



**OECD Conference on the
Financial Management of Flood Risk**

Building financial resilience in a changing climate

**PRESENTATIONS –
SESSION 6**

**12-13 May 2016
Paris, France**





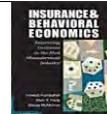
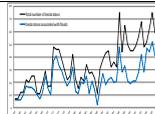
Session 6 – Supporting insurability and affordability – challenges and innovations Setting the Stage

Howard Kunreuther

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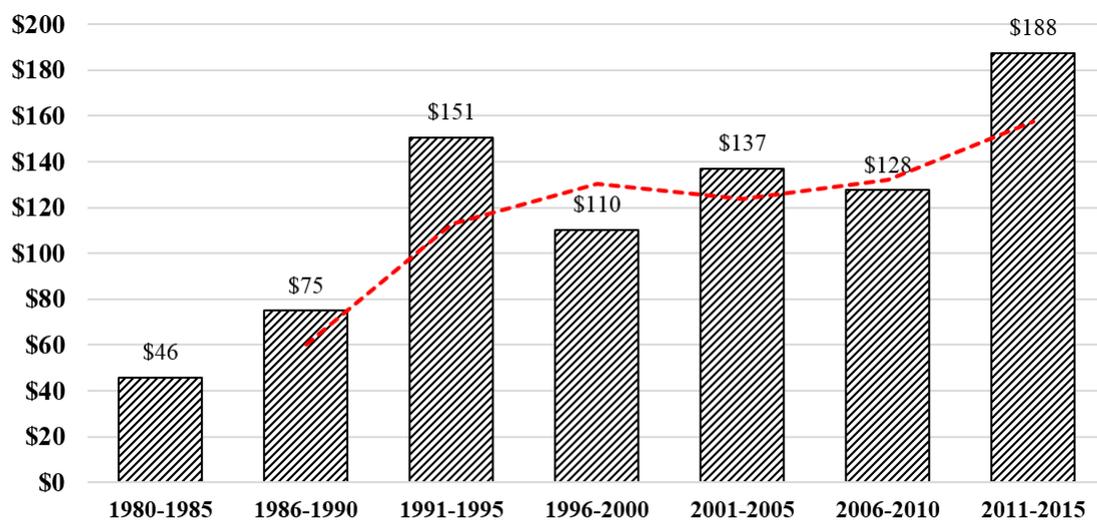
James G. Dinan Professor of Decision Sciences and Public Policy
Co-Director, Risk Management and Decision Processes Center
Wharton School University of Pennsylvania

OECD Conference on the Financial Management of Flood Risk
Paris, France
May 13, 2016



Economic Cost of Natural Disasters, 1980-2015

(in \$ billion, 2016 prices, corrected for inflation.) Decadal trend is the dashed line.



12 of the 15 most costly insured catastrophes worldwide between 1970–2015 (2014 prices), occurred since 2000. 10 are flood-related.

\$ BILLION	EVENT	VICTIMS	YEAR	AREA OF PRIMARY DAMAGE
78	Hurricane Katrina; floods	1,836	2005	USA, Gulf of Mexico
41	9/11 Attacks	3,025	2001	USA
37	Earthquake (M 9.0) and tsunami	19,135	2011	Japan
35	Hurricane Sandy; floods	237	2012	USA
26	Hurricane Andrew	43	1992	USA, Bahamas
22	Northridge Earthquake (M 6.6)	61	1994	USA
22	Hurricane Ike; floods	136	2008	USA, Caribbean
16	Hurricane Ivan	124	2004	USA, Caribbean
15	Floods; heavy monsoon rains	815	2011	Thailand
15	Earthquake (M 6.3); aftershocks	181	2011	New Zealand
15	Hurricane Wilma; floods	35	2005	USA, Gulf of Mexico
12	Hurricane Rita	34	2005	USA, Gulf of Mexico, et al.
11	Drought in the Corn Belt	123	2012	USA
10	Hurricane Charley	24	2004	USA, Caribbean, et al.
10	Typhoon Mireille	51	1991	Japan

Guiding Principles for Insurance to Deal with Affordability

Principle 1: Premiums reflecting risk

- Signals to individuals the hazards they face
- Encourages investment in cost-effective adaptation measures

Principle 2: Dealing with equity and affordability issues

- Provide vouchers to individuals requiring special treatment
- Only provide vouchers if homeowners mitigate their property to reduce future flood losses

Principle 3: Multi-year insurance contracts

- Premiums reflecting risk with vouchers to deal with affordability
- Addresses myopia
- Encourages investment in loss reduction measures through loans

A Proposed Program for Dealing with Affordability *

Encourage Investment in Loss Reduction Measures

- Risk-based premiums based on updated maps
- Home improvement mitigation loans tied to property
- Premium reductions for undertaking mitigation measures

Address Affordability Issue

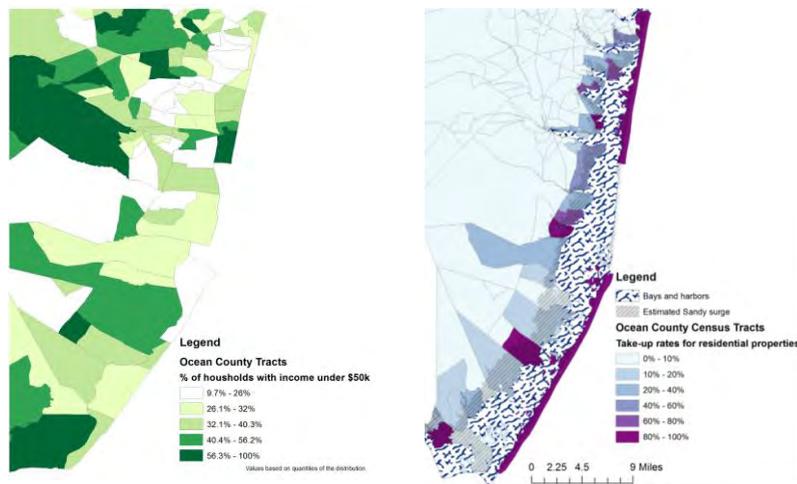
- Means-tested vouchers for current residents
- Covers insurance premium and mitigation loan
- Condition for a voucher: *You must mitigate*
- Required multi-year insurance and loans tied to the property



*Kousky, C., and Kunreuther, H. (2014). Addressing Affordability in the National Flood Insurance Program. *Journal of Extreme Events* 1(01).

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An Illustrative Example: Dealing with Affordability in Ocean County, NJ



6

Two Families Residing in Ocean County, NJ

Family 1 is in the A Zone and pays \$4,000 for flood insurance.

Family 2 is in the V Zone and pays \$18,550 for flood insurance.

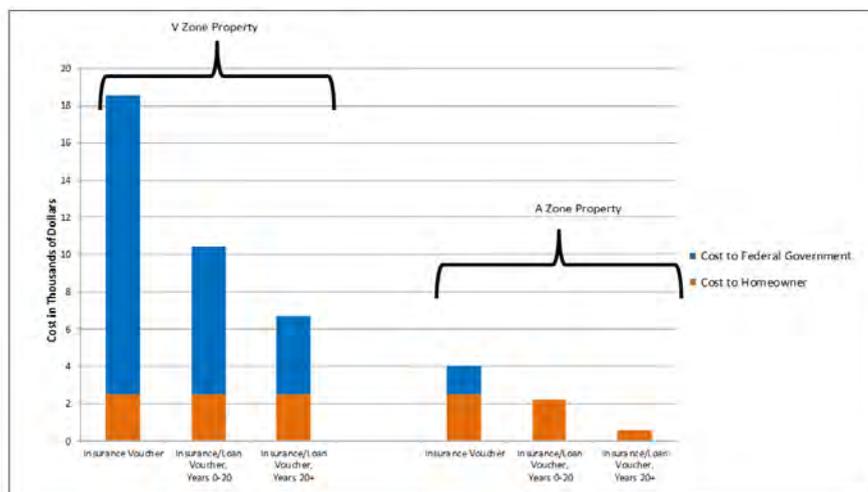
- Both homes are 3 feet below Base Flood Elevation (BFE)
- Each family has an annual income of \$50,000 per year

Cost of elevating home to 1 foot above BFE:

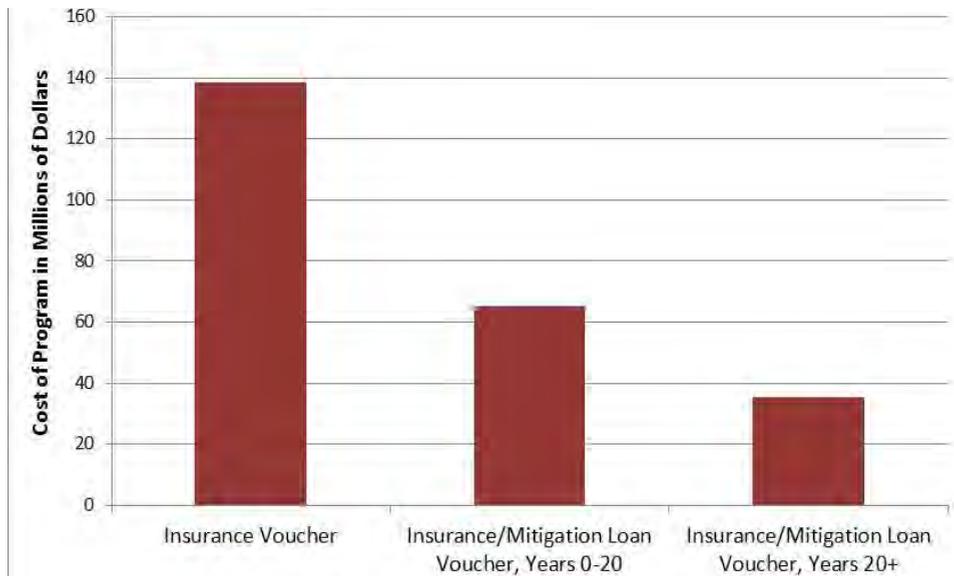
- Family 1: \$25,000 20-Year 3% Loan (Annual Payment \$1,680)
- Family 2: \$55,000 20-Year 3% Loan (Annual Payment \$3,660)

Means-tested voucher covers insurance and mitigation costs above \$2,500 (i.e., above 5% of income)

Cost to the Public Sector and the Two Families



Estimates of Program Costs for Ocean County Tracts that Experienced Storm Surge



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Everyone is a Winner

Homeowner:

Lower total annual payments

Insurers:

Reduction in flood losses

Financial institution:

More secure investment due to lower losses from disaster

Public sector :

Lower voucher costs due to reduced insurance premiums because property is mitigated (e.g., elevated; flood-proofed)

General taxpayer:

Less disaster assistance



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Designing Targeted Assistance Programs for an Affordability Program



Challenges and Questions for Discussion

How can the flood risk be effectively communicated to residents in flood-prone areas?

What role can mitigation measures play in making flood insurance more affordable?

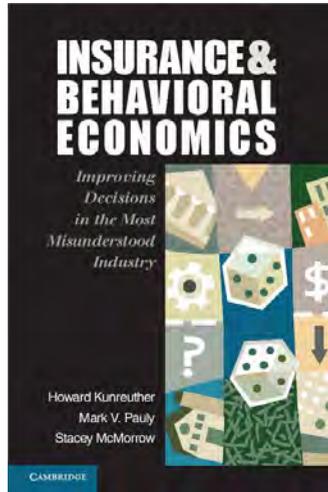
What types of financial assistance should be provided to address affordability issues?

What are the roles of the public and insurance sectors in supporting such initiatives?

What impact can these have on the affordability of insurance coverage?

How do different countries address the affordability problem?

*Insurance and Behavioral Economics:
Improving Decisions in the Most Misunderstood Industry*



Part I: Contrasting Ideal and Real Worlds of Insurance

Chapter One: **Purposes of this Book**

Chapter Two: **An Introduction to Insurance in Practice and Theory**

Chapter Three: **Anomalies and Rumors of Anomalies**

Chapter Four: **Behavior Consistent with Benchmark Models**

Part II: Understanding Consumer and Insurer Behavior

Chapter Five: **Real World Complications**

Chapter Six: **Why People Do or Do Not Demand Insurance**

Chapter Seven: **Demand Anomalies**

Chapter Eight: **Descriptive Models of Insurance Supply**

Chapter Nine: **Anomalies on the Supply Side**

Part III: The Future of Insurance

Chapter Ten: **Design Principles for Insurance**

Chapter Eleven: **Strategies for Dealing with Insurance-Related Anomalies**

Chapter Twelve: **Innovations in Insurance Markets through Multi-Year Contracts**

Chapter Thirteen: **Publicly-Provided Social Insurance**

Chapter Fourteen: **A Framework for Prescriptive Recommendations**

OECD Conference on the Financial Management of Flood Risk
12/13 May 2016

Session 6: Supporting insurability and affordability – challenges and innovations

Some insights from Germany

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Availability of flood insurance in Germany

Since 1994, a voluntary natural hazards insurance as a supplement to the building or contents insurance is available in all of Germany.

Current market penetration: >15%



Until 1994, there was a compulsory flood insurance in Baden-Württemberg.
Current market penetration: 90%

Until 1990 (in the GDR), flood losses were covered by the household insurance.

Current market penetration: >30%

Overall market penetration in Germany (residential buildings)
in 2002: 19%
in 2013: 34%

Governmental disaster relief after major floods

August 2002



June 2013



Impact indicator	August 2002	June 2013
Fatalities	21	14
Financial losses (first estimates)	€ 22000 million	€ 14000 million
Financial losses (final expenses)	€ 11600 million	around € 6 - 8 billion
Governmental disaster funds	€ 7100 million	€ 8000 million

Empirical data base

Written surveys among property insurers on insurance conditions

In spring 2003

Response:
25 out of 119 (21%)

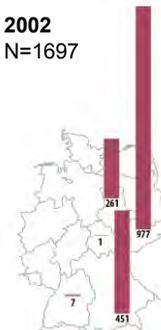
December 2012/ January 2013

Response: 29 out of 106 (27%)
Market share of the responding insurers:
46% (contents)
53% (buildings)

Telephone surveys among flood-affected residents 9 months after the flood

- Flood impact and damage
- Warning, response, mitigation, insurance etc.
- Socio-demographic characteristics

2002
N=1697



2013
N=1652



Insurability

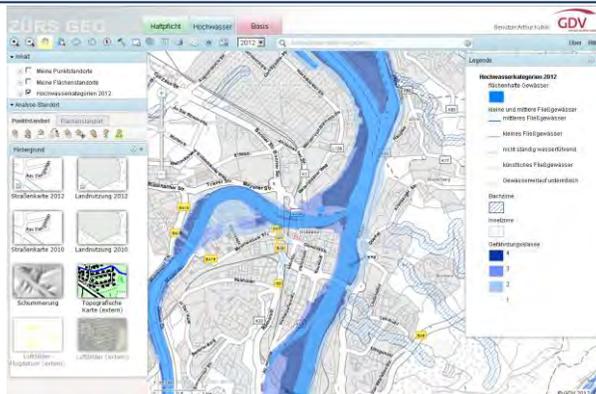
Conditions that usually have to be fulfilled to receive Natural Hazards Insurance Coverage for residential buildings

Assessment criterion	in 2002	in 2012/13
ZÜRS-Zone I	---	89%
ZÜRS-Zone II	58%	85%
ZÜRS-Zone III	32%	74%
No damage in 5 years	89%	18.5%
No damage in 10 years	84%	63%
Up to 1 claim in 10 years	11%	11%
Up to 2 claims in 10 years	0%	11%
No restriction	0%	7%
Number of valid cases	19	27

In case these conditions cannot be fulfilled, 25 of 29 insurers offer individualized conditions including loss mitigation measures (18 or 62%); **in 2002**: only 6 of 19, only 2 insurers considered loss mitigation measures

Flood hazard and insurability

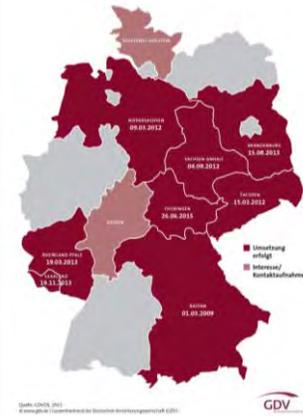
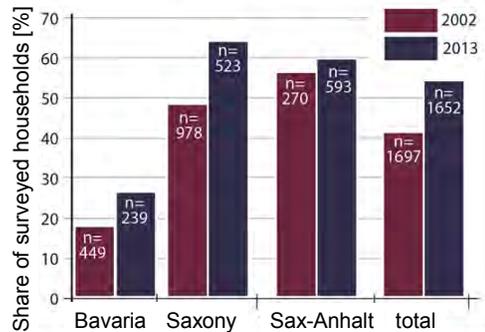
ZÜRS: Flood zoning system of the German insurers



- Hazard zone IV: flooded on average once in 10 years
- Hazard zone III: flooded on average once in 10 to 50 years
- Hazard zone II: flooded on average once in 50 to 200 years
- Hazard zone I: flooded on average less than once in 200 years

<http://www.gdv.de/2008/08/geo-informationssystem-zuers-geo-zonierungssystem-fuer-ueberschwemmungsrisiko-und-einschaetzung-von-umweltrisiken/>

Natural Hazards Insurance Coverage among surveyed flood-affected households



<http://www.gdv.de/2013/11/informationskampagnen-fuer-mehr-naturgefahrenschutz/>



Possible reasons for the increase

- Recurrent flood events
- Changes in disaster relief guidelines in Bavaria and Saxony
- Enhanced risk communication, e.g. flood hazard and risk maps
- Joint information campaigns of GDV and water agencies

Comparison of insured and uninsured households

Percentage of households receiving compensation of...	Flood of August 2002		Flood of June 2013	
	uninsured households (n = 963)	insured households (n = 673)	uninsured households (n = 679)	insured households (n = 893)
100%	4.88%	15.60%	6.77%	14.89%
At least 80%	7.37%	24.22%	10.90%	22.96%
At least 50%	17.03%	43.83%	17.53%	35.27%
Less than 50%	42.99%	25.86%	30.04%	21.05%
No compensation	22.43%	8.62%	32.11%	17.47%
No answer	17.55%	21.69%	20.32%	26.21%

Significant differences (in 2013):

- Insured get higher compensation payments than uninsured
- Insured are more satisfied with the process than uninsured
- Insured have higher content losses than uninsured and recover sooner (replacement of damaged items)

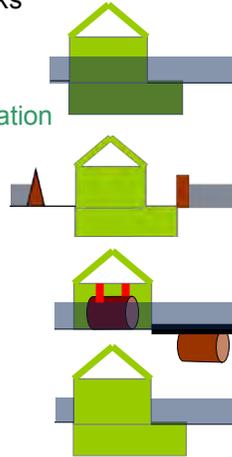
No significant differences (in 2013):

- Damage to the building and recovery
- Household income

What is private mitigation?

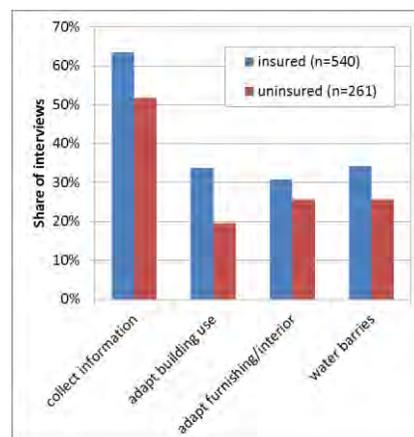
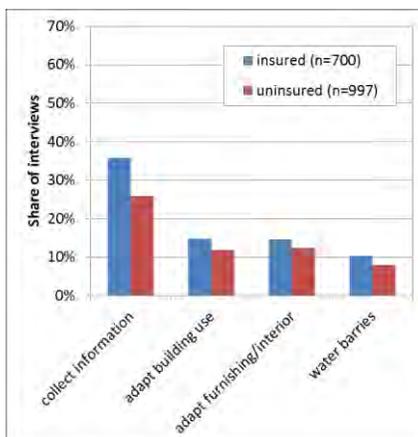
Property-level mitigation measures

- Collection of information
- Neighbourhood help, networks
- Flood-adapted building use
- Flood-adapted interior decoration
- Mobile water barriers
- Heating in upper floors
- Protection of oil tank
- Sealing of the building
- Preparatory measures (e.g. water pumps)
- **Insurance**



Property-level mitigation and insurance

Mitigation before the flood in 2002 and as of 2012



Private mitigation and insurance (cont.)

In 2013, German property insurers supported private mitigation by:

- Informing residents about their flood hazard potential (25 out of 29 insurers)
- Informing residents about appropriate mitigation measures (22 insurers)

If property-level mitigation measures are in place then

- flood insurance is offered despite a high flood hazard by individualized contracts (25 out of 29 insurers)
- the deductible is reduced (8 insurers)
- the insurance premium is reduced (7 insurers)
- the deductible is omitted (3 insurers)

SUPPORTING INSURABILITY AND AFFORDABILITY

CHALLENGES AND INNOVATIONS

DON FORGERON
PRESIDENT AND CEO
INSURANCE BUREAU OF CANADA



DFAA
PAYMENTS

200+
DISASTERS
(1970 TO 2014)

\$6.8 BILLION
\$5.2 BILLION *FLOOD-RELATED*

1970

1980

1990

2000

2010

2020

\$37

MILLION PER YEAR

FEDERAL DISASTER
RELIEF SPENDING

\$608

MILLION PER YEAR

\$900

MILLION PER YEAR

FUTURE LIABILITIES ESTIMATE

INDUSTRY ALONE CANNOT FULLY ADDRESS HIGHEST RISK PROPERTIES

ACCURATE MAPPING TARGETED INVESTMENT WIDESPREAD AWARENESS GOVERNMENT INVOLVEMENT

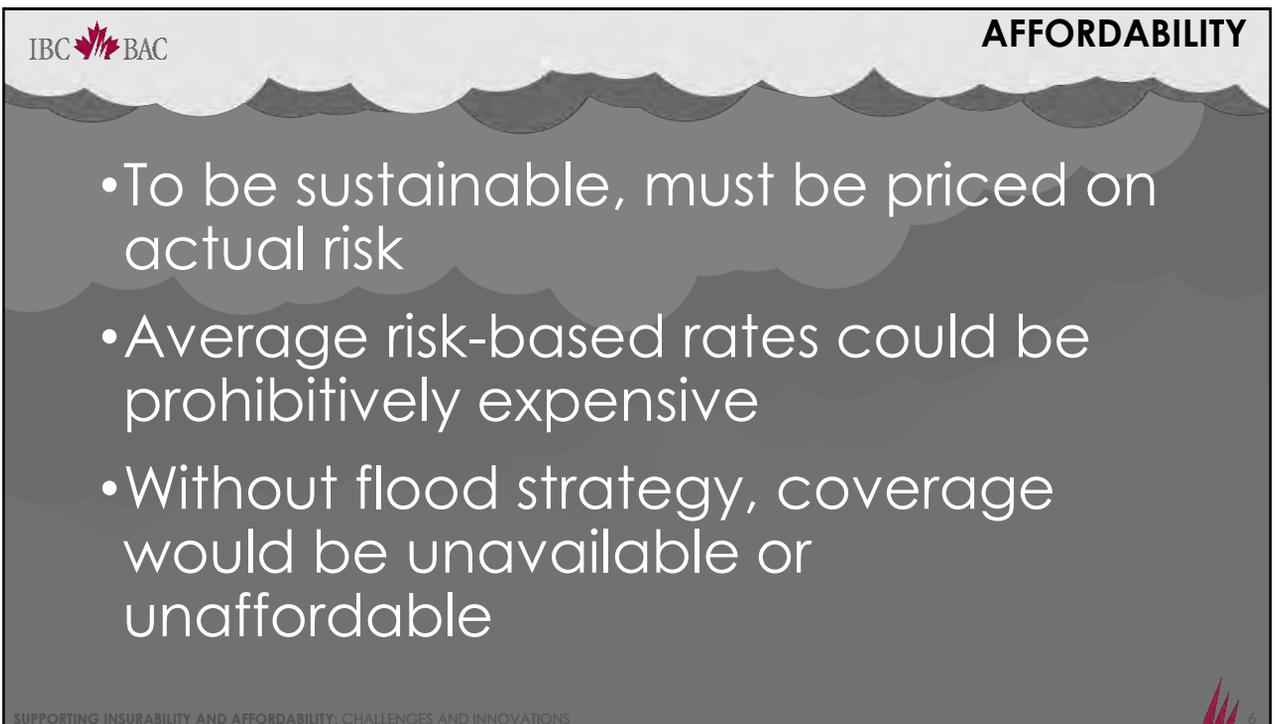


IBC  BAC

AFFORDABILITY

- To be sustainable, must be priced on actual risk
- Average risk-based rates could be prohibitively expensive
- Without flood strategy, coverage would be unavailable or unaffordable

SUPPORTING INSURABILITY AND AFFORDABILITY: CHALLENGES AND INNOVATIONS



The infographic has a dark grey background with a white scalloped border at the top. The word 'AFFORDABILITY' is in the top right. Three bullet points are listed in white text. The IBC logo is in the top left, and a red flame-like logo with the number '6' is in the bottom right.

- Subsidization of high risk properties
- Take up rates
 - Optional vs. mandatory coverage
- Non-regulated line of business
- Federal – provincial jurisdictional challenges

- Adapting to climate change a priority of new government
- Continue forward with government
- Build partnerships
- Advocate for a national flood strategy

SUPPORTING INSURABILITY AND AFFORDABILITY

CHALLENGES AND INNOVATIONS

DON FORGERON
PRESIDENT AND CEO
INSURANCE BUREAU OF CANADA

IBC  BAC



OECD Conference on the Financial Management of Flood

Session 6 – Supporting insurability and affordability – challenges and innovations

13 May 2016
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Vice President, Personal Lines
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Supporting Insurability and Affordability

Recently, there have been various efforts to establish the conditions for a private residential flood insurance market in the U.S.

- What are the major impediments to the development of a private flood insurance market in the U.S. and what can be done to address those challenges?
- If the NFIP stopped offering flood insurance tomorrow – would the private sector be able to fill the gap?

2

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Brief Overview of Current Program

- NFIP legislation enacted in 1968
- Currently > 5 million policyholders – but declining base
- FEMA estimates > 10 million properties with flood risk
- NFIP premiums > \$3b annually
- Program needs to be reauthorized by 30 September 2017
- U.S. private insurance market in strong capital position
 - "Combined" ratio under 97% in 2014 and 97.8% in 2015
 - Premiums-to-surplus ratio of .74:1 – 2014 and .76:1 – 2015
 - 57-year average 1.38:1
- Provisions in current laws – pools and reinsurance
- Biggest challenges for private sectors:
 - Primary insurers: pricing/regulation
 - Reinsurers: low interest government loans

3

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NFIP Reauthorization Legislation

- HFSC leadership (Rs) want significant privatization of the NFIP
- Others interested in limiting private sector role
- Stalemate = lapses/short-term extensions
- Biggert-Waters law phasing in higher federal rates (esp. 2019+)
 - HFIAA rollback only for primary residences - adds a \$250 surcharge to 2nd home and business policies (\$25 on all others)
 - Surcharge is forcing more properties to market rates (or higher)
- Strong primary and reinsurer interest in underwriting flood in the private market
- House unanimously passed legislation to encourage lender acceptance of private flood insurance on 28 April 2016

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PCI Board Working Group on Flood

- Board established to develop PCI policy in response to Congress
 - Mixture of surplus lines, small and large admitted, and WYOs

Long-Term Vision

- The private sector can model and price flood risk
- Need a gradual transition
- Private insurance requires rate adequacy; most NFIP consumers are being subsidized
- Continued govt. program necessary where policymakers determine ongoing subsidies are necessary
 - Federal insurance should be serviced by private WYOs

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Pro-Market Flood Insurance Reforms

PCI supported pro-free market reforms:

- Improve/streamline NFIP (reduce complexity/increase certainty)
- Eliminate WYO non-compete clause
- Reexamine NFIP Direct
- Increase lender acceptance of private flood insurance
- Encourage NFIP purchase of reinsurance
- Make NFIP underwriting data available to insurers
- Publish updated NFIP rating information
 - Comparison to private with transparent subsidies
- Encourage education of consumers, state legislators and regulators regarding the need for flood insurance and community participation in the program

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Flood Insurance Restructuring Options

- Limit eligibility of non-primary residences
 - Commercial (5.4%) [\$500k cap on structures/contents]
 - 2nd homes [\$250k cap on structures; \$100k on contents]
 - Homes > \$1m assessed value (perhaps with a sliding scale)
- Analysis of additional top comprehensive restructuring options, how they could be implemented, and pros/cons
 - Cedent option (insurers assume a small % of risk like FHCF)
 - Negotiate take-outs (like FL Citizens)
 - NFIP created industry pools
 - FHA approach
 - Depopulate NFIP by rate increases, mitigation, & buy-outs
- NFIP residual market necessary where continued subsidies – through WYOs or private market with a govt. backstop

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U.S. Flood Insurance: Other Issues

- \$23b debt
- \$250 surcharge
- Funding NFIP's ongoing mitigation
- Controversy over mapping
- Limited purchase of flood insurance where not mandated

+ PCI sponsored National Flood Conference - 15-18 May 2016

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The Future?!

- ❖ Advocate PCI's long-term vision:
 - Support private sector underwriting
 - Gradual transition
 - Stress need for rate adequacy (private market levels)
 - Support NFIP w/private WYO servicing where p/m require subsidies
- ❖ Advocate targeted reforms:
 - Improve/streamline NFIP
 - Eliminate WYO non-compete clause
 - Reexamine NFIP Direct
 - Increase lender acceptance of private flood insurance
 - Encourage NFIP purchase of reinsurance
 - Make NFIP data available
 - Encourage flood insurance purchases
- ❖ Bring to table narrowing NFIP eligibility (commercial; 2nd homes; \$1m+)
- ❖ Provide analysis of other restructuring options

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Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation

Federal Department of Finance FDF
State Secretariat for International Finance SIF

Flood Insurance and Prevention in Switzerland

Thomas Luder, 13 May
OECD Conference on the Financial Management of
Flood Risks



Insurance of ...

Business Interruption

Buildings

Car/Motor/Auto

Content of Buildings

Accident, Health,
Life

Insurance in Switzerland for buildings and content: Hazards



3

Two Systems for Nat Cat Insurance

26 Cantons (=states) in Switzerland.



19 cantons:
local cantonal monopoly building insurers.

7 cantons:
coverage provided by private insurers.

13.5.2016

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Two Systems: Monopolies + Private Insurers

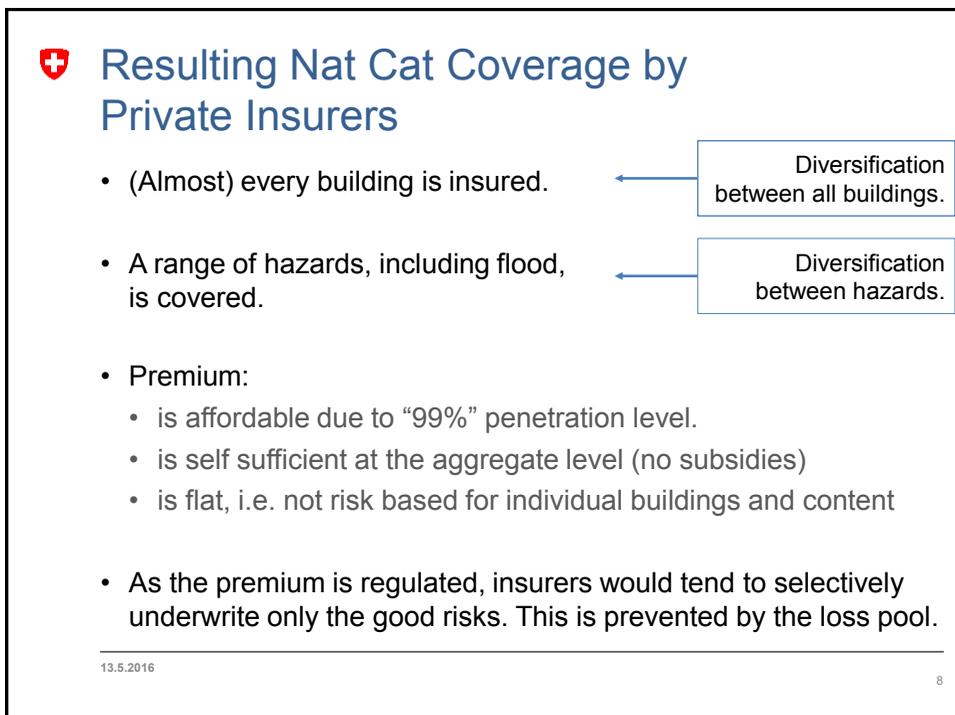
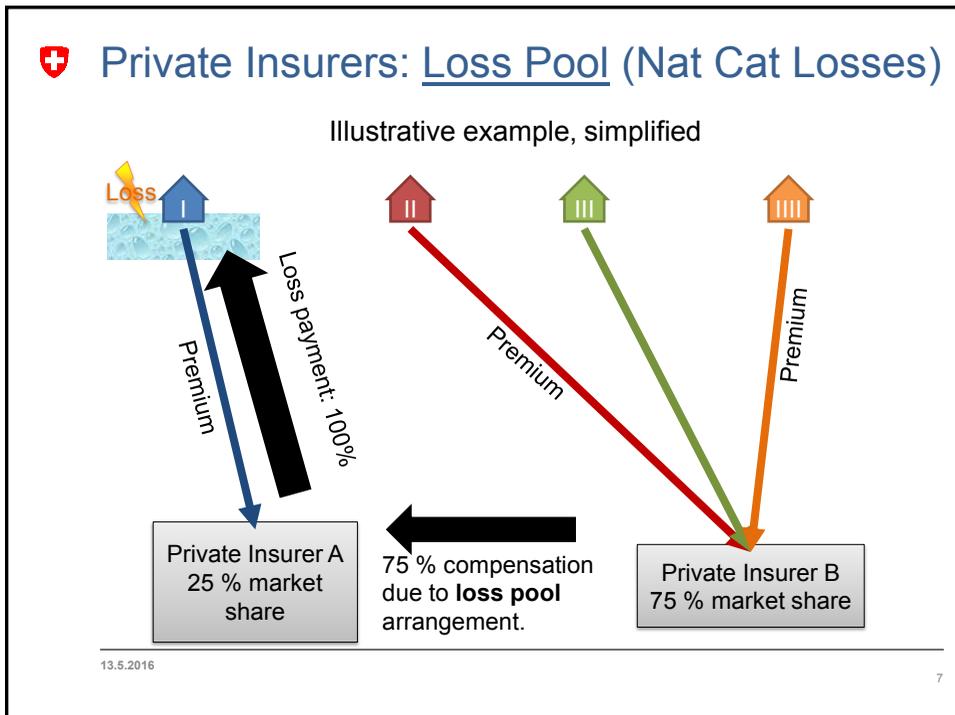
Cantons (= States)	Building Insurance			Content Insurance		
	Insurer	Sum insured	Base coverage is compulsory.	Insurer	Sum insured	
19	NW, VD, GL	State Monopolies	CHF 2 300 bn	Yes	State Monopo.	CHF 87 bn
	ZH, BE, LU, ZG, FR, SO, BS, BL, SH, AR, SG, GR, AG, TG, NE, JU				Private Insurers	CHF 830 bn
7	UR, SZ, OW	Private Insurers	CHF 550 bn	Yes	Private Insurers	
	AI, TI, VS, GE			No, but almost complete penetration.		

Nat Cat coverage by Private Insurers

- Where: In 7 out of 26 Cantons the building insurance coverage is provided by private insurance companies.
- Having a base building coverage is compulsory in 3 of these cantons. In the remaining 4, almost every building is insured.
- Regulation: These insurers are regulated by federal law.
- Premiums: The rate is flat and regulated by federal policy, currently (since 2006):
 - Content: 0.21 Permill of sum insured ~ 170 Mio. CHF
 - Buildings: 0.46 Permill of sum insured ~ 250 Mio. CHF
- Loss Pool: Insured losses are shared among the insurance companies proportional to market share. This prevents insurers from selectiv underwriting.

13.5.2016

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🇨🇭 Nat Cat Coverage by State Monopolies

- Where: In 19 out of 26 Cantons the base building insurance coverage is provided by local cantonal insurers. Each holds a local monopoly.
- Building owners are obliged to purchase building coverage in all of these cantons.
- Total sum insured: CHF 2 300 bn
- Collected Premium: ~ CHF 1 bn (includes fire coverage.)
- Regulation: These monopoly insurers are regulated by cantonal law.
- Premiums: Different from canton to canton. Premium is partially risk based.
 - Base rate + additional premium for increased loss potential.
 - Base rate e.g. is 0.5 permil of sum insured (includes a fire coverage.)
 - Premium to be increased for buildings with bad loss experience.

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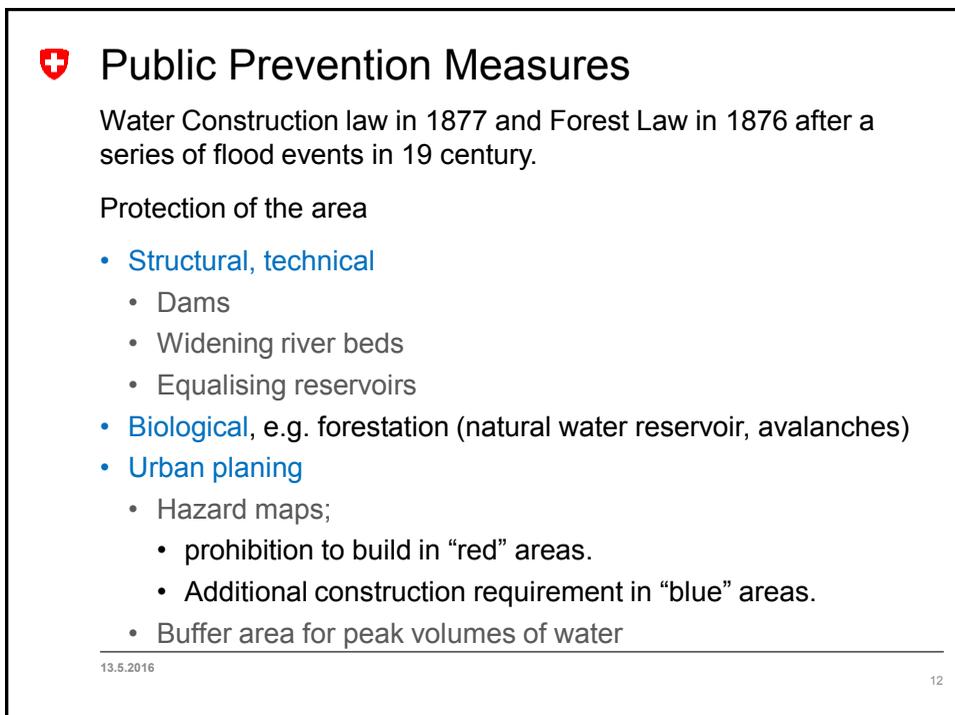
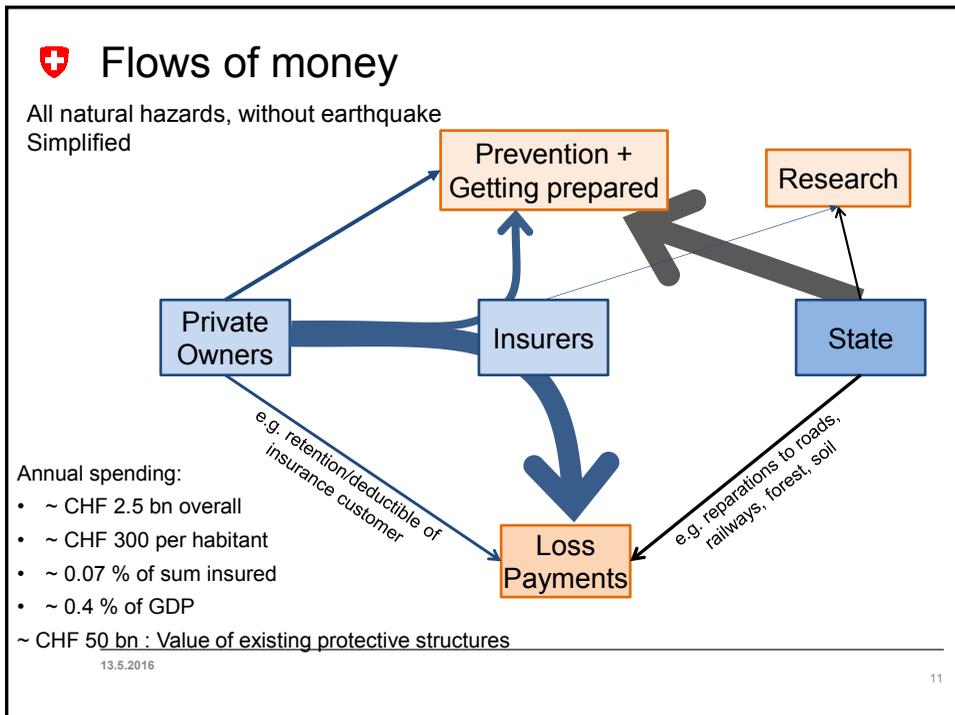
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🇨🇭 Resulting Nat Cat coverage by State Insurers

- Every building is insured.  Diversification
between all buildings.
- A range of hazards, including flood, is covered.  Diversification
between hazards.
- Premium:
 - is affordable
 - is self sufficient at the aggregate level (no subsidies)
 - is partially risk based at the individual building level.

13.5.2016

10



Equalising reservoir



Das Ausgleichsbecken Obermatt der Kraftwerke Engelbergeraa AG befindet sich an der Engelberger Aa zwischen Engelberg und Grafenort. Ein Teil des Abflusses der Engelberger Aa wird mit dem Tirolerwehr gefasst und über eine Entsanderanlage in das Ausgleichsbecken geleitet. Bild: Ausgleichsbecken Obermatt der Kraftwerke Engelbergeraa AG, Kanton NW 2005



13.5.2016

Image source: <http://www.planat.ch/en/images-list-view/>

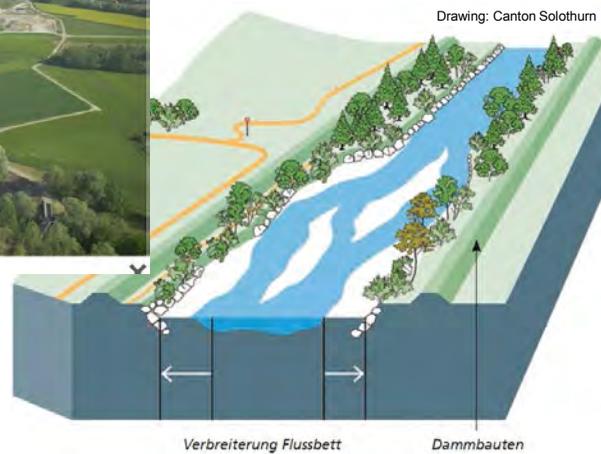
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Widening River Beds + Dams



Fussverteilung bei der Ummat, C. Gald 2005

Image source: <http://www.planat.ch/en/images-list-view/>



13.5.2016

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 **Bars and dams**



Schutzbauten an der Gürbe, Andreas Götz, Bild: PLANAT 21.05.2004

Ablenkdiämme leiten die Schneemassen an Orte, wo sie keine Zerstörung verursachen können. Bild: Lawnerleitsdiämme Redfingen, SLF 10.02.1984

Image source: <http://www.planat.ch/en/images-list-view/>

13.5.2016

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 **Relief Valve for Peak Water Volumes**

Prevention costs
CHF 26 Mio.

Resulting reduction in
loss amount in 2005 event:
CHF 160 Mio.



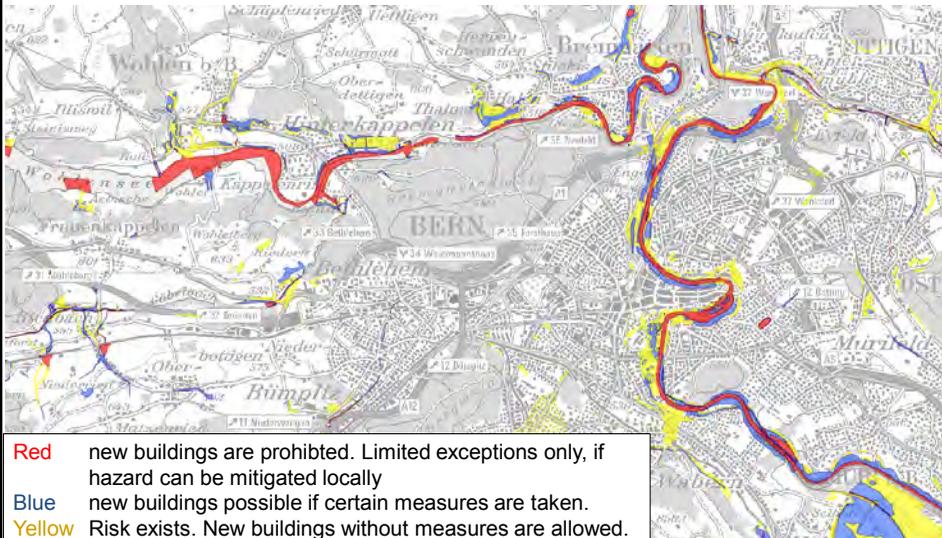
Engelberger Aa verlässt das Flussbett an den vorgesehenen Entlastungsstellen und strömt über Ennetbürgen und Buochs in den Vierwaldstättersee. Das zentrale Element des Engelberger Aa sind die vier Hochwasserentlastungen von Dallenwil, Ennerberg und dem Korridor der Engelberger Aa (2), Kanton NW 2005

Image source: <http://www.planat.ch/en/images-list-view/>

13.5.2016

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Hazard Maps



13.5.2016

Image source: http://www.map.apps.be.ch/pub/synserver?project=a42pub_gk5&userprofile=geo&language=de

17

Prevention by state monopol insurers

State insurer use approximately **25 % of collected premium** for prevention:

- Financial support for fire and rescue service.
- Financial support for the improvement of individual existing buildings.
- General education and improving awareness of risks.
- Providing individual advise to building owners free of charge.
- Establish building guidelines.
- Online warning systems (www.wetteralarm.ch)
- Support the update of hazard maps.
- Financial support to dedicated foundations.

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Prevention Measures by Individuals

- Protection measures for individual buildings.
- State insurers can increase the premium after a series of losses, if the building owner does not take prevention measures.

Cellar window with concrete shell.



Erhöhter Kellerfenster und Vorrichtung für Schutzwand als Vorsichtsmaßnahme gegen Überschwemmungen, B&B Objektschutz in Guttannen, Simone Hurdler PLANAT 17.08.2006

13.5.2016

Image source: <http://www.planat.ch/en/images-list-view/>

Underground oil tank prevented from swimming



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Prevention measures for individual objects



Die Hochwasserschutzmauer mit Durchlass dient dazu, dass bei tieferen Wasserständen das Bachbett der Engleberger Aa zugänglich bleibt. Dies erlaubt die Ausführung von Unterhaltsarbeiten oder einen vereinfachten Zutritt für Badegäste. Bei Hochwassergefahr wird die Öffnung mit Dammballen verschlossen, damit das Wasser nicht aus dem Bachbett treten kann. B&B Hochwasserschutzmauer an der Engleberger Aa in Oberdorf, Kanton NW 26.08.2005

Image source: <http://www.planat.ch/en/images-list-view/>



Hölzer-Abwehrung zur Verhinderung von Ausbrüchen des Baches aus dessen Gemme (bei Tschöfen SG), B&B 2015

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Conclusion

- Two insurance approaches which:
 - Cover almost all buildings against natural hazards.
 - At an affordable price (e.g. less than 0.5 permill of sum insured).
- Public prevention at the national, cantonal/state and community level.
- Prevention by individual building owners: state insurers can increase premium after loss events, if prevention measures are not taken.



The Zurich Flood Resilience Program

- investing in resilience to reduce social, economic and insured losses caused by floods

Sean Kevelighan, Group Head of Public Affairs, Zurich Insurance Group



Who is Zurich?



What do these images have in common?



It wasn't
the first
time...



Why flood resilience?



Looking beyond risk-based pricing



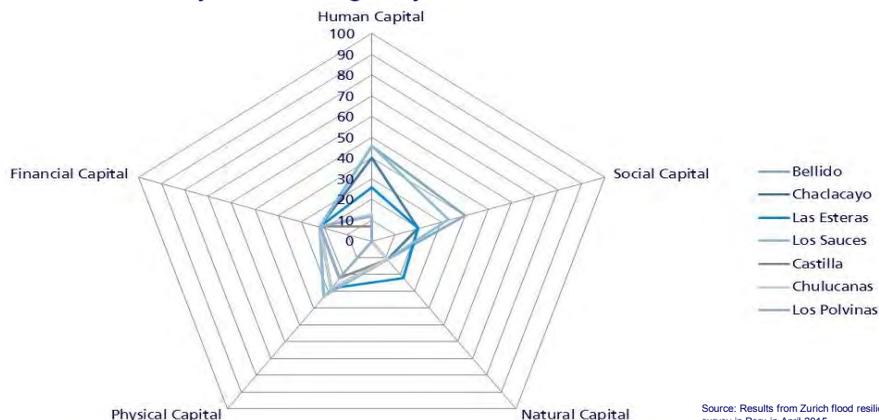
- Research shows that investing in pre-event risk reduction pays out
- Human behavior is often the biggest obstacle to taking action
- Risk reduction and mitigation activities need to build resilience



Measuring resilience is the first step



“Flood resilience is the ability of a community to pursue its social, ecological and economic development and growth objectives, while managing its flood risk over time, in a mutually reinforcing way”



Driving behavioral change



- Psychology plays a major role in flood risk management
- Moral hazard remains a barrier for risk reduction
- Show the real costs if no action is taken



Clarifying roles and responsibilities



- Who is responsible for which risk reduction and mitigation activity
- Improve coordination across jurisdictions
- Multi-stakeholder dialogues to resolve conflicting objectives





**“Those who cannot
remember the past are
condemned to repeat it.”**

George Santayana, *The Life of Reason*, 1905

Improving resilience means building forward



- Behavior of critical infrastructure can create cascading failures
- Repetitive losses of same magnitude is a reality
- Resilience can be enhanced during the reinstatement period



Developing standards for resilient reinstatement



- Standards can reduce costs but also increase awareness and uptake
- Underlying loss reduction can overbalance the costs of resilience investment



Investing in resilience needs a multi-stakeholder approach



- We need to work together to make it happen





Thank you!
