Financial aspects of flood and drought risk

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Recent examples of severe floods

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Thailand *September - November 2011*
Overall losses: US$ 43bn
Insured losses: US$ 10bn
Largest river flood losses ever, worldwide effects/losses

Uttarakhand/India *June 2013*
5,500 fatalities,
tens of thousands of pilgrims forced to stay in the cold mountains for many days

Philippines *November 2013 (*Typhoon Haiyan)
Overall losses: US$ 10bn
Insured losses: US$ 700m
>6,000 fatalities
1,200,000 destroyed/damaged buildings

Atacama Desert Chile *March 2015*
Overall losses: US$ 1.5bn
Insured losses: US$ 500m
31 fatalities

China *June - August 2016*
Overall losses: US$ 30bn
Insured losses: US$ 400m

Floods (excluding tsunamis) in the period 2000-2014, in which more than 1500 people died

Year	Region	Event	Deaths*
2008	Myanmar	Cyclone Nargis	140,000
2013	Philippines	Typhoon Haiyan	6,334
2013	India	Flash floods	5,500
2007	Bangladesh	Cyclone Sidr	3,295
2004	India, Bangladesh, Nepal	Floods	2,200
2007	Bangladesh, India, Nepal	Floods	2,030
2004	Haiti, Dominican Republic	Floods	2,000
2004	Haiti	Hurricane Jeanne, floods	2,000
2010	Pakistan	Floods	1,760

* not including those missing

see article „**Flood disasters - a global perspective**“ in Water Policy 17(2015) (HELP Special issue on Flood)

Source. Munich Re NatCatSERVICE 2014

Floods (excluding tsunamis) in the period 2000-2014, in which material losses* of US$ 8bn and more occurred

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* due to water, in original values

Year	Region	Event/basin(s)/area	Overall (US$ bn)	Insured (US$ bn)	% in-sured
2005	USA	Hurr. Katrina/Gulf Coast	83 (2/3)	41.5 (2/3)	50
2012	USA, Canada, Carib.	Hurr. Sandy/Northeast	46 (2/3)	19.7 (2/3)	43
2011	Thailand	Chao Phraya	43	16	37
2002	Central, S. Europe	Elbe, Danube, N. Italy	16.5	3.4	21
2013	Central Europe	Danube, Elbe	12.6	3.1	25
2008	USA	Missouri/Midwest	10	0.5	5
2010	Pakistan	Indus	9.5	0.1	1
2000	Italy, Switzerland	Southern Alps	8.5	0.48	6
2010	China	East, Southeast, South	8	0.15	2
2012	China	East, North-, Southeast	8	0.18	2
2011	USA	Hurr. Irene/Northeast	5 (1/2)	3 (1/2)	55
2013	Philippines	Typhoon Haiyan/Leite	5 (1/2)	0.35 (1/2)	7

(1/2) (2/3) = an estimated half/two thirds of the overall/insured losses were attributed to flood (the remainder to windstorm)

see article „**Flood disasters - a global perspective**" in Water Policy 17(2015) (HELP Special issue on Flood)

Source. Munich Re NatCatSERVICE 2014

Number of high-loss weather events in the past decades (regarding overall losses)

Period (yrs.)	≥US$ 2bn*	≥US$ 5bn*	≥US$ 10bn*
<1990 (>10)	3	-	-
1990s (10)	-	13	6
2000s (10)	-	10	3
2010s (4.5)	-	9	3

* in original values

Source. Munich Re NatCatSERVICE 2014

Number of high-loss weather events in the past decades (regarding overall losses)

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<1990 (>10)	3[#]	3	-
1990s (10)	-	13	6
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* in original values

[#] US$ 3bn in 1980 translates into US$ 5.8bn in 2013 after adjustment for inflation

Source. Munich Re NatCatSERVICE 2014

Number of high-loss weather events in the past decades (regarding overall losses)

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2000s (10)	-	10	3
2010s (4.5)	-	9	3
2010s (10)	-	20	6.7

* in original values

period 2010 to mid-2014 extrapolated to the whole decade of the 2010s

Source. Munich Re NatCatSERVICE 2014

Flood disasters
Increase in number of events

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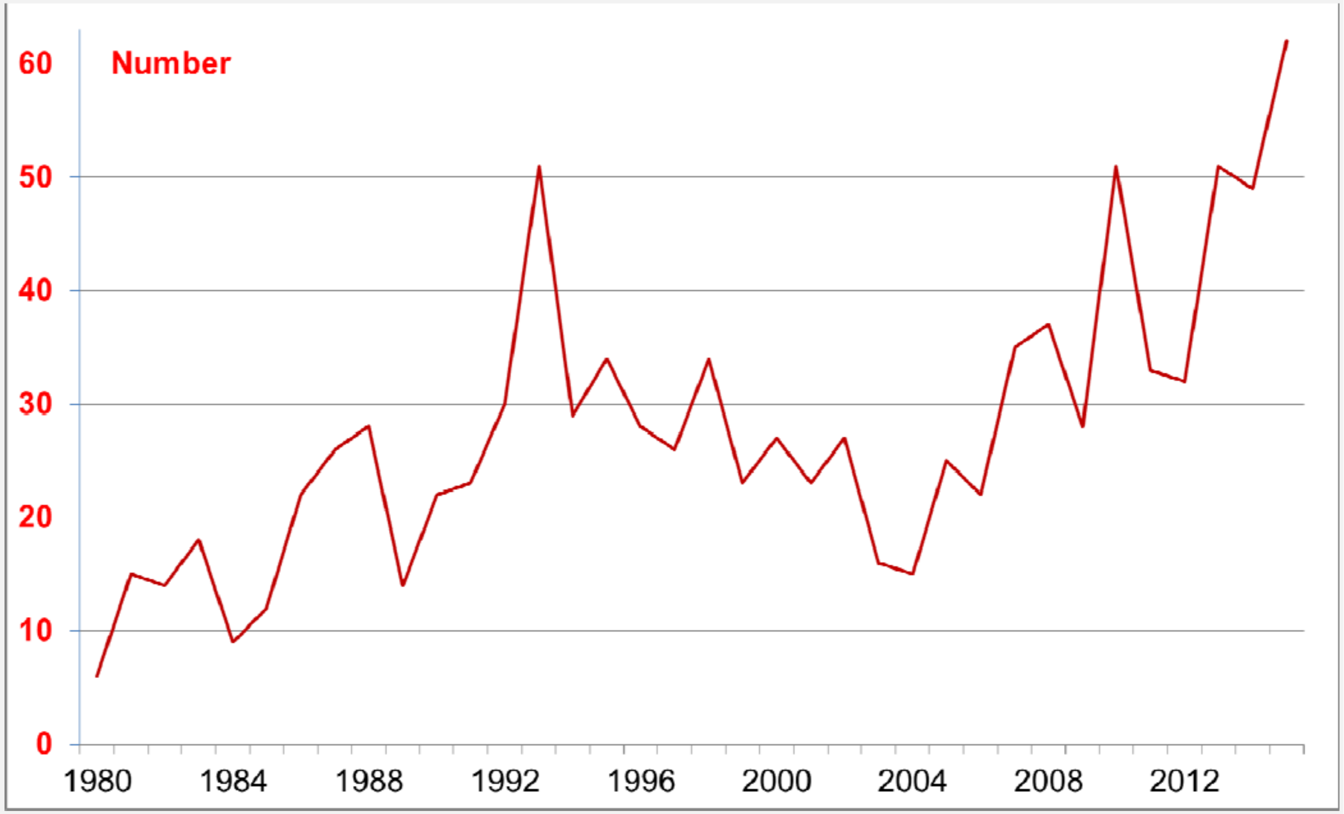
Inland flood losses
1980 – 2015

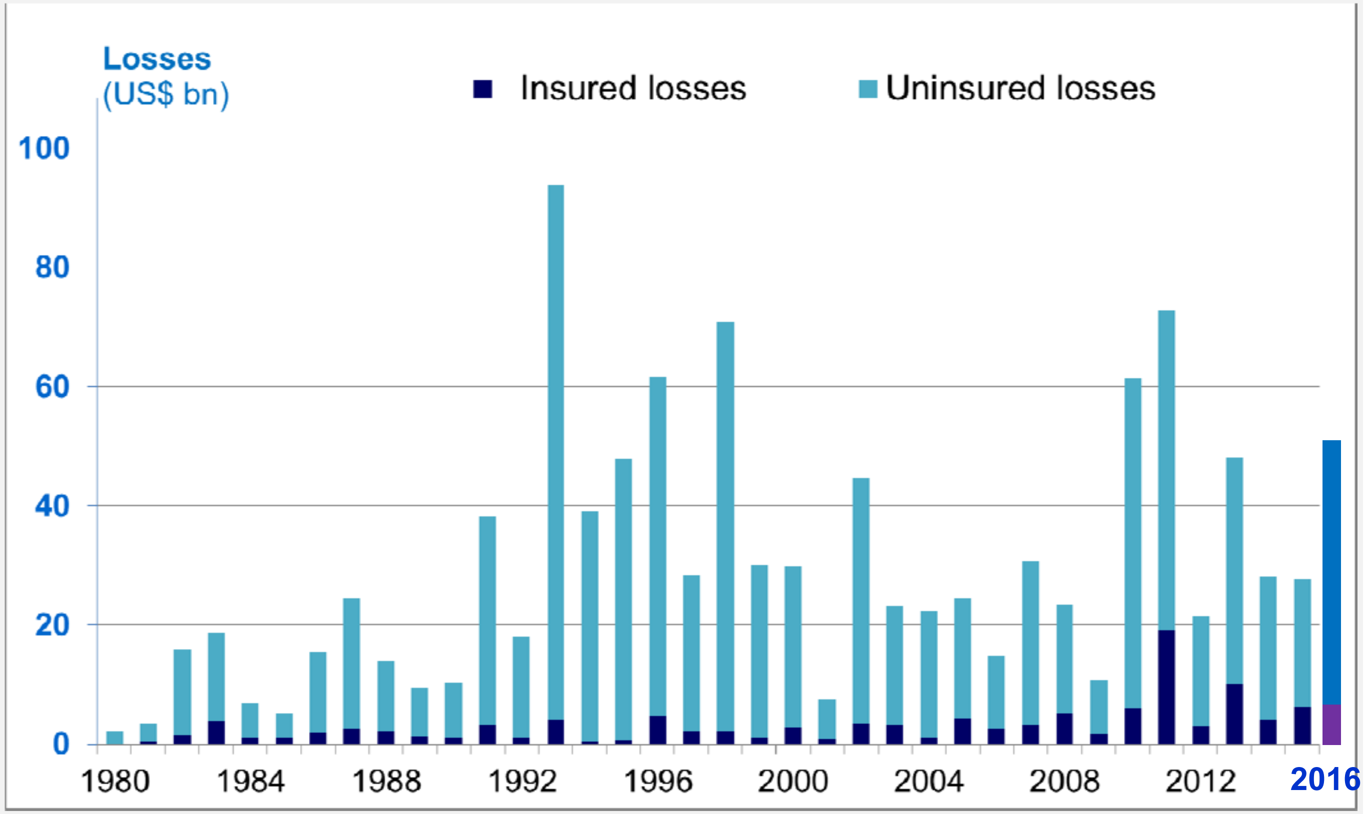
(only events with inflation-adjusted loss **>US$ 50m** are shown)



Flood disasters
Increase in losses

Munich RE

Inland flood losses
1980 – 2015

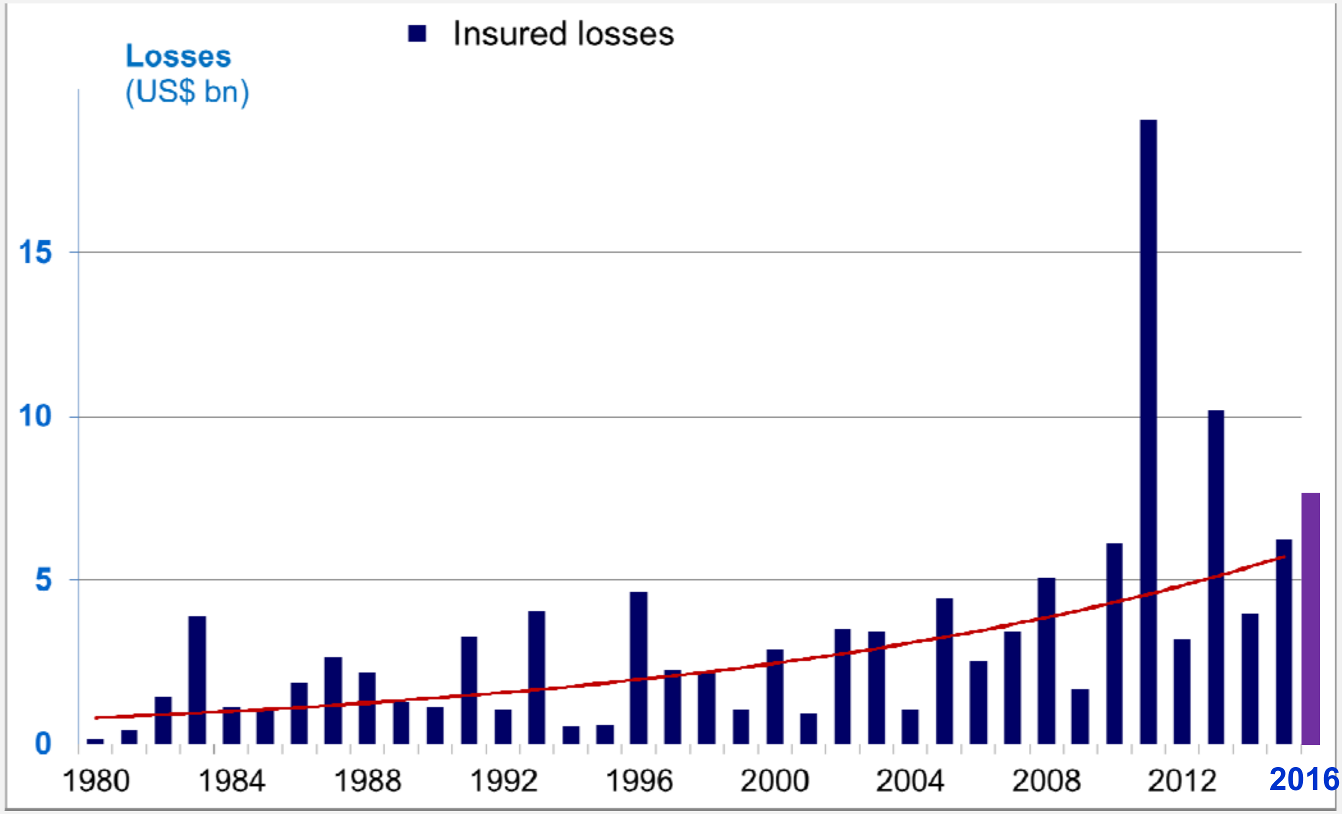


(only events with inflation-adjusted loss **>US$ 50m** are shown)

Flood disasters
Increase in insured losses

Inland flood losses
1980 – 2015

(only events with inflation-adjusted loss **>US$ 50m** are shown)



Thailand floods 2011
Losses and consequences

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Overall loss	US$ 43bn
Insured loss	US$ 16bn
Deaths	813
People evacuated	2,000,000
Homes destroyed/damaged	1,000,000
Flooded arable land	**1.6 million hectares**
Flooded production halls	**1,000**
Affected factories	**15,000 – 20,000**
Affected workers	**500,000**
Lost jobs	**300,000 (permanently) – 700,000 (temporarily)**
Largest inland flood loss of all times	7th costliest natural catastrophe loss ever
Worldwide effects by interruption of supply chains	**>US$ 3bn**

Thailand floods 2011
Contingent Business Interruption (CBI) losses

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Worldwide effects by interruption of supply chains: Flood in Thailand, loss in USA (e.g.). Global players among the most affected companies.

Japanese car producers had to cease operations: production loss of 6,000 cars/day.

The closure of a hard drive plant had a worldwide impact. 25% of all hard disk drives are manufactured in Thailand. The sector was hit by shortages and prices rose.

Estimated CBI loss	Loss amount (US$ bn)	Vehicle construction (%)	Computer, electronic and electrical equipment (%)	Other (%)
total	3.06	53	38	9
insured	2.04	46	43	11

Drought

Significant droughts in the period 1980–2015

Period	Affected area	Direct overall losses in US$ m (original values)	Insured losses in US$ m (original values)
June–Sep 2012	United States (esp. Midwest)	25,000	12,000
Jan–Dec 1988	United States (esp. Midwest)	15,000	650
July–Aug 2003	Europe	14,000*	1,100*
Apr–Oct 2002	United States (esp. Great Plains)	10,000	2,000
Jan–Dec 2011	United States (esp. TX)	8,000	2,400
Jan–Jul 1996	United States, Mexico	6,200	500
May 1999 – Nov 2001	Iran	5,100	
Nov 2011 – Feb 2012	Argentina, Brazil, Paraguay	5,000	185
Dec 2013 – Mar 2015	Brazil (esp. South)	5,000	
Sep 1992 – Jan 1995	Spain	4,500	

*Including heatwave and subsidence losses.

from: Water Policy – Special issue on Droughts
Drought aspects – fostering resilience through insurance
Wolfgang Kron*, Sabine Schlüter-Mayr and Markus Steuer

Direct overall annual losses from droughts and heatwaves (1980–2015)

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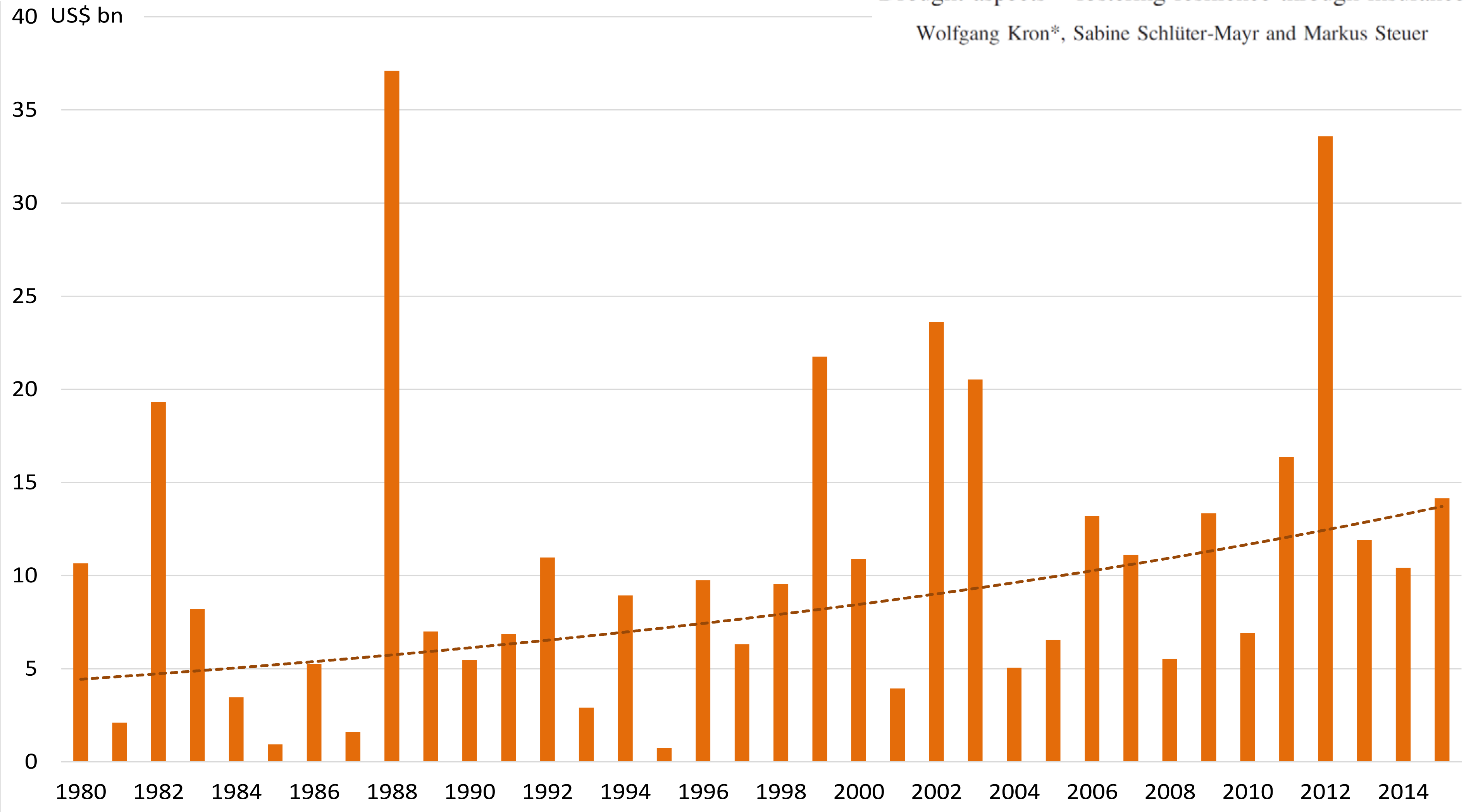


from: Drought aspects – fostering resilience through insurance

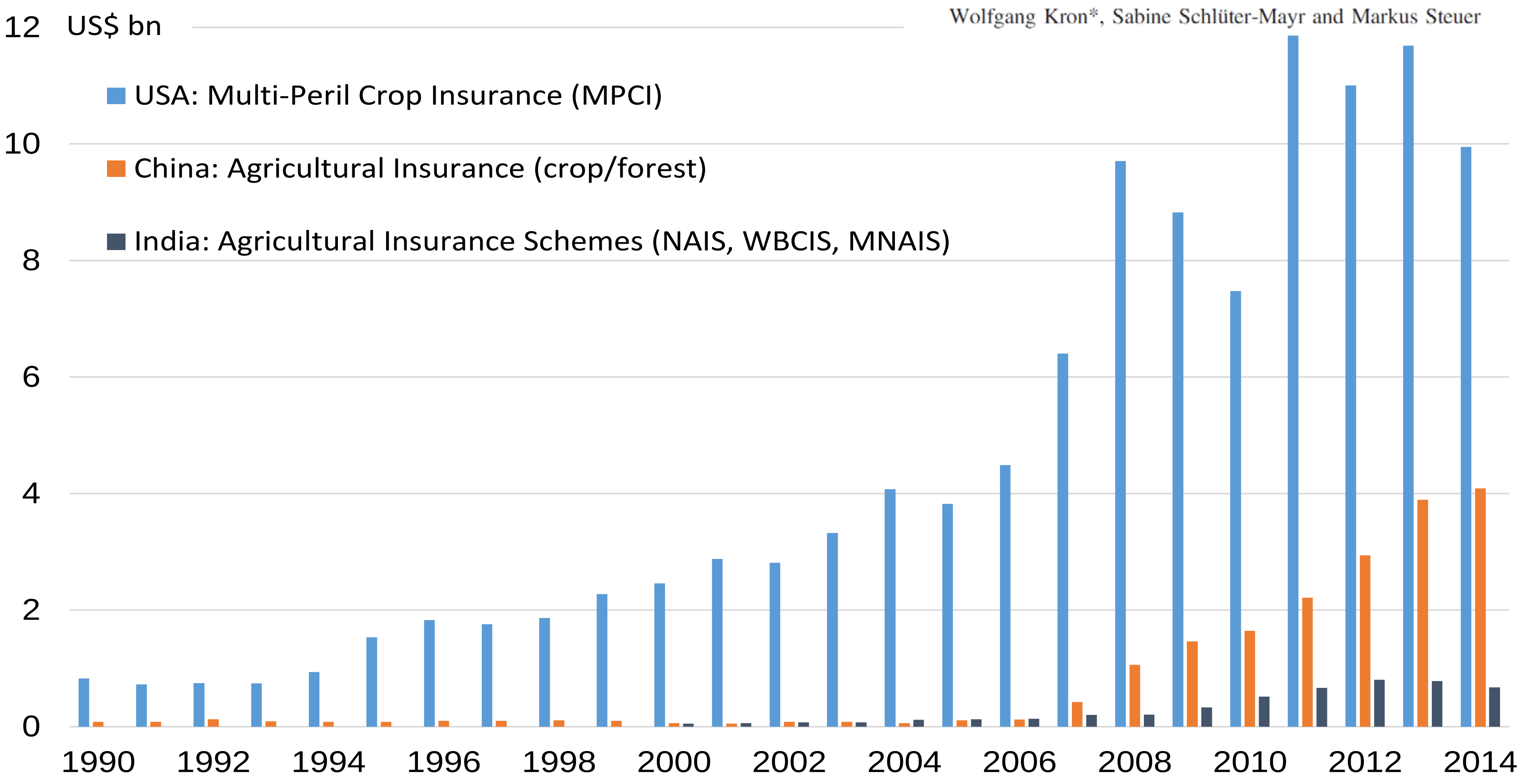
Wolfgang Kron*, Sabine Schlüter-Mayr and Markus Steuer

Contributing values are inflation-adjusted using the local consumer price indices. Wildfire and subsidence losses are not included.

Development of crop insurance premiums in the United States, China and India (1990–2014)

from: Drought aspects – fostering resilience through insurance

Wolfgang Kron*, Sabine Schlüter-Mayr and Markus Steuer



All types of natural disasters
Insured losses in 2015 as percentage of overall losses

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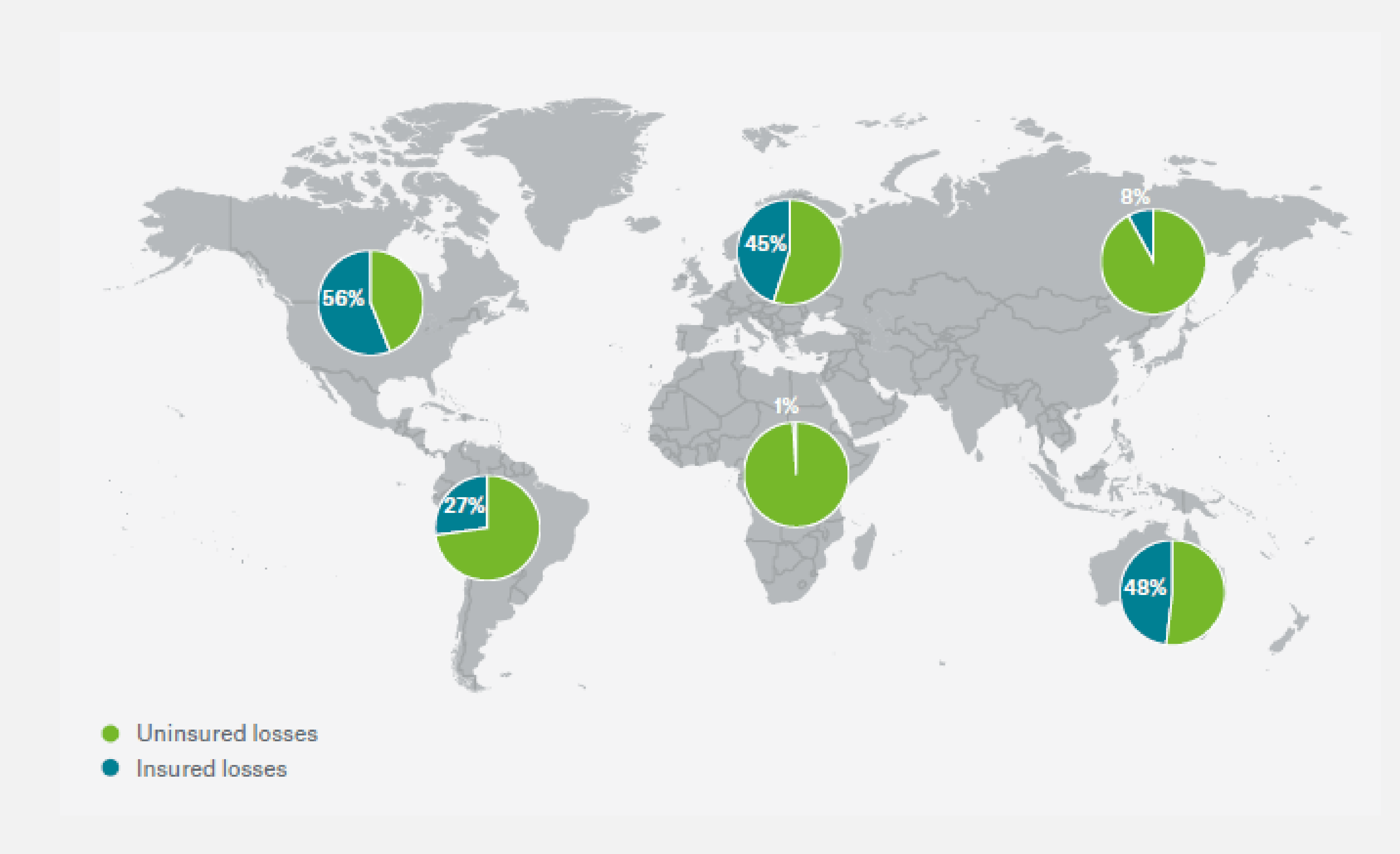
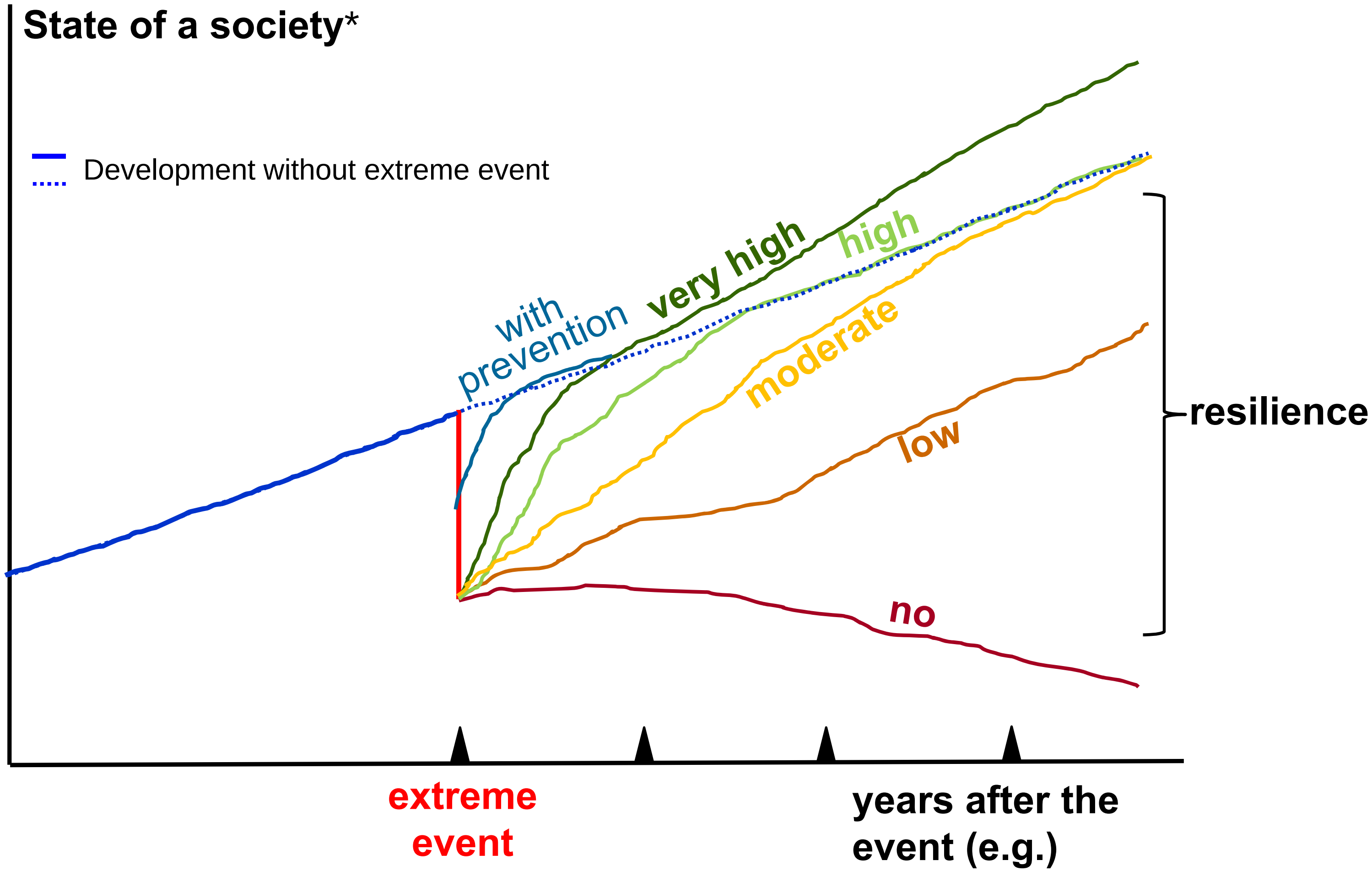


Resilience

= the ability

a. to return to the original form after strain or deformation („bouncing back“)
b. to withstand significant external stress („maintain essential functioning“)



* this can be GDP, wealth, national „happiness“, functioning of the society and economy, etc.

Resilience
Preconditions for high resilience

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Informed/educated/trained population

Well organised political system/ administration

Political unity (no split society)

Plans for reaction to a disruption available, existing disaster management

Disaster relief units (Search and rescue) available and fit for service

Financial means/funds/ insurance available

Strong/solid economy, esp. strong construction sector

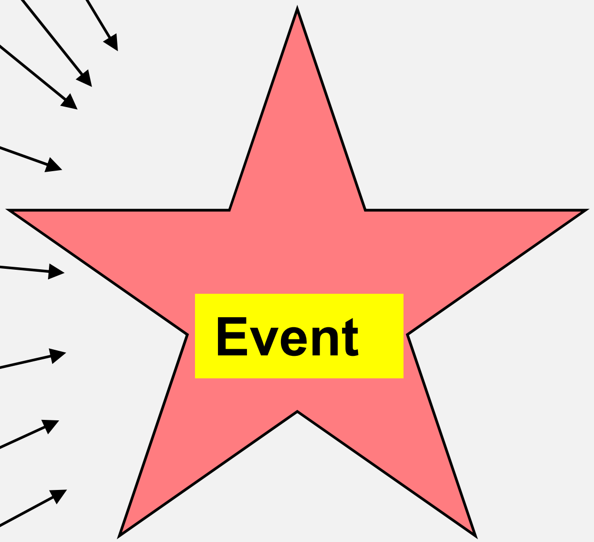
Hardened lifelines

Hardened general infrastructure

Good general construction quality

Alarm plans

Behaviour



Defence forces

Management

Resilience capacity (construction sector)

Post-Disaster-Management (reconstruction): chance to plan/built better than before

Availability of financial means

INSURANCE is among the most important cornerstones

BEFORE | **DURING** | **AFTER**

Cumulative change of **GDP** following a major loss

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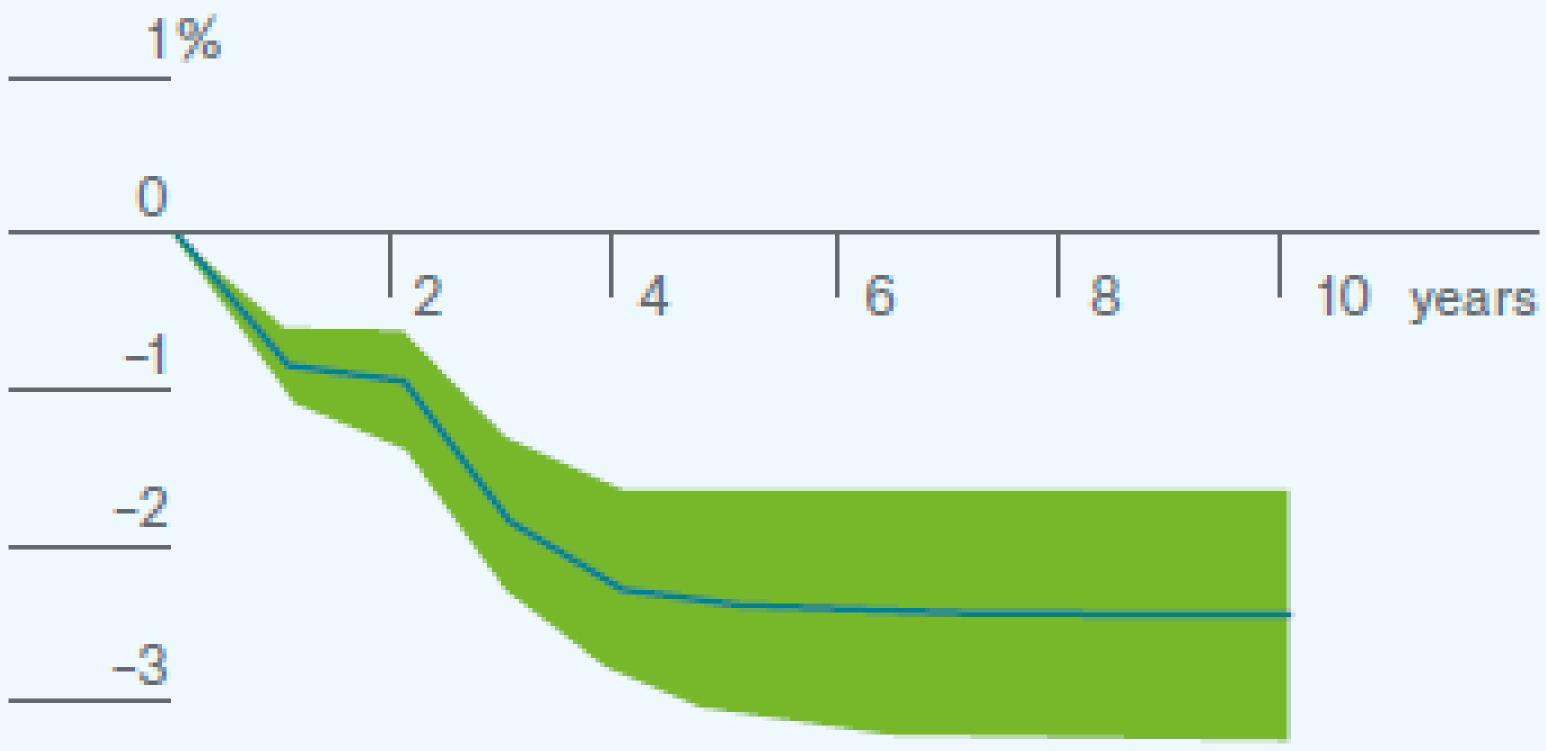
Countries **without** a natural catastrophe insurance scheme

Deviation from the trend



Source: Munich Re, based on von Peter et al., Bank for International Settlements, 2012 (schematic presentation)

Cumulative change of **GDP** following a major loss

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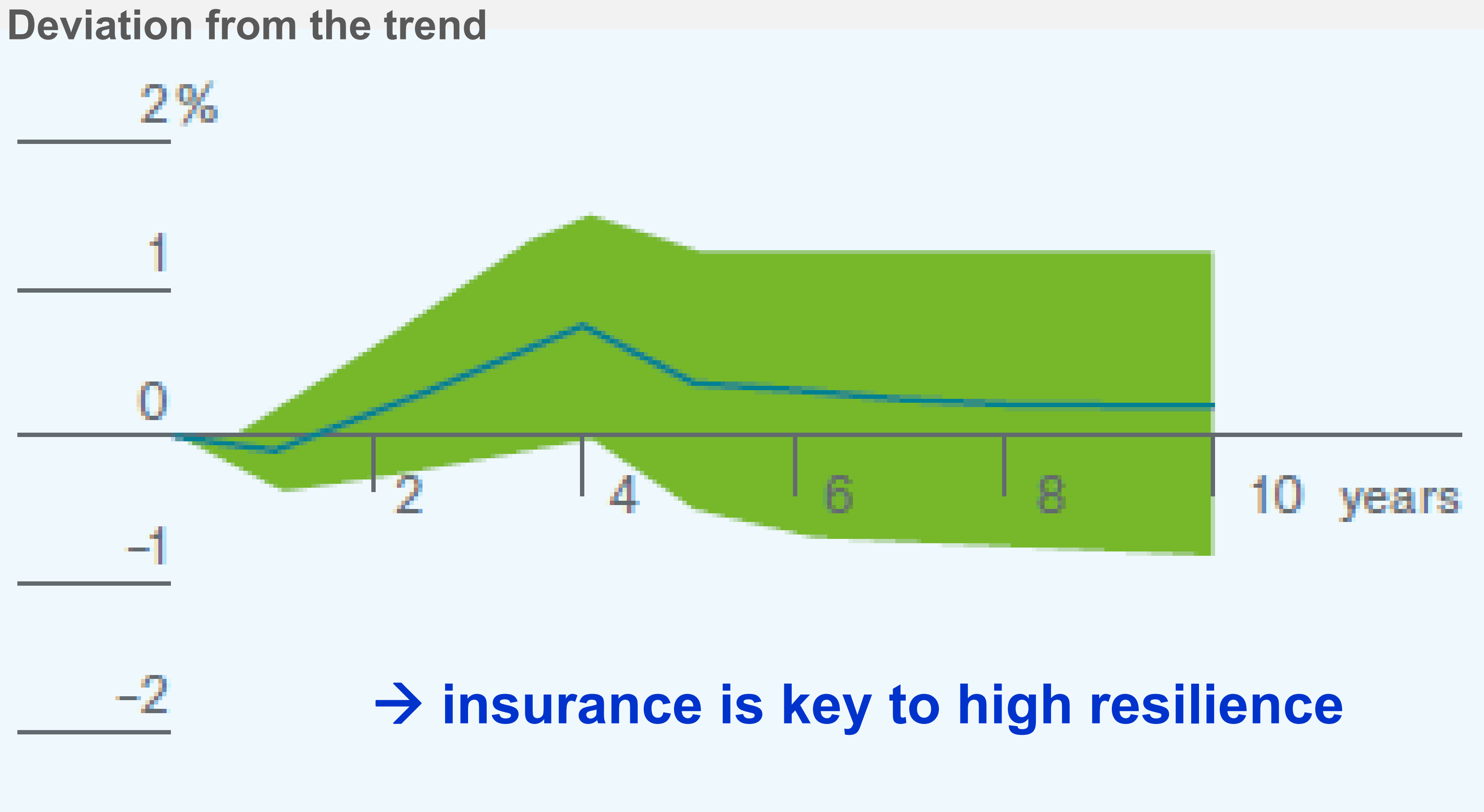
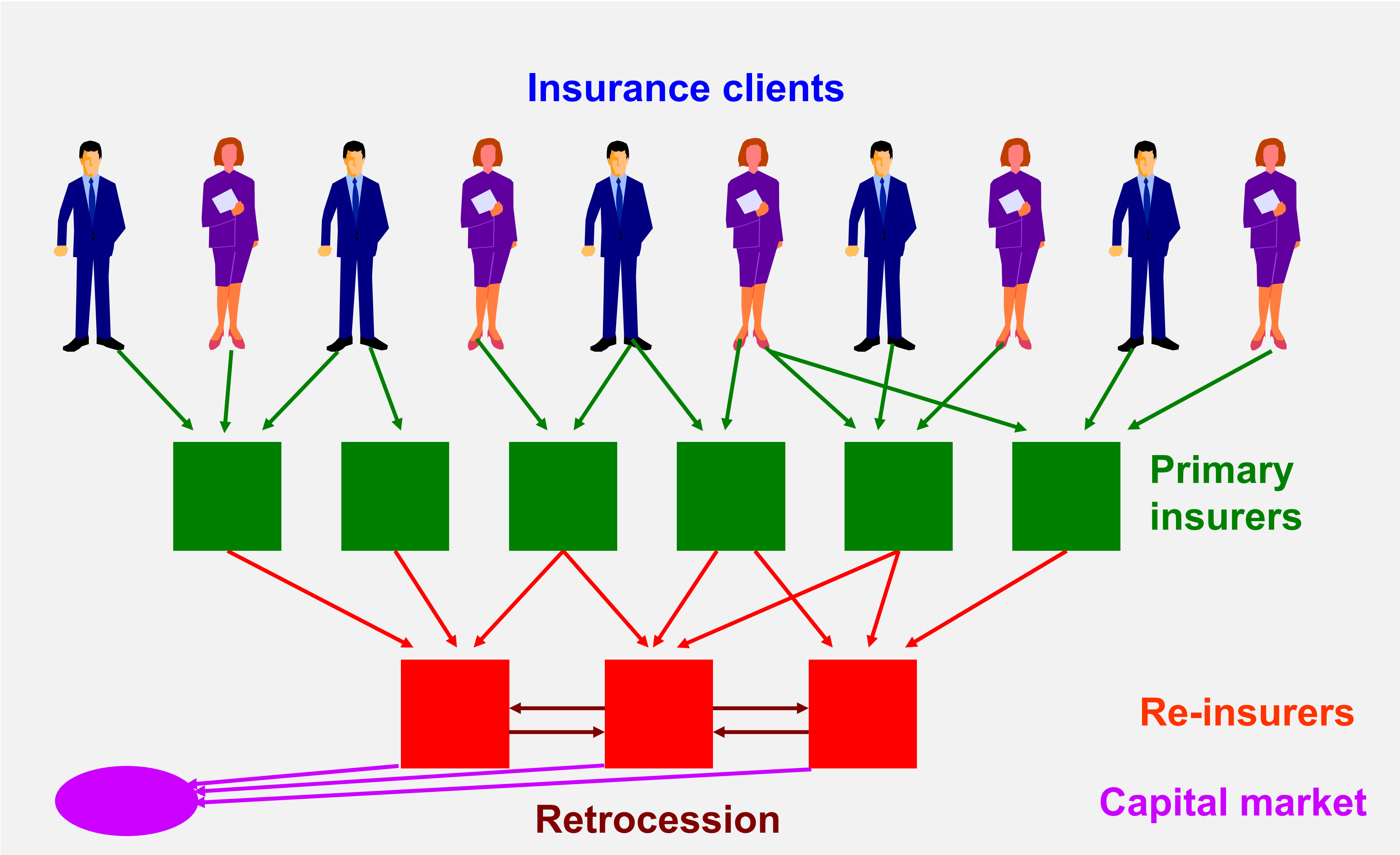
Countries **with** a comprehensive natural catastrophe insurance scheme



→ **insurance is key to high resilience**

Source: Munich Re, based on von Peter et al., Bank for International Settlements, 2012 (schematic presentation)

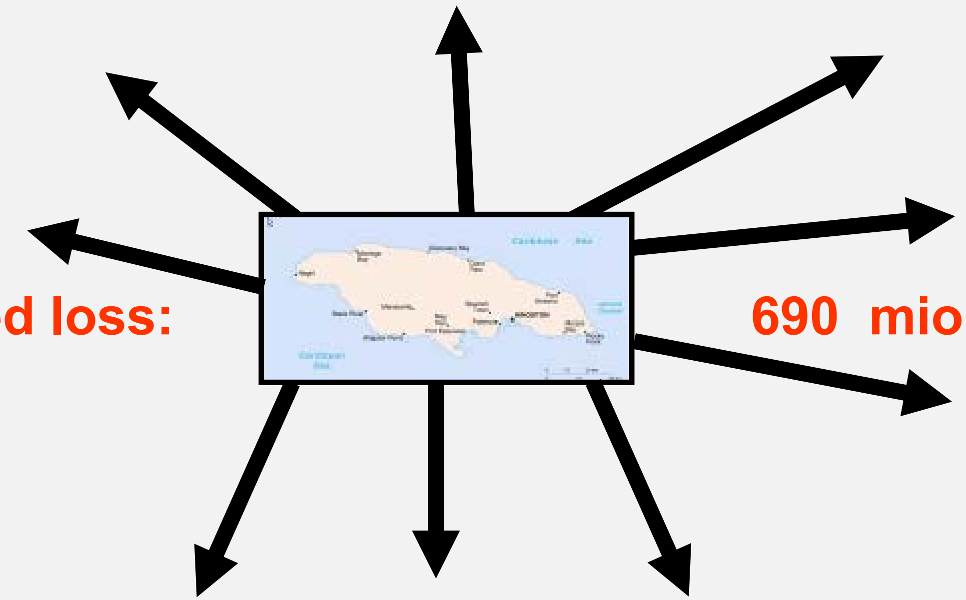
The international risk spreading system
Reinsurance



The international risk spreading system
Example of reinsured losses

Hurricane Gilbert (Jamaica 1988)

Overall loss: US$ 2 000m
Insured loss: US$ 700m



reinsured loss: **690 mio US$ (99 %)**

typical percentages of reinsured losses:

weak markets:	>90%
strong markets	<50%

The international risk spreading system in a more holistic way

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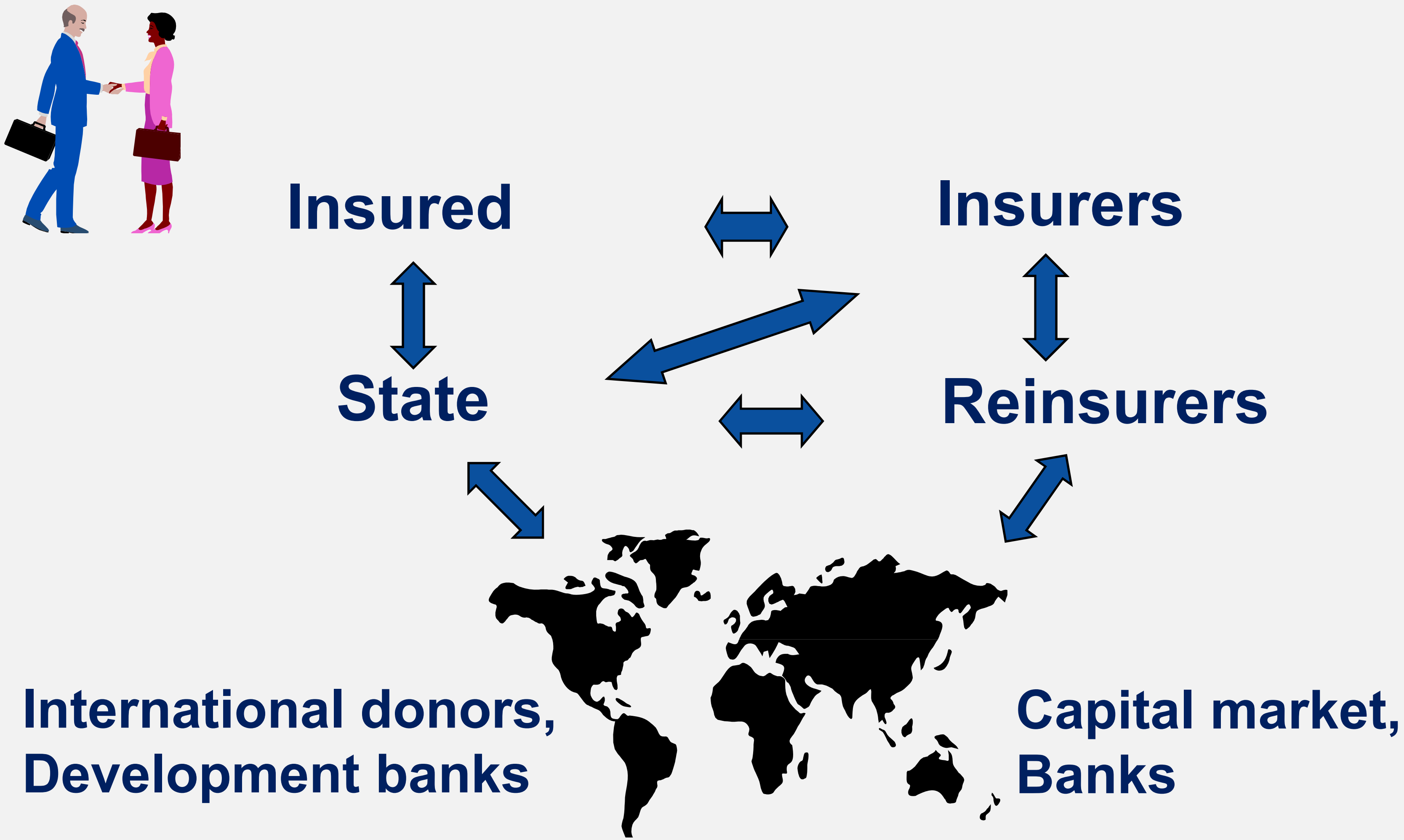

We have

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)

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

→ geared to very large potential losses

→ mainly used in developed countries

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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.**

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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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Insurance penetration in little developed countries is low.

Reasons:

- lack of risk awareness

- lack of financial means

- insurance cover is not available

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.

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).

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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,

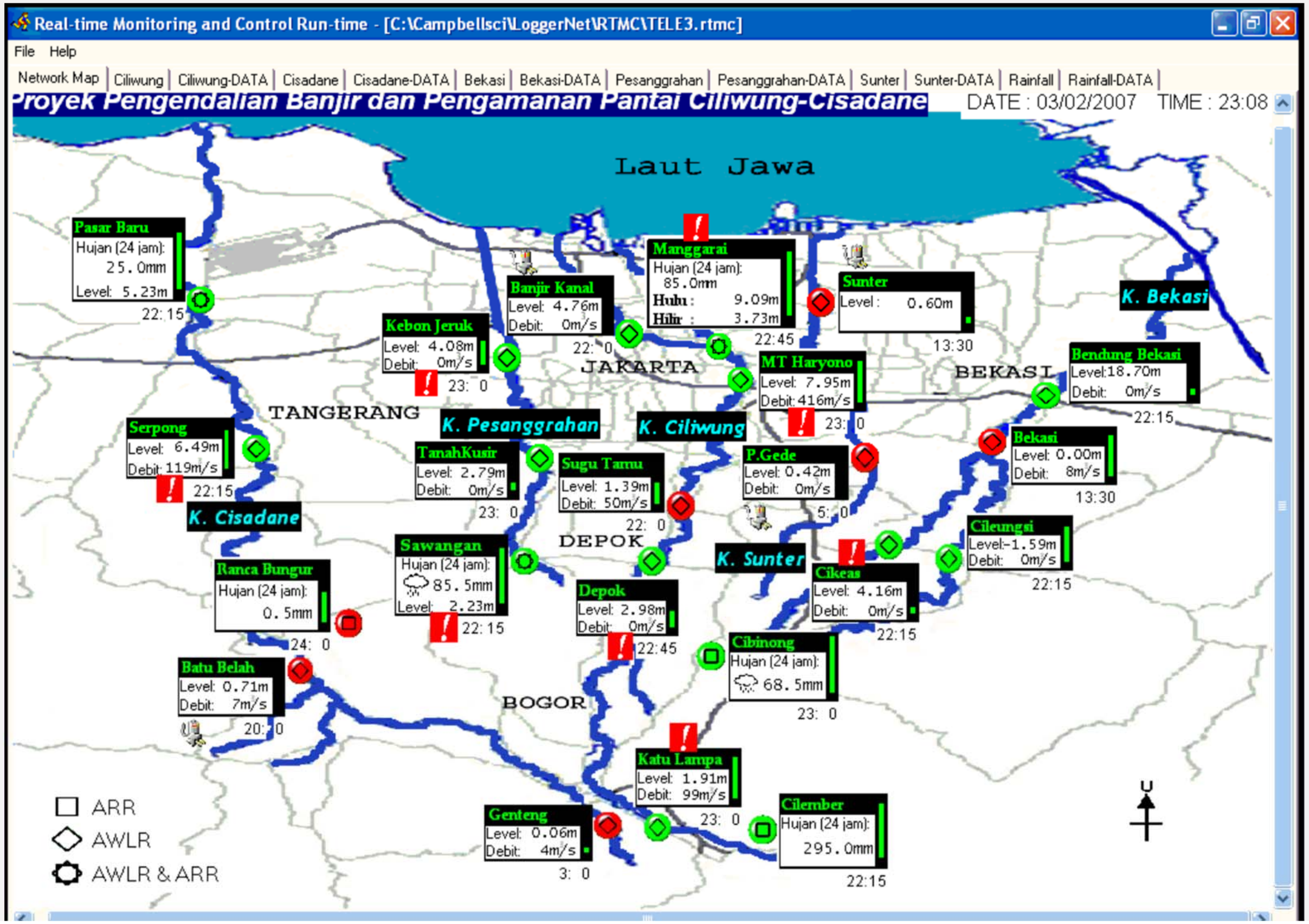
- lack of data.

Most important:

Raising awareness and educating the people concerned.

Micro-Insurance
Example

A scheme for underprivileged residents of Jakarta, who suffer from flooding almost every year, was set up in 2008, ...



Micro-Insurance
Example

... but abandoned in 2010.

Why?

It did not work, because people had high expectations for government compensation (as in the past) and were not interested in the insurance product.

Jakarta

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G7 Climate Risk Insurance Initiative -
Protection for the most vulnerable

- Create effective climate risk insurance solutions in relevant developing countries
- Contribute to enhance poverty reduction, climate resilience, economic growth
- Pledges amounting to USD 420 million have been made by G7 members
- Strengthen insurance-related facilities and initiatives:

  - African Risk Capacity (**ARC**)
  - Caribbean and Central American Catastrophe Risk Insurance Facility (**CCRIF**)
  - Pacific Catastrophe Risk Assessment and Financing Initiative (**PCRAFI**)
  - Climate Insurance Fund (**CIF**)
  - Climate Risk and Early Warning Systems Initiative (**CREWS**)

Urbanisation
Jakarta 1975

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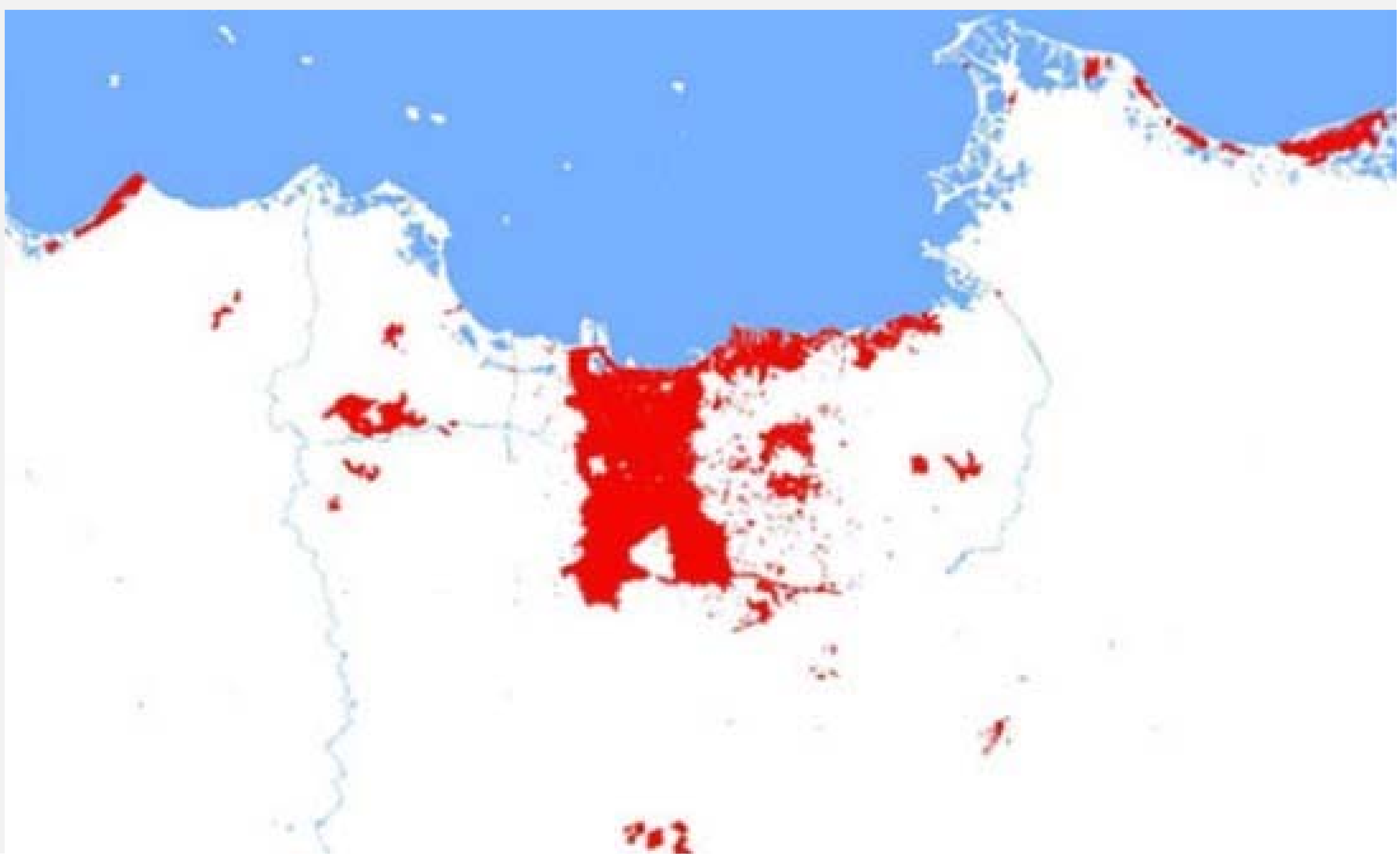

Urbanisation

Jakarta 1990

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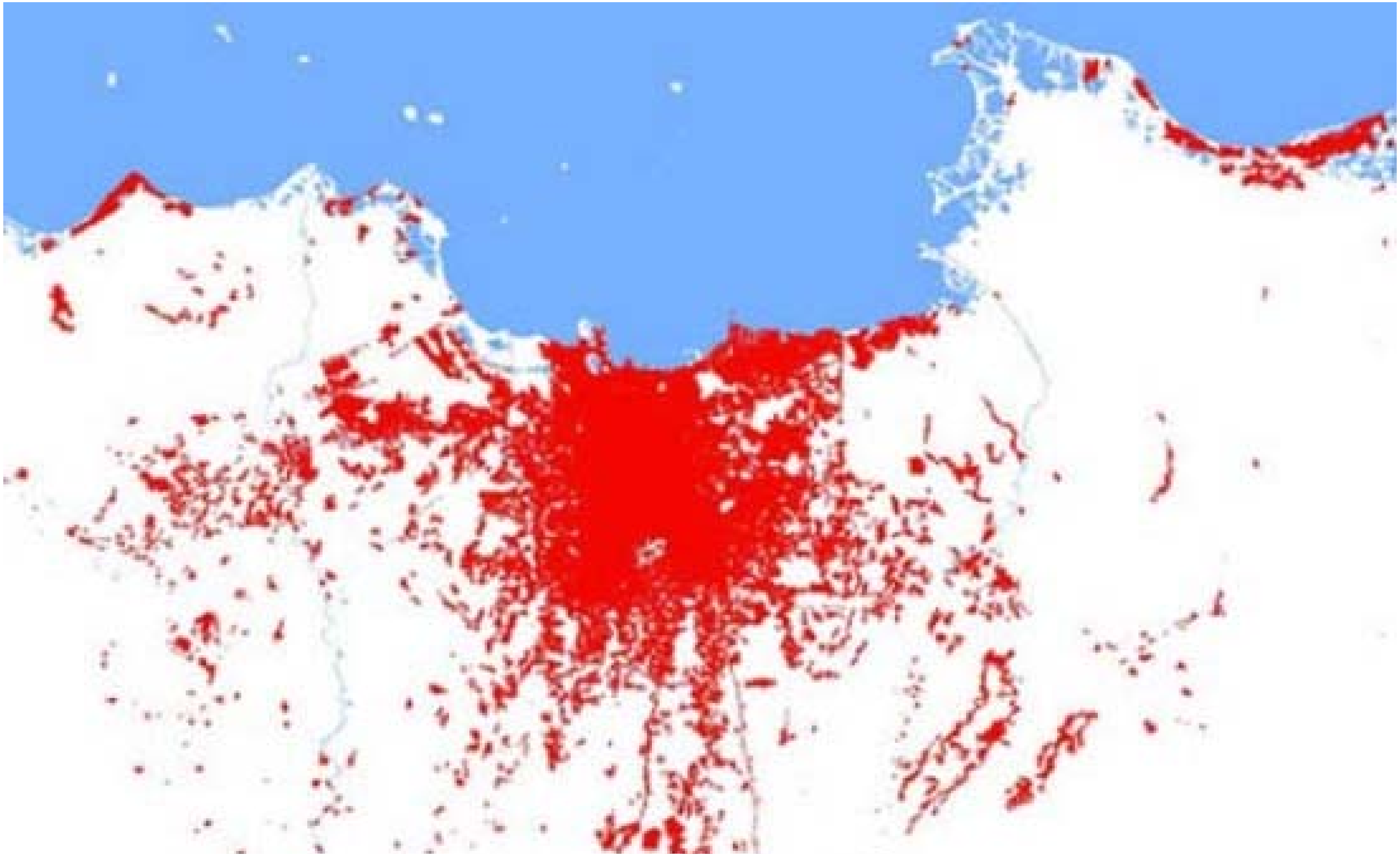

Urbanisation
Jakarta 2010

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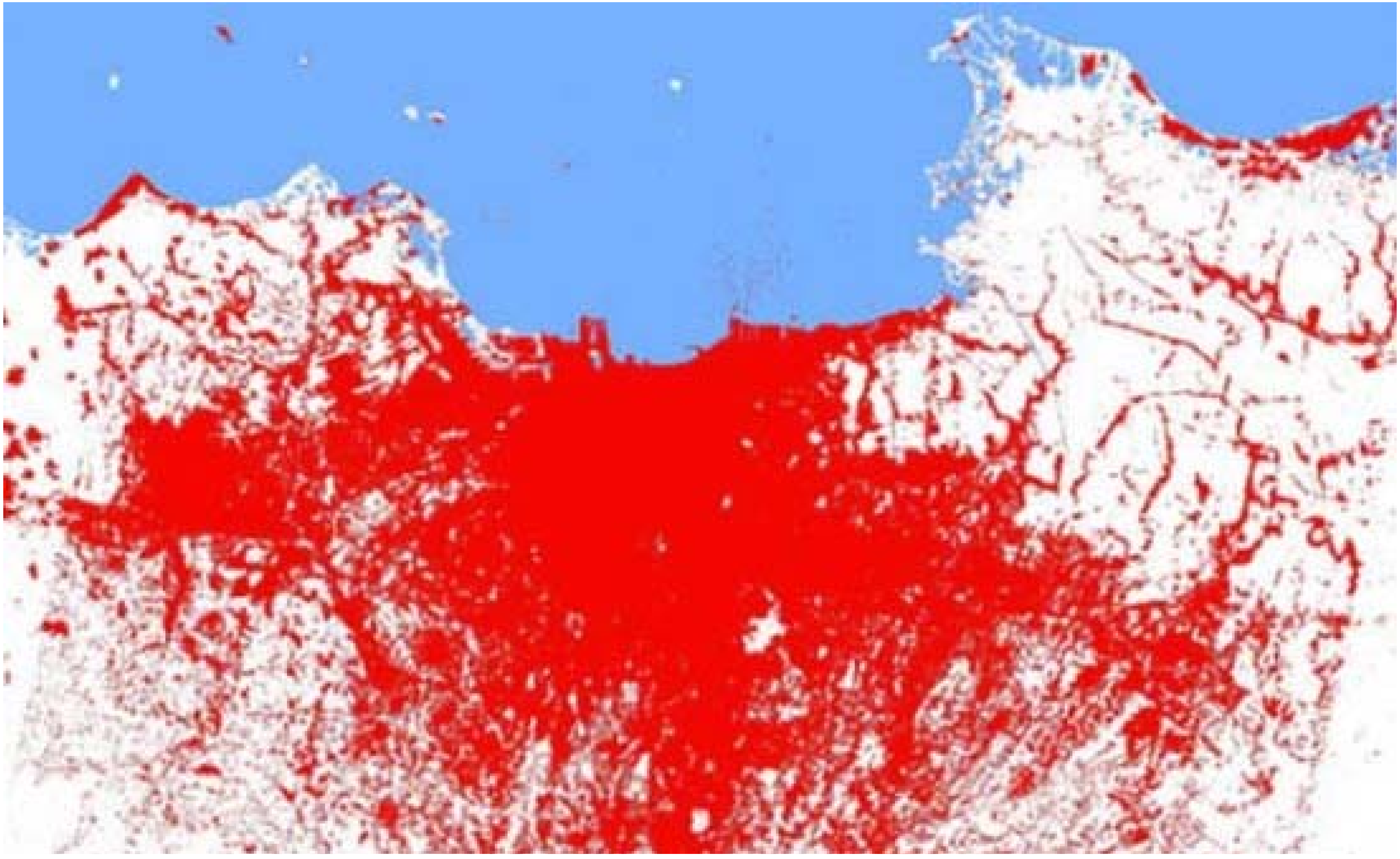
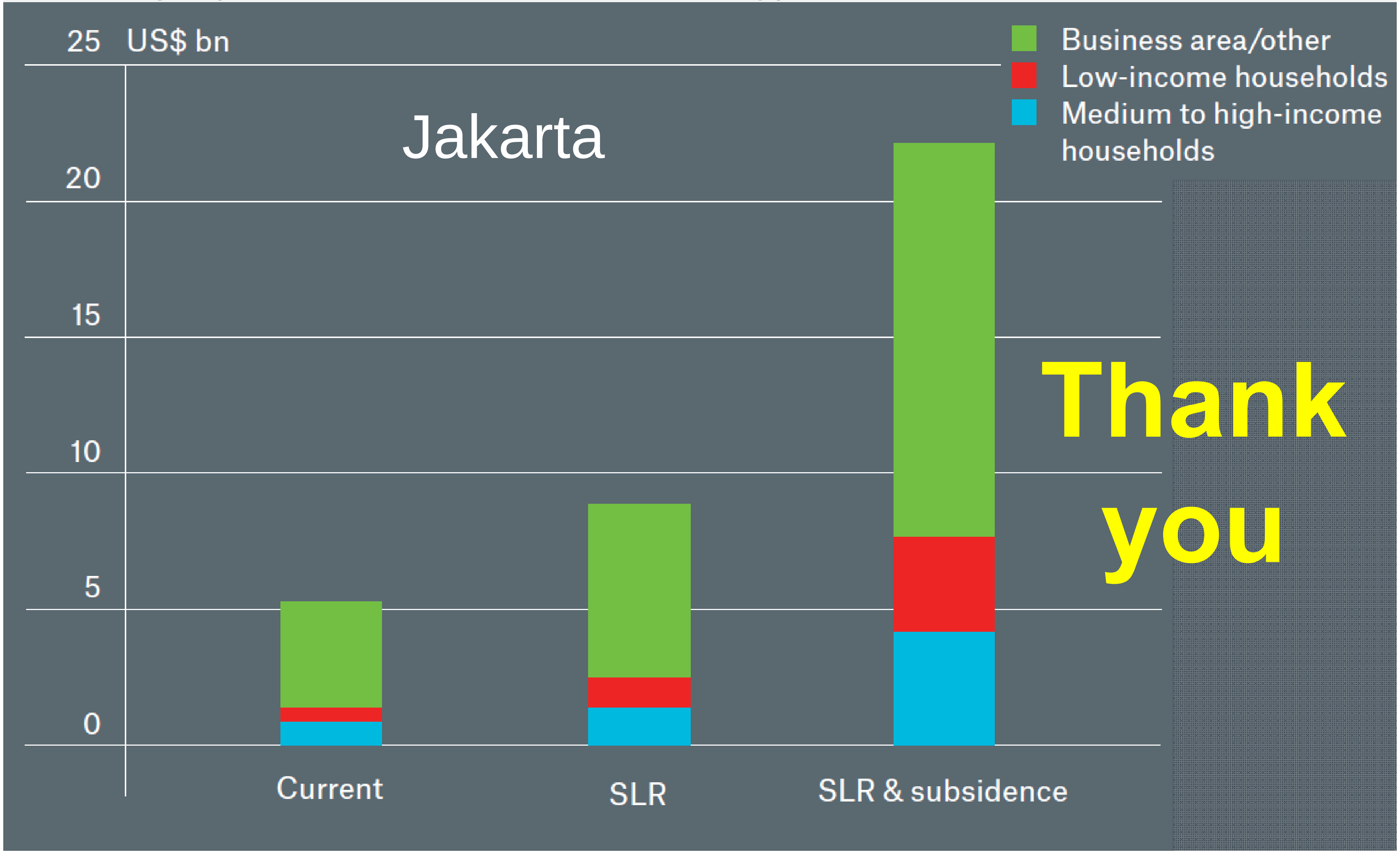


Subsidence

Simulations for three coastal 100-year inundation scenarios showing exposed assets for different landuse types



Thank you