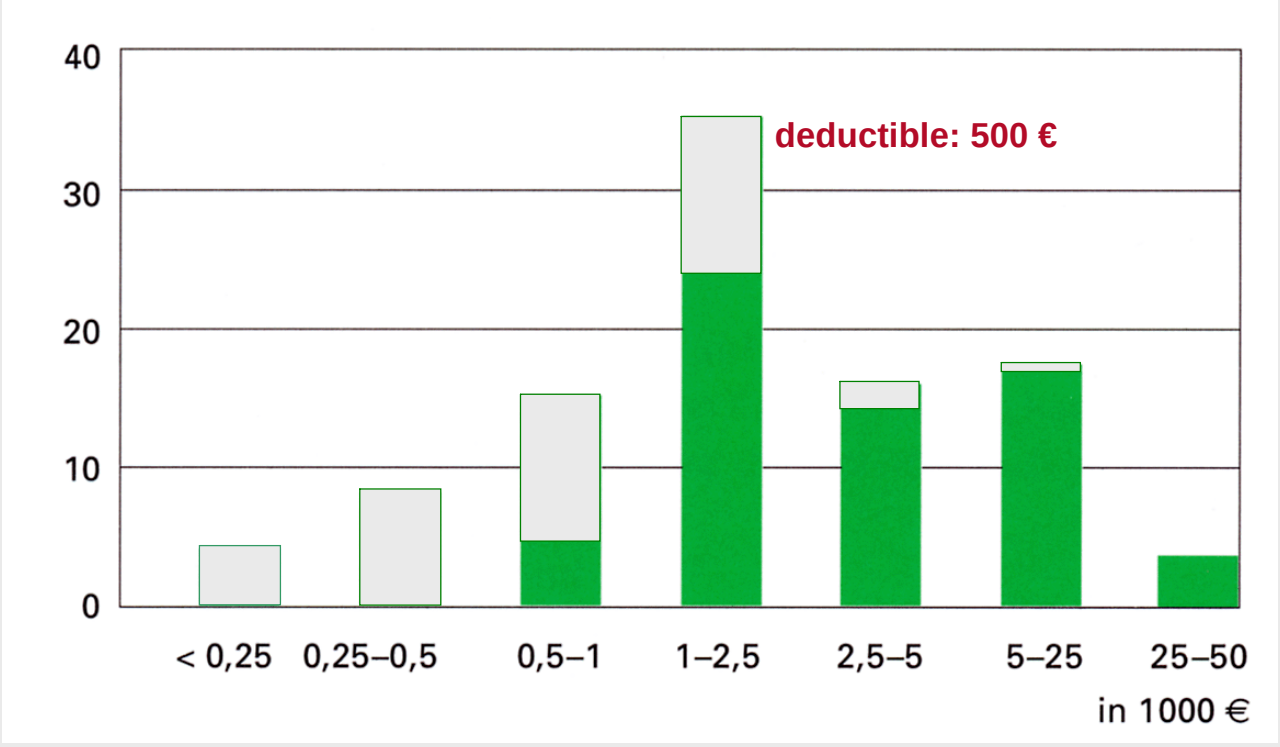


⇒ Reduction of the number of losses by **51%**

Deductibles

example: Windstorm “Lothar” 1999 - Germany

Percentage of the total losses amount (buildings)



⇒ Reduction of the total loss amount by: **35%**

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Natural peril insurance

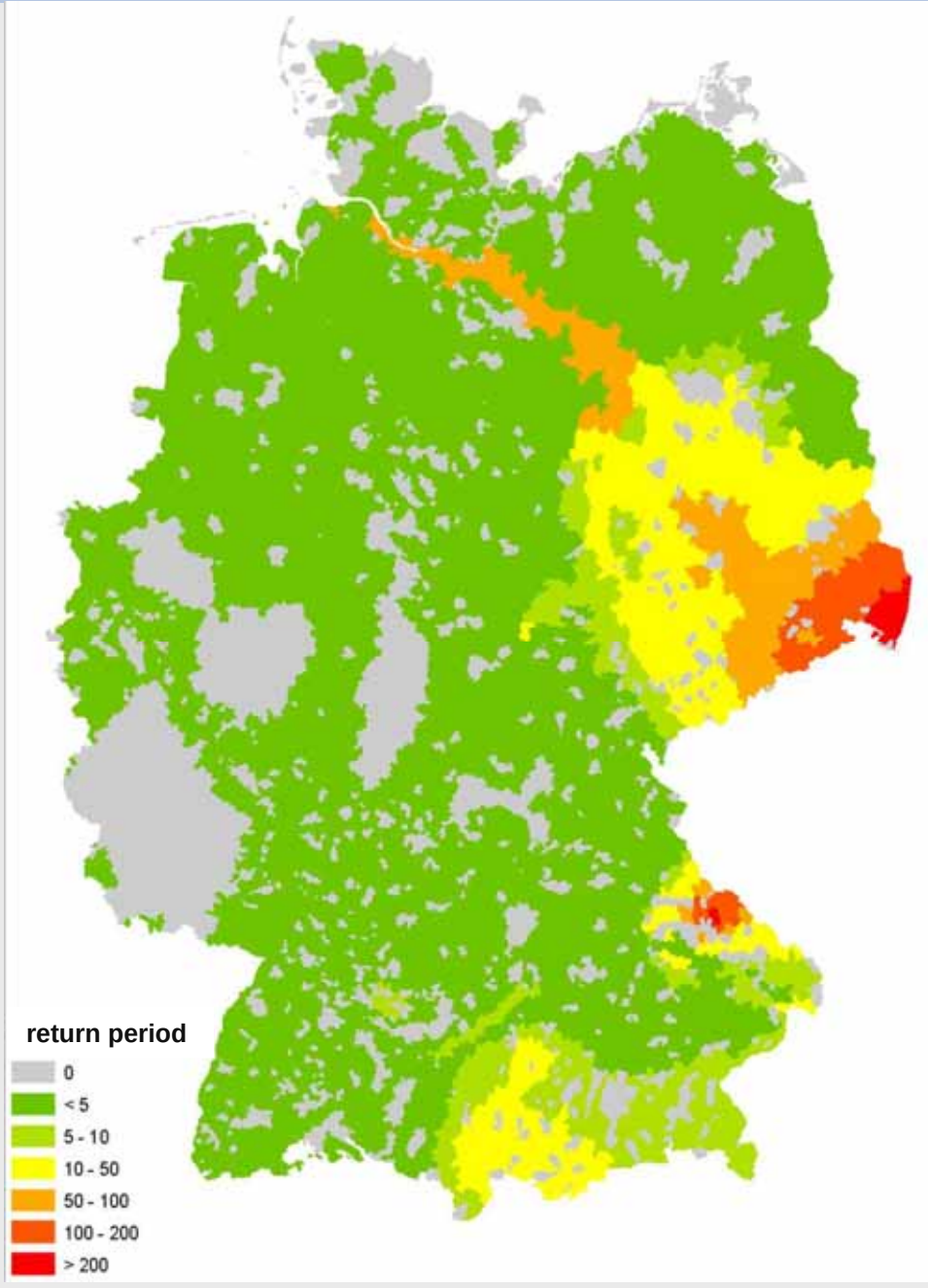
Effect of deductibles

- The insured pays a portion of the loss himself.
- The number of minor losses and the administrative costs will be drastically reduced.
- The total effort of the insurers will be reduced.
- Premiums can be kept at a low level or be reduced.
- Insureds are motivated to loss reduction measures in order to keep their own losses low.
- The total loss/costs are reduced.

How much does a large flood cost?

e.g., an event as in August 2002 in the Elbe and Danube catchments in Germany?

Or an even bigger one?



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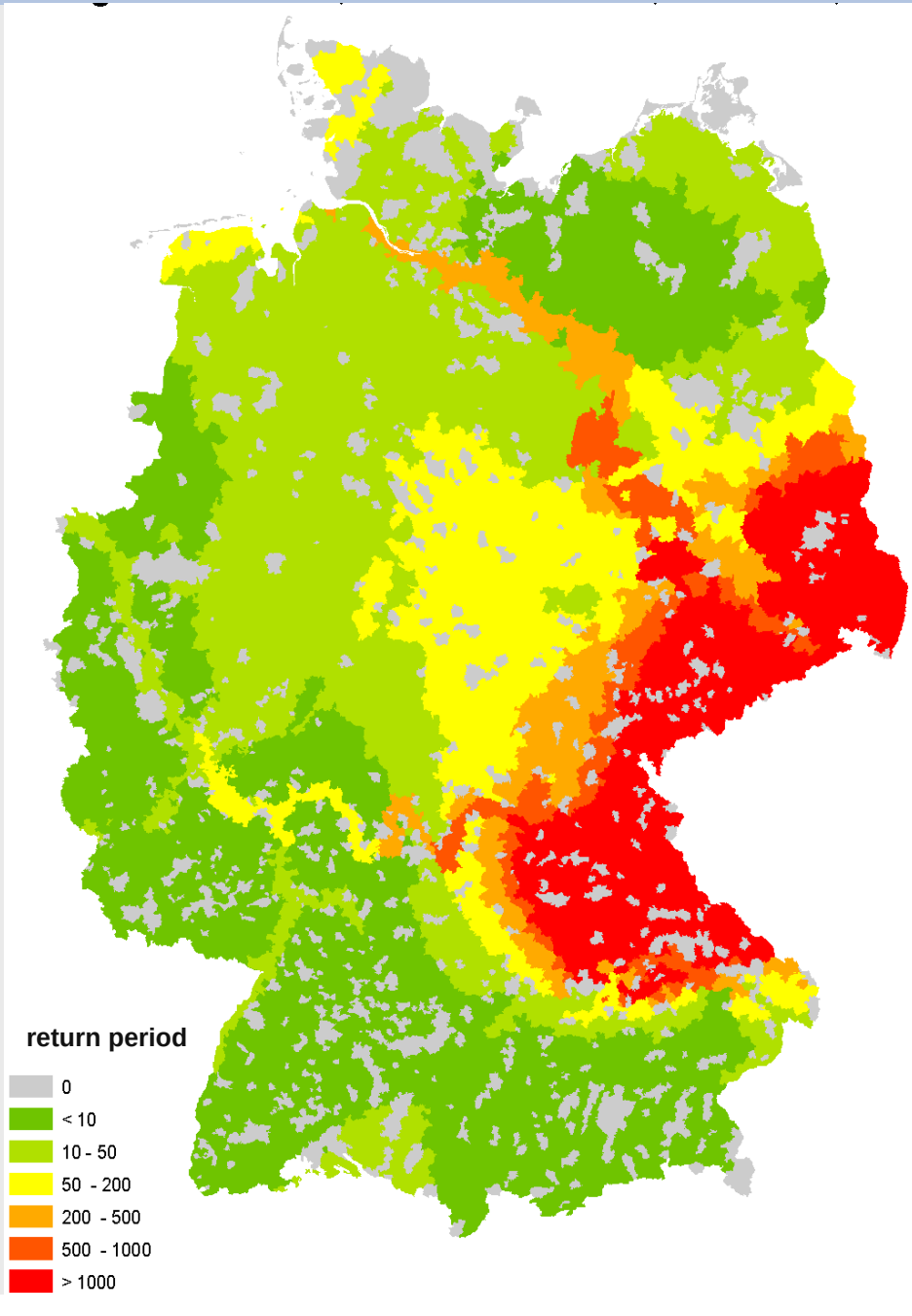
WANTED:

The Probable* Maximum Losses (PML)
that a portfolio, i.e. a company may face

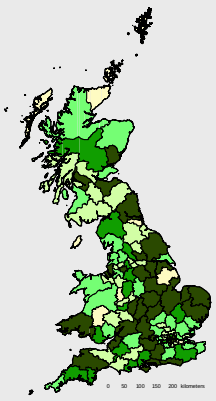
*** "Probable" depends on the company's risk policy, but also on legal requirements (e.g. Solvency II)**



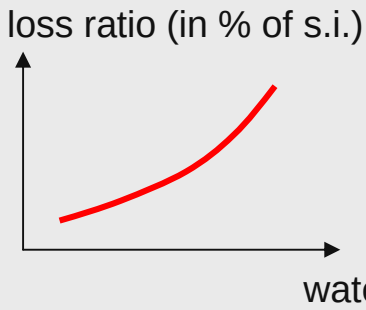
Calculation of a PML curve

To obtain (estimate) the loss of a single event, we have to combine:

liability distribution



vulnerability



event scenario

Values at risk	Vulnerability	Hazard

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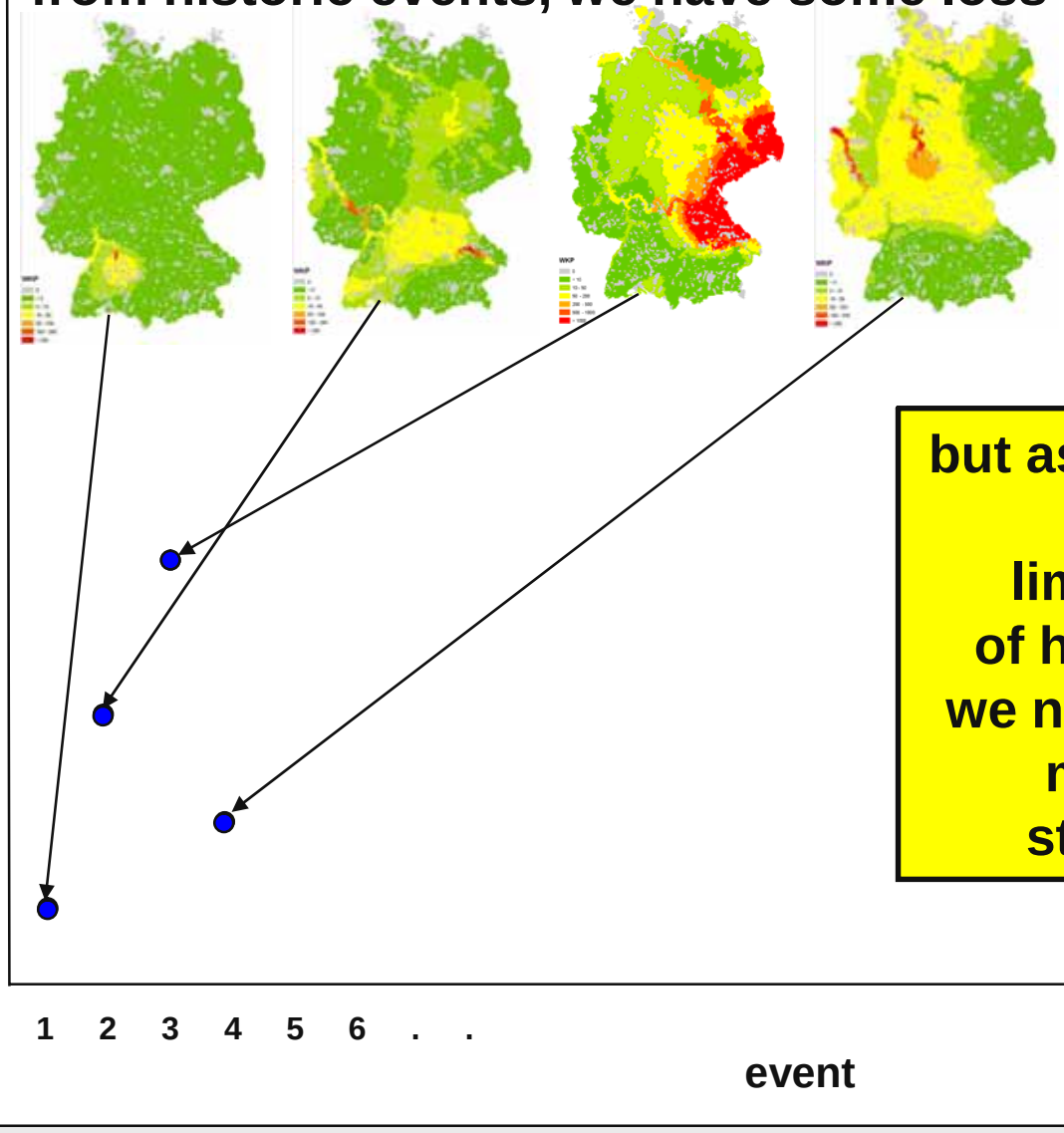
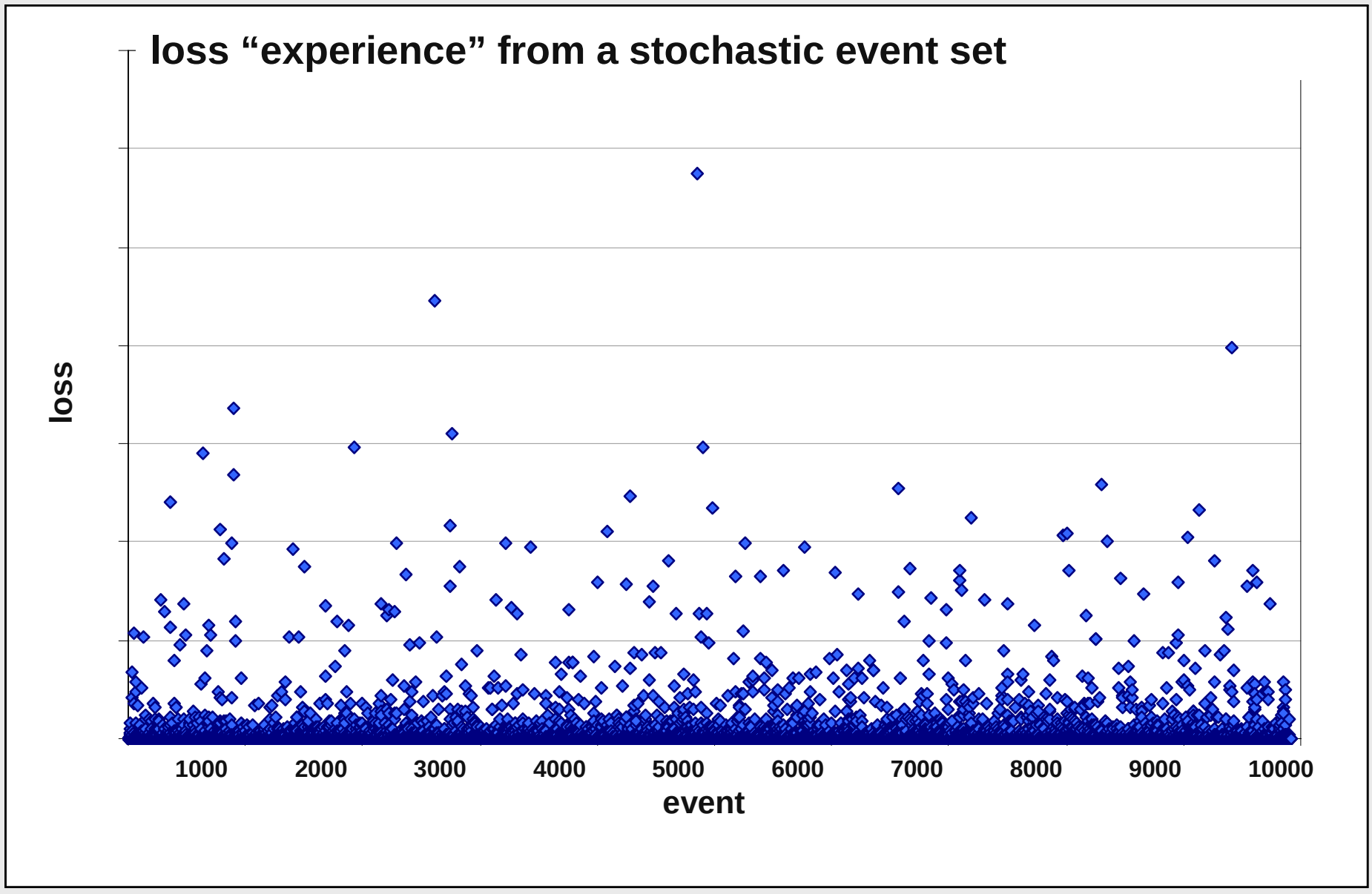
from historic events, we have some loss experience



but as we have only a VERY limited number of historic events, we need to generate more events stochastically



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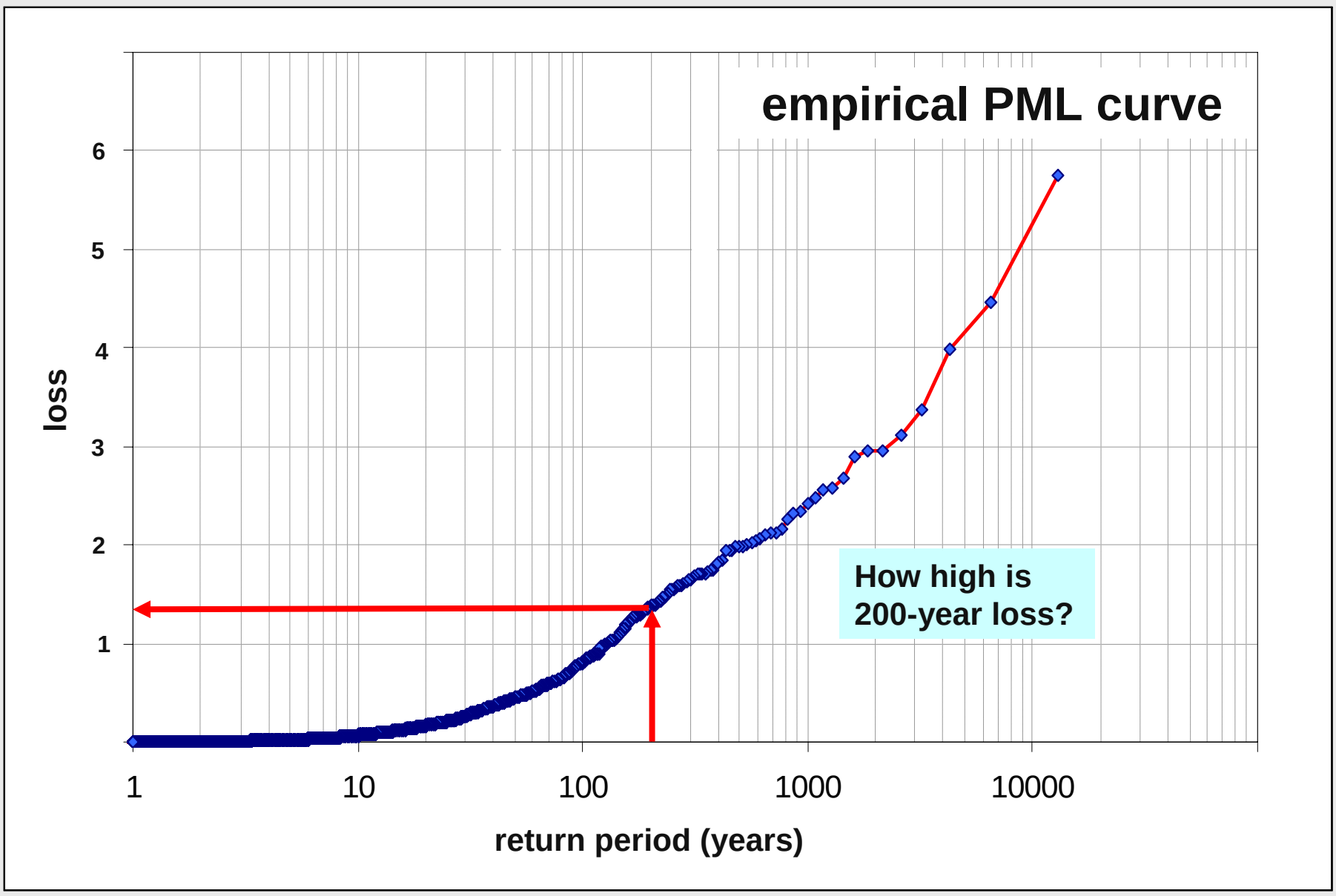

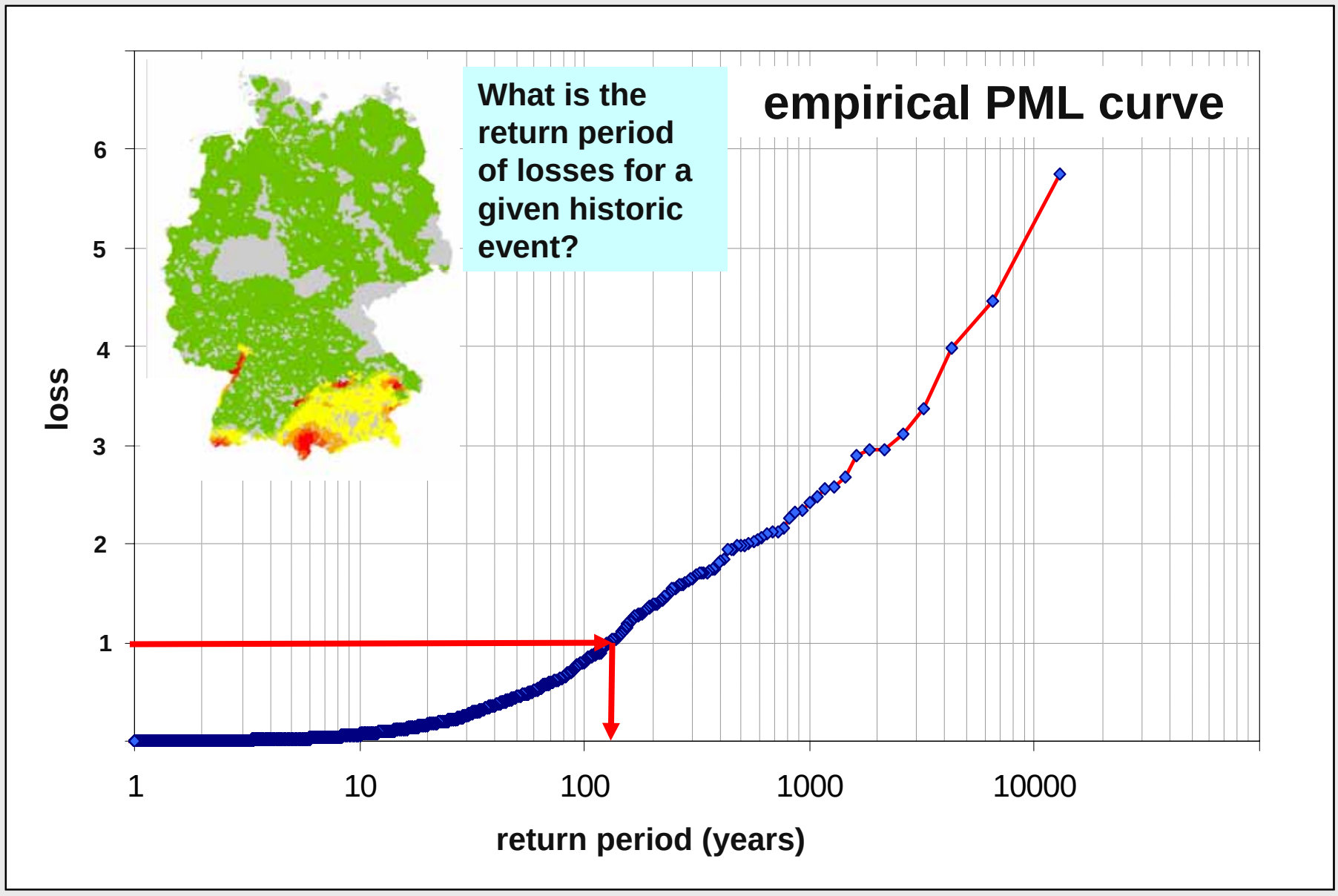
What is the return period of losses for a given historic event?
empirical PML curve
loss
6
5
4
3
2
1
1
10
100
1000
10000
return period (years)


Cat bonds

Cat bonds

We have

potential of record losses from single natural catastrophes ⟷ huge amounts of money in the international financial markets

Alternative Risk Transfer (ART):

Catastrophe bonds (Cat bonds)

→ new financial instruments, which supplement the classical distribution of risk via the reinsurance market.

→ geared to very large potential losses

→ exclusively used in developed countries

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Cat bonds

How does it work?

A specified risk (e.g. losses from a hurricane in Florida) is transferred

from a **risk carrier (sponsor)** reinsurers, large companies such as a national railroad company

to **investors** hedge funds, specialised catastrophe-oriented funds, asset managers, life insurers, reinsurers, banks, pension funds

The investor buys a share of the cat bond.

If the catastrophic event for which the bond is issued does

- not occur: the invested capital plus high interest is paid back to the investor at maturity.
- occur: the investor loses its principal or a portion of it.

Cat bonds

How is "occurrence" (triggering of the cat bond) defined?

- by a certain loss to the sponsor (indemnity trigger)
- by a market loss (industry loss index trigger)
- if a set of certain defined physical threshold values (e.g. wind speeds at certain points or discharges) are exceeded (parametric trigger).

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Cat bonds

Current situation:

- only one cat bond has been triggered so far (by hurricane Katrina),

- trigger points still quite high,

  (Example: Munich Re issued a cat bond in 2007; it covers
  - covers: hurricane losses in 26 US states until 2010.
  - trigger: market loss (total insured losses) > US$ 35bn)

- increasing experience will probably reduce prices and enhance the competitiveness of cat bonds,

- diversity of cat bonds in terms of expected loss levels, trigger types, and underlying perils will grow.

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Micro-insurance

Flood insurance penetration in developed countries is low.

Reasons:

- lack of risk awareness
- lack of financial means
- insurance cover is not available

Micro-insurance

For whom is it meant?

- for low-income people,
- for people ignored by mainstream commercial and social insurance schemes,
- for people who do not have access to regular products.

For what is it meant?

- to provide cover against specific perils in exchange for regular premium payments,
- to help people to manage their risk better,
- to help people to maintain their standard of living.

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Micro-insurance

How does it work?

basically, like any other insurance scheme,
but some aspects make a difference:

- MI does not cover a single client but rather thousands of clients under one contract.

- MI requires an intermediary between the client and the insurance company (e.g. a local non-governmental organisation or a rural bank that can handle the distribution and administration).

Micro-insurance

What are the problems?

- low premiums and high transaction costs per client,
- lack of infrastructure,
- lack of insurance knowledge,
- insurance illiteracy (clients do not understand the concept of insurance),
- low and irregular income,
- lack of data.

Most important:

Raising awareness and educating the people concerned.

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Micro-insurance

Current situation:

- Micro-insurance covers for risks related to natural disasters are still hardly available.
- As fewer than 100 million people (or 3%) of the world's poor have access to insurance, the MI market has a huge development potential.
- Helping people to develop a stable life situation will also allow them to eventually become normal clients of the insurance industry.
- A scheme underprivileged residents of Jakarta, Indonesia, who suffer from flooding practically every year, is currently being set up.
- In Colombia (and soon in other Latin American countries) a micro-insurance is developed for low-income groups and microentrepreneurs for protection against the impacts of natural disasters.

Final Remarks

- Weather catastrophes have increased in number and intensity.

- Losses have increased and reached new dimensions.

- Public authorities, affected people and enterprises, and the insurance industry must work together in a risk partnership.

- The insurance industry can considerably contribute to risk reduction and loss reduction.

- It must protect its own business by accumulation control.

- New instruments have been developed for insuring the poor and for coping with extremely large single losses.

- It is of crucial importance to create – and constantly maintain – proper risk awareness on all levels of the society.