Dealing with climate-related risks and uncertainties.

Insights from applying methodological frameworks to operationalize Climate Risk Management

Reinhard Mechler

UR Focus Day Event

Risk Assessment, Risk Reduction and Risk Mitigation –

What Role Do Models, Numbers, Text and Stories Play?

May 18, 2018

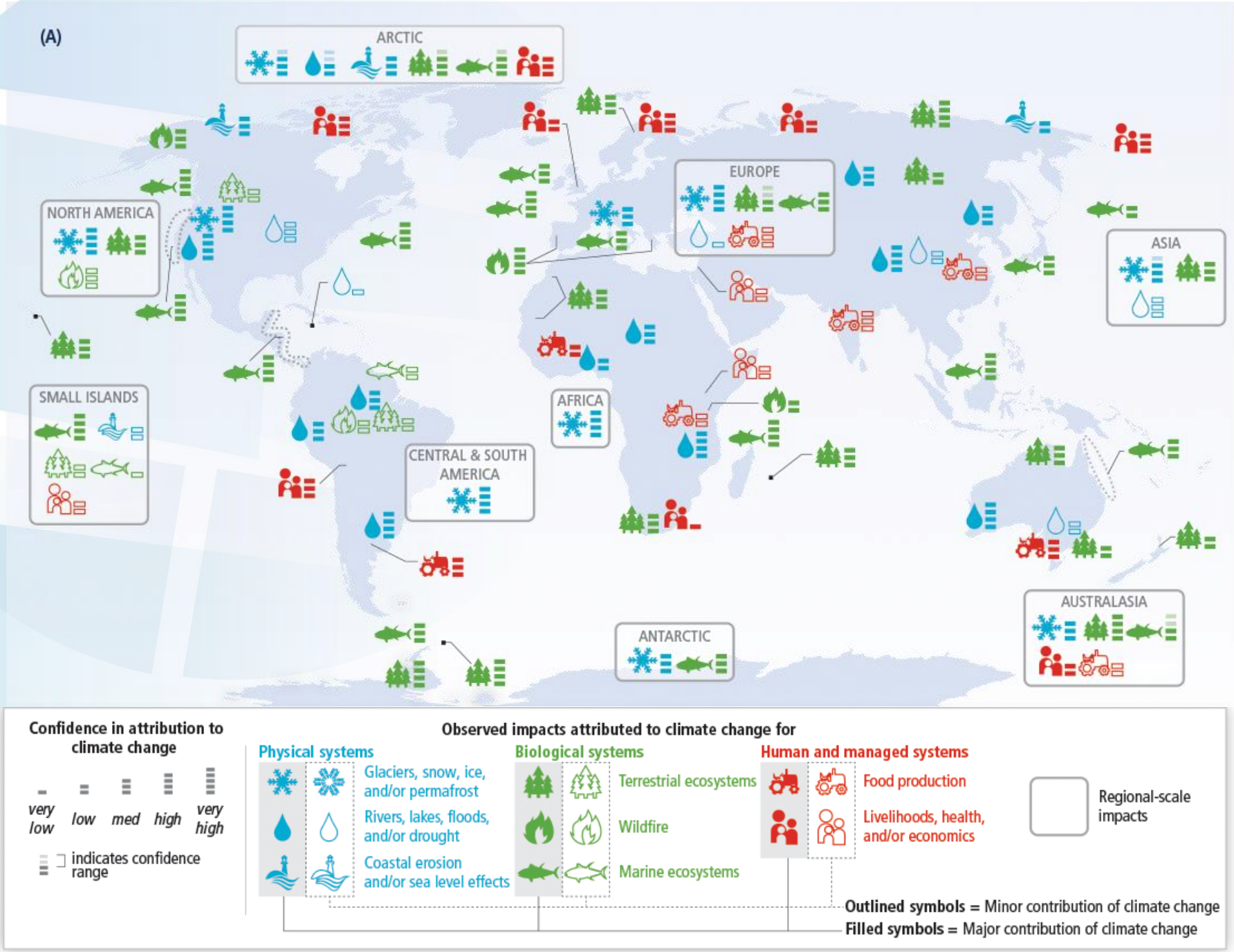
IIASA enhance Partnership for Risk Reduction

2016 UR Understanding Risk Forum

PACINAS Public Adaptation to Climate Change

Suggestions

- Extremes with potential for game changers
- Risk lense with increased relevance for responses to climate change
- Evolution in constructions of risk
- Broad risk-perspective seeing operationalizing via multiple lines of evidence to inform climate risk management policy and practice

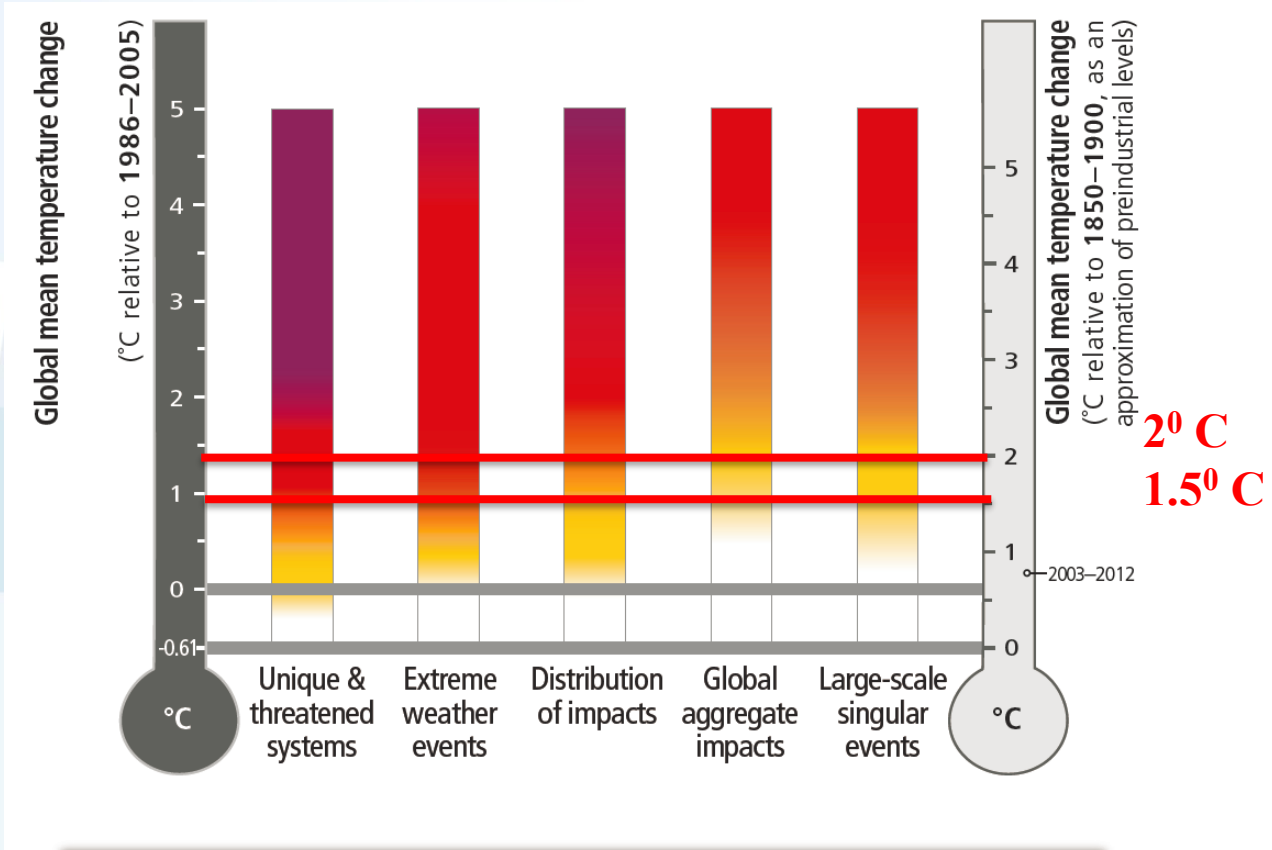

(A)
ARCTIC
NORTH AMERICA
EUROPE
ASIA
SMALL ISLANDS
AFRICA
CENTRAL & SOUTH AMERICA
AUSTRALASIA
ANTARCTIC
Confidence in attribution to climate change
very low
low
med
high
very high
indicates confidence range
Observed impacts attributed to climate change for
Physical systems
Glaciers, snow, ice, and/or permafrost
Rivers, lakes, floods, and/or drought
Coastal erosion and/or sea level effects
Biological systems
Terrestrial ecosystems
Wildfire
Marine ecosystems
Human and managed systems
Food production
Livelihoods, health, and/or economics
Regional-scale impacts
Outlined symbols = Minor contribution of climate change
Filled symbols = Major contribution of climate change


WIDESPREAD
OBSERVED IMPACTS
A CHANGING WORLD
ipcc
INTERGOVERNMENTAL PANEL ON climate change


RISKS OF
CLIMATE CHANGE
INCREASE
WITH CONTINUED
HIGH EMISSIONS

Risk construction 1: Idealized risk

IPCC's Reasons for Concern for assessing dangerous interference with the climate system



CLIMATE CHANGE

REDUCING AND MANAGING RISKS

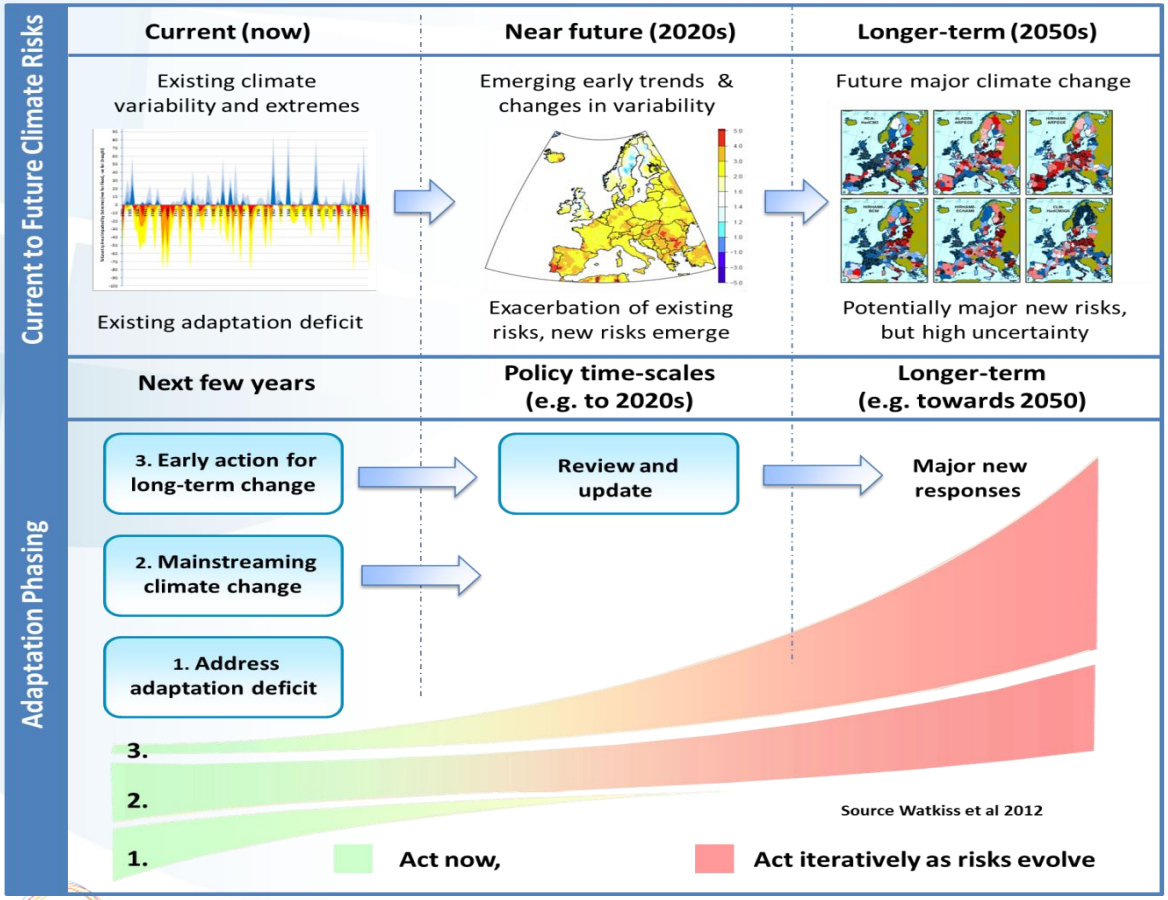
ipcc
INTERGOVERNMENTAL PANEL ON climate change

Risk in the recent IPCC report

Chris Field, IPCC Working Group II Co-Chair:

"Fundamentally, the challenge of managing climate change is a challenge of managing and reducing risk. We know plenty, but we need a transition from the perspective of knowing lots to doing lots."

Iterative risk management: When and how to act?



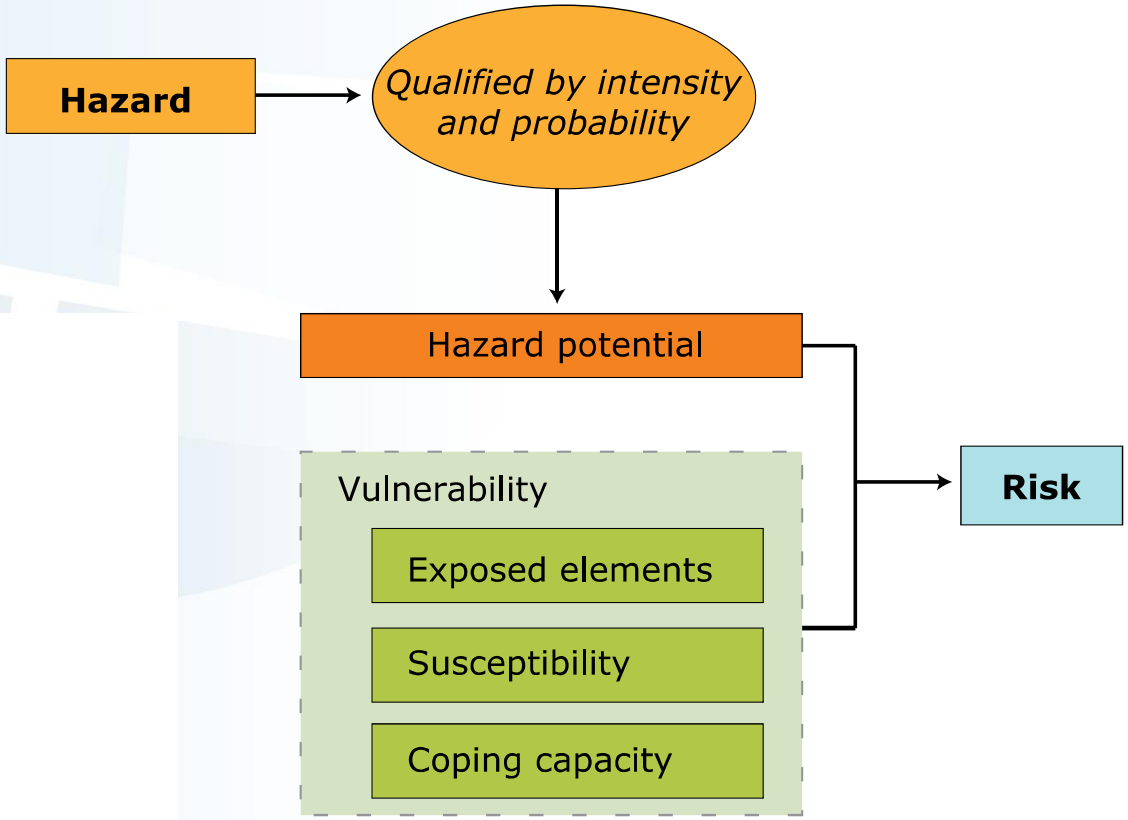
IPCC and epistemological constructions of risk

1. *Idealized risk*: the conceptual framing of the problem at hand - dangerous anthropogenic interference with the climate system as dominant framing
   → informing mitigation

2. *Calculated risk*: the product of a model based on a mixture of historical (observed) and theoretical information
   → informing adaptation

3. *Perceived risk*: the subjective judgment people make about an idealized risk
   → informing adaptation

Risk construction 2: Calculated risk



Risk construction 2: Risk drivers

Hazard

Intensities, duration and frequencies of some hazards changing (IPCC 2012&14)

Extreme event attribution in early stages (James et al., 2014; Trenberth et al., 2015)

Exposure

Dominating Factor - <u>currently</u> (IPCC, 2012&14)

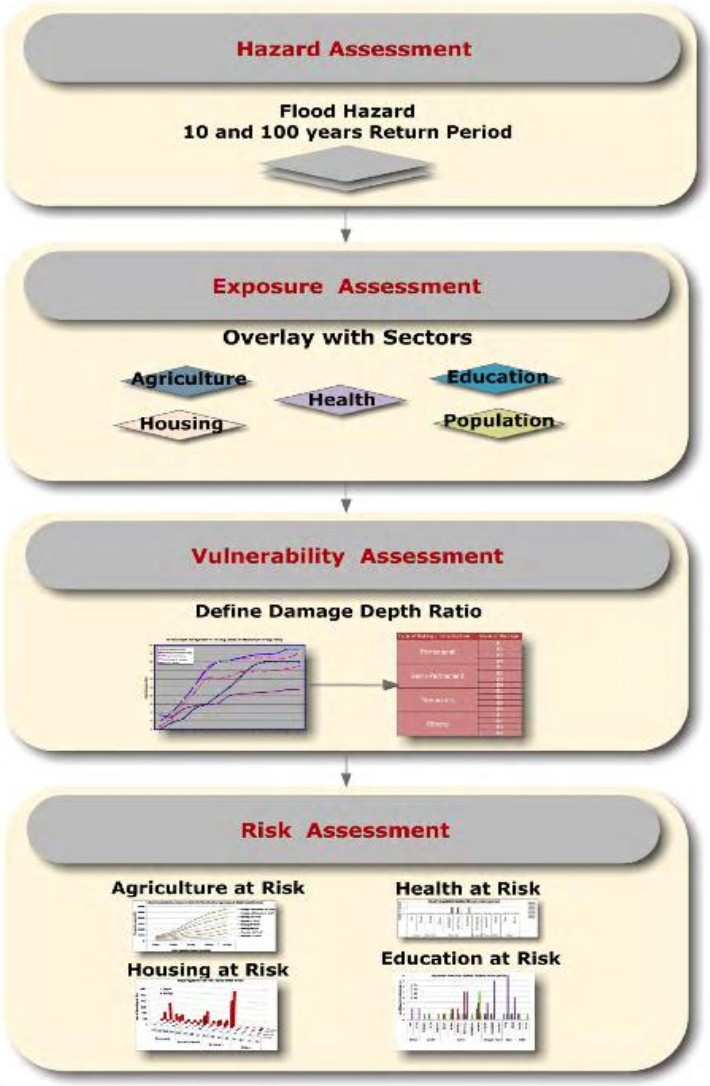
Vulnerability

Key driver, knowledge gaps, significant adaptation deficit (IPCC, 2012)

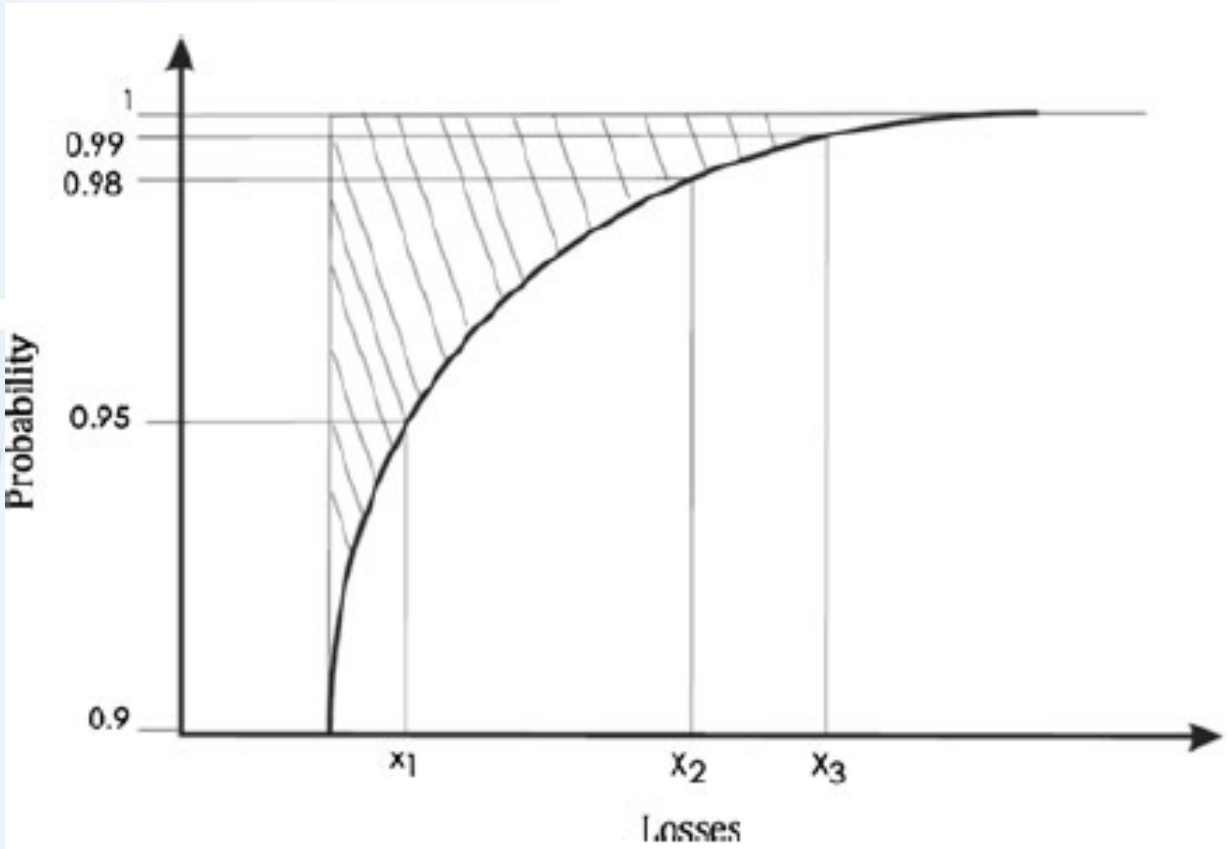
PACINAS

Public Adaptation to Climate Change

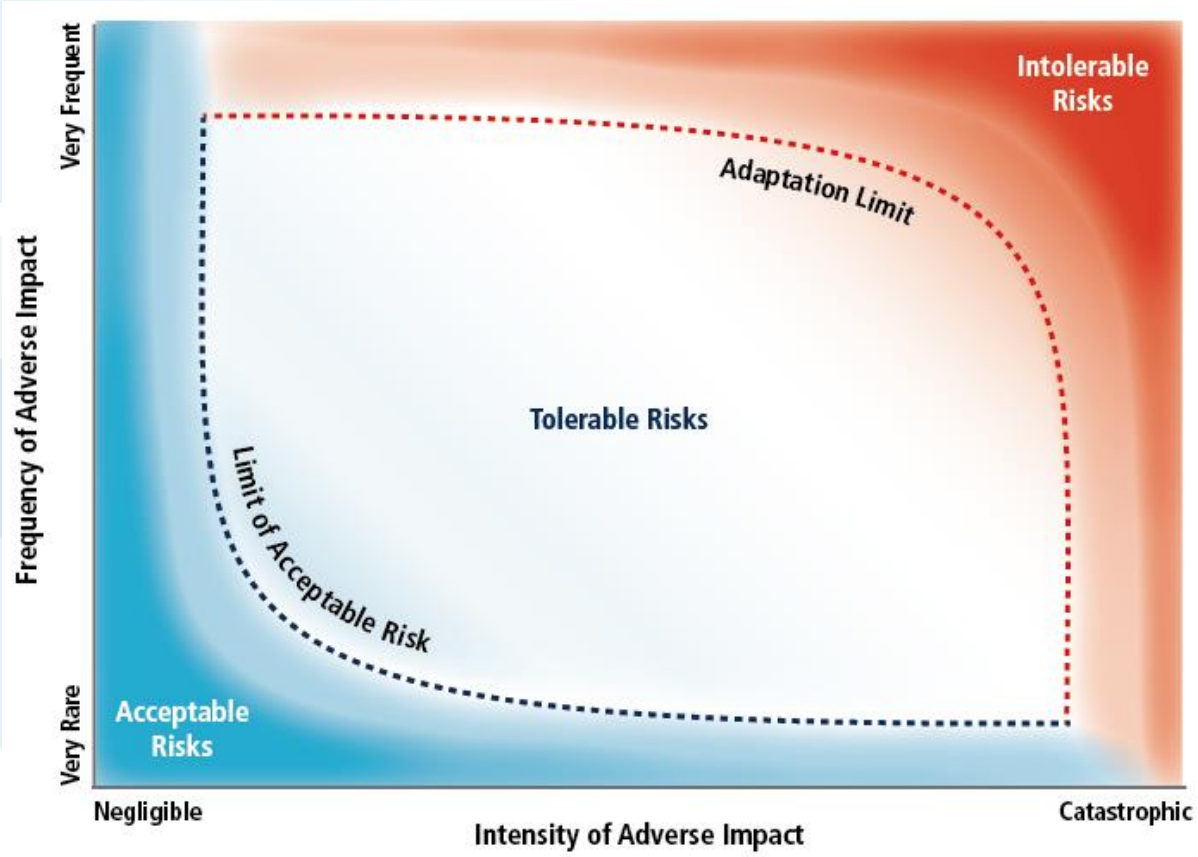
Risk assessment



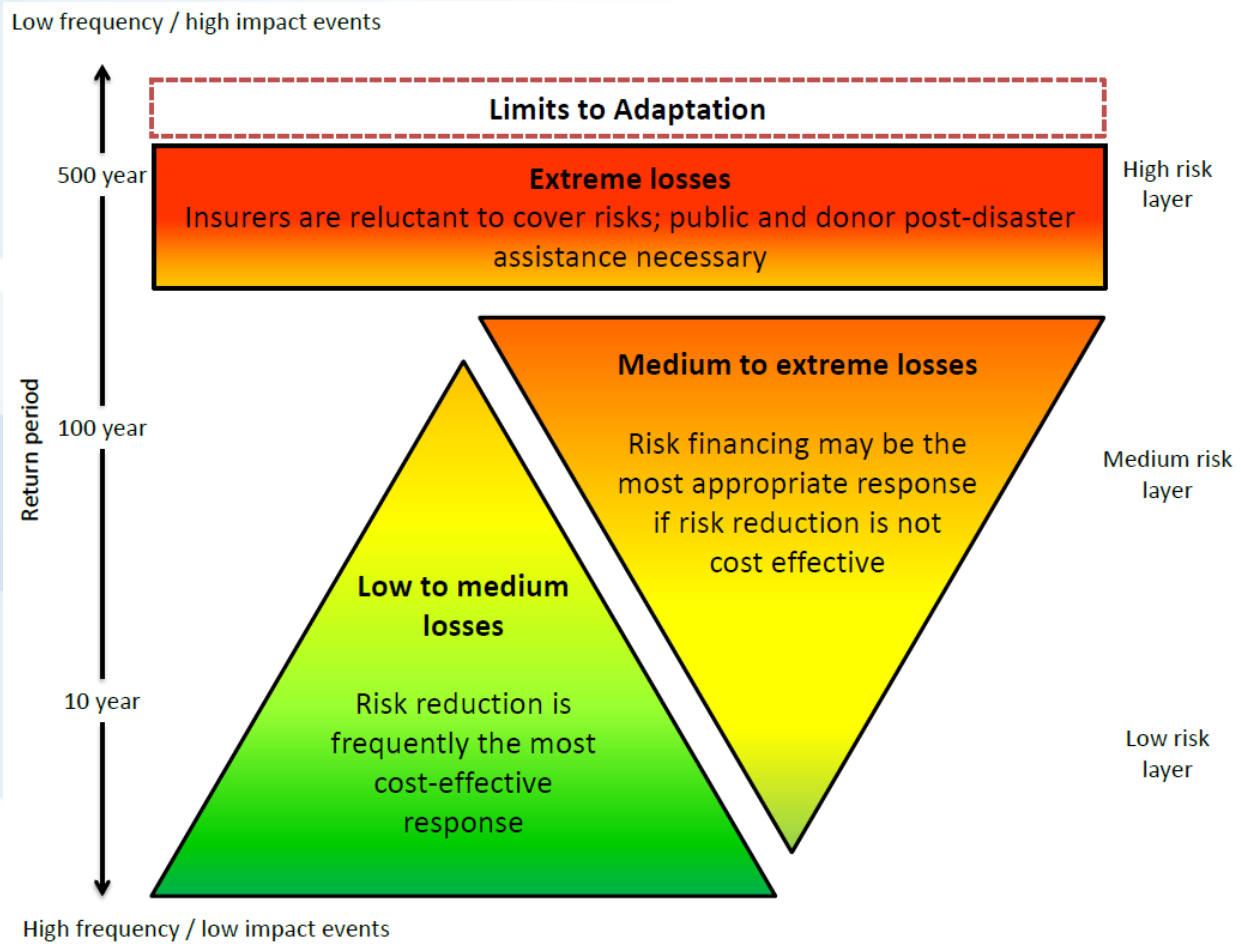
Probabilistic risk analysis



Risk construction 3:
Risk perception and tolerance

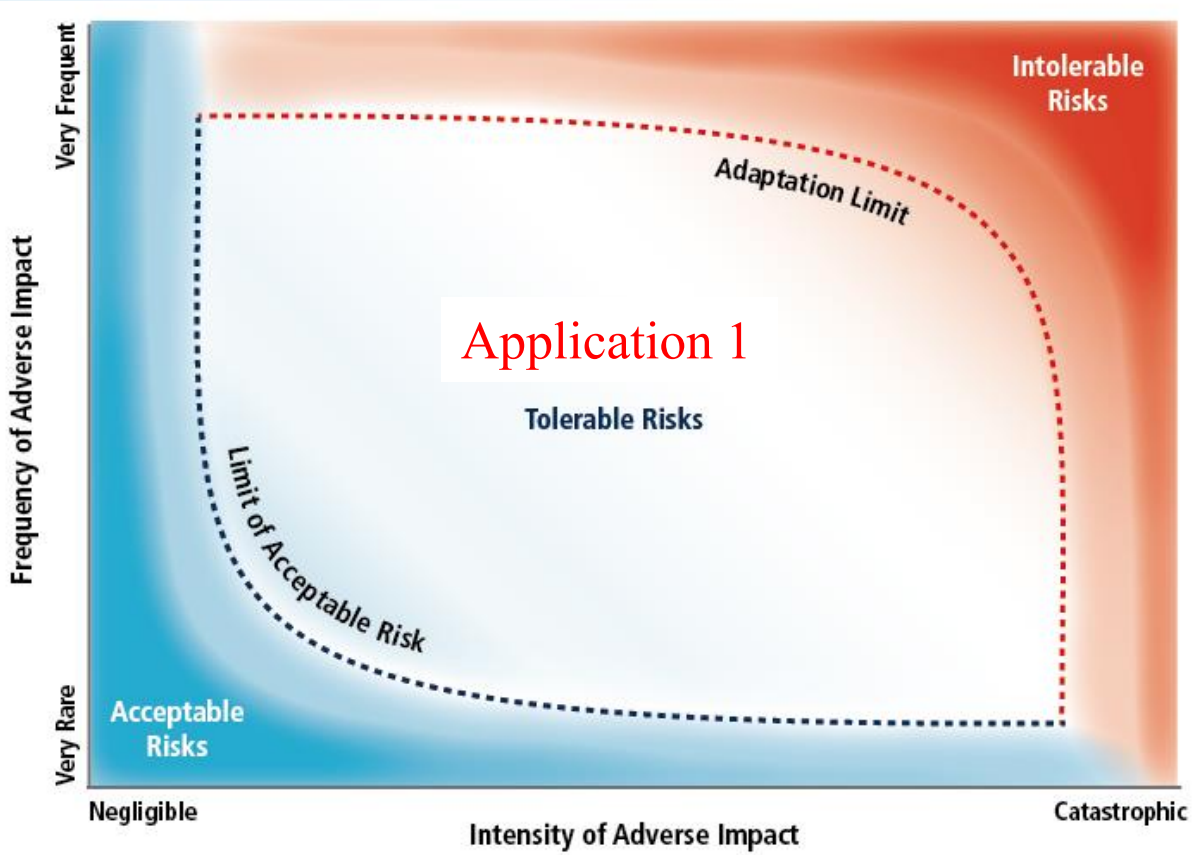


Risk construction 3:
Layering risk management to identify entry points



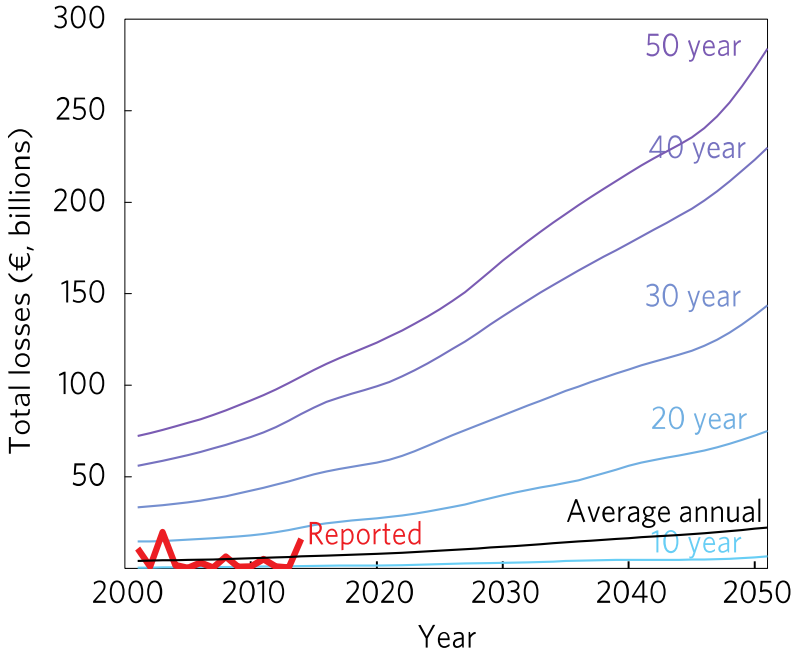
Mechler et al., 2014

Case of Austria



Flood Risk

- Large recent events have raised awareness for climate variability and change
- Role of climate change in shaping risk trends well understood
- Large scale assessments: Austrian IPCC (APCC) and Cost of Inaction (COIN) studies
- Yet, currently no climate signal in flood risk identified



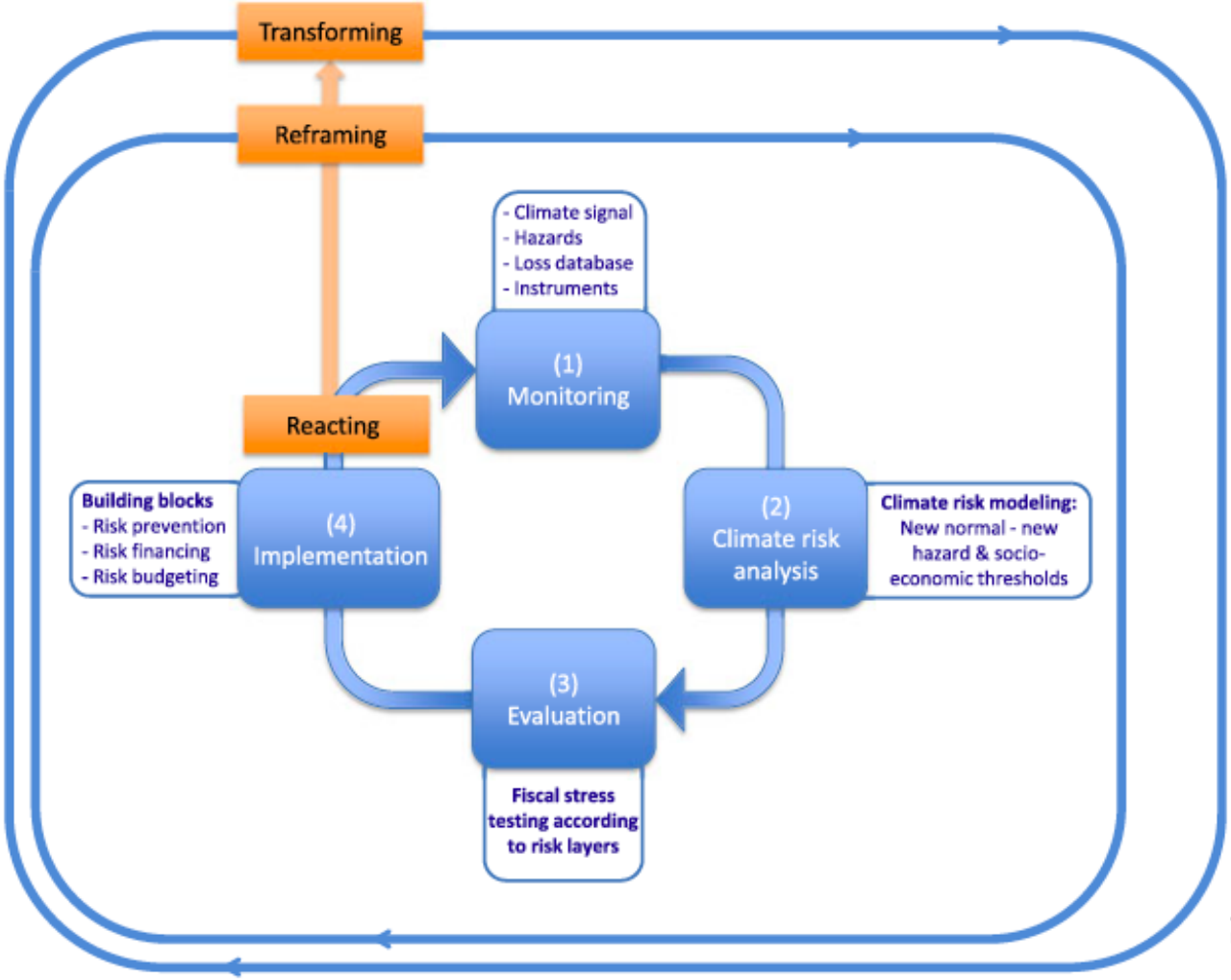
Climate scenario: SRES A1B scenario (high emissions)

Jongman et al.,2014

Multiple lines of evidence

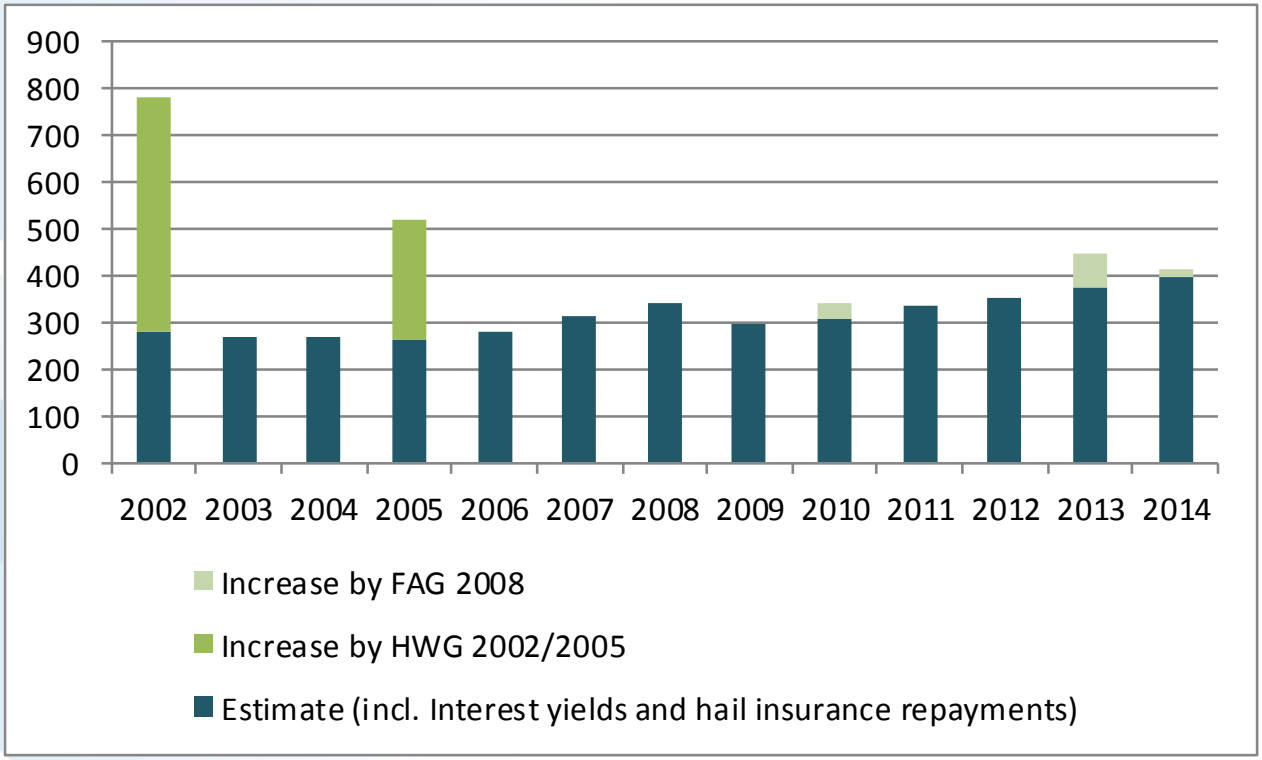
- Stakeholder consultation
- Review of disaster statistics and
- Scenarios
- Modelling disaster risk and fiscal stress testing
- Risk layering

Iterative climate risk management
Multiple lines of evidence and learning cycle



Schinko et al., 2016

Empirics
Budgetary implications of flooding



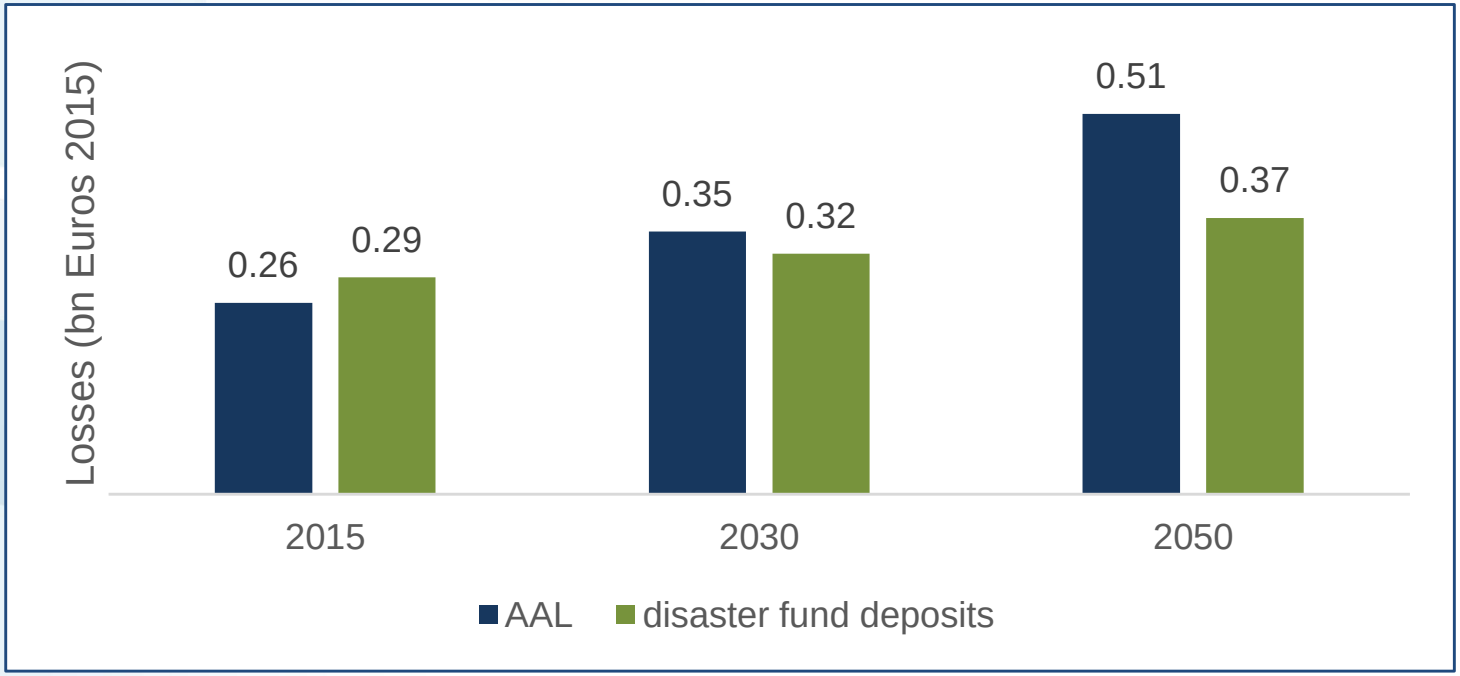
Additional spending

Catastrophe fund

Schinko et al., 2016

Risk Modelling

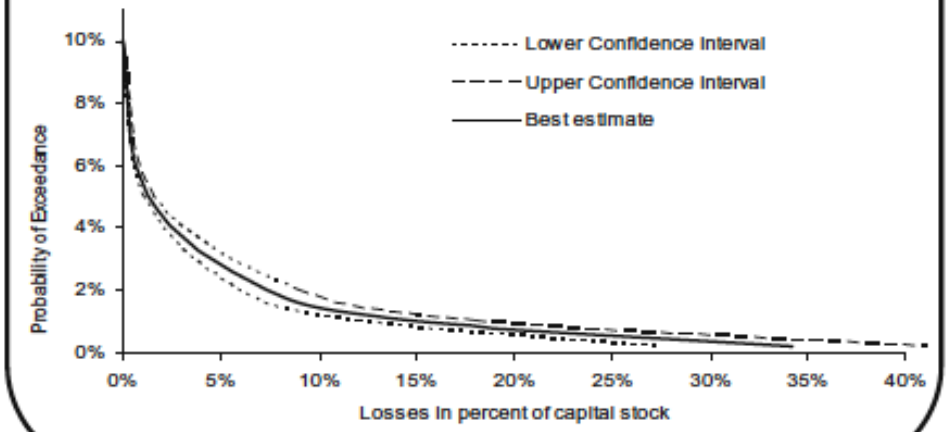
Projection of flood risks and catastrophe fund reserves



Schinko et al., 2016

Risk Modelling: Sovereign risk stress testing

Loss exceedance distribution – direct risk



Fiscal resilience

Ex-ante:

- Catastrophe fund

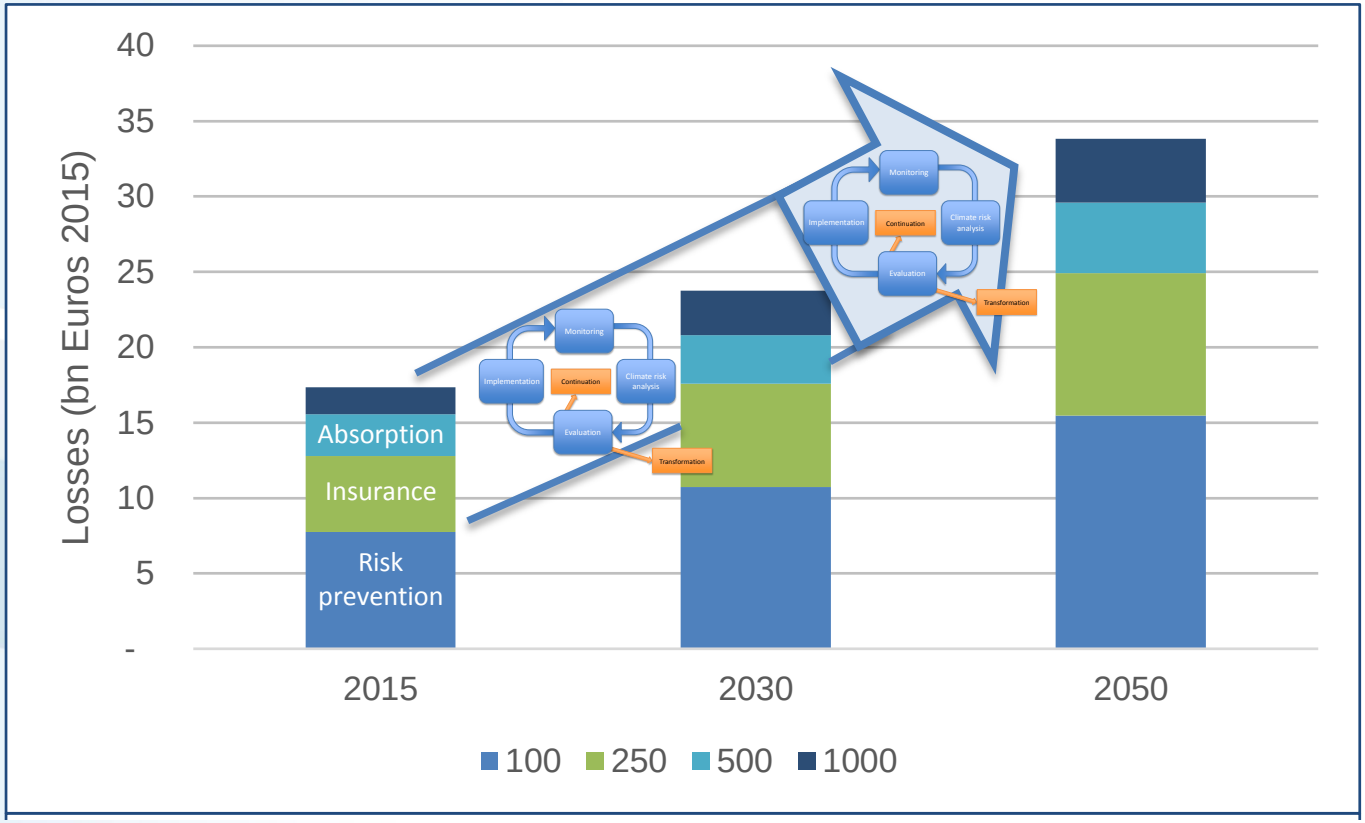
Ex-post:

- Budget diversion
- Taxation
- European Solidarity Fund

Fiscal risk

CATSIM framework

Iterative Climate Risk Management
Today's and future risk layering

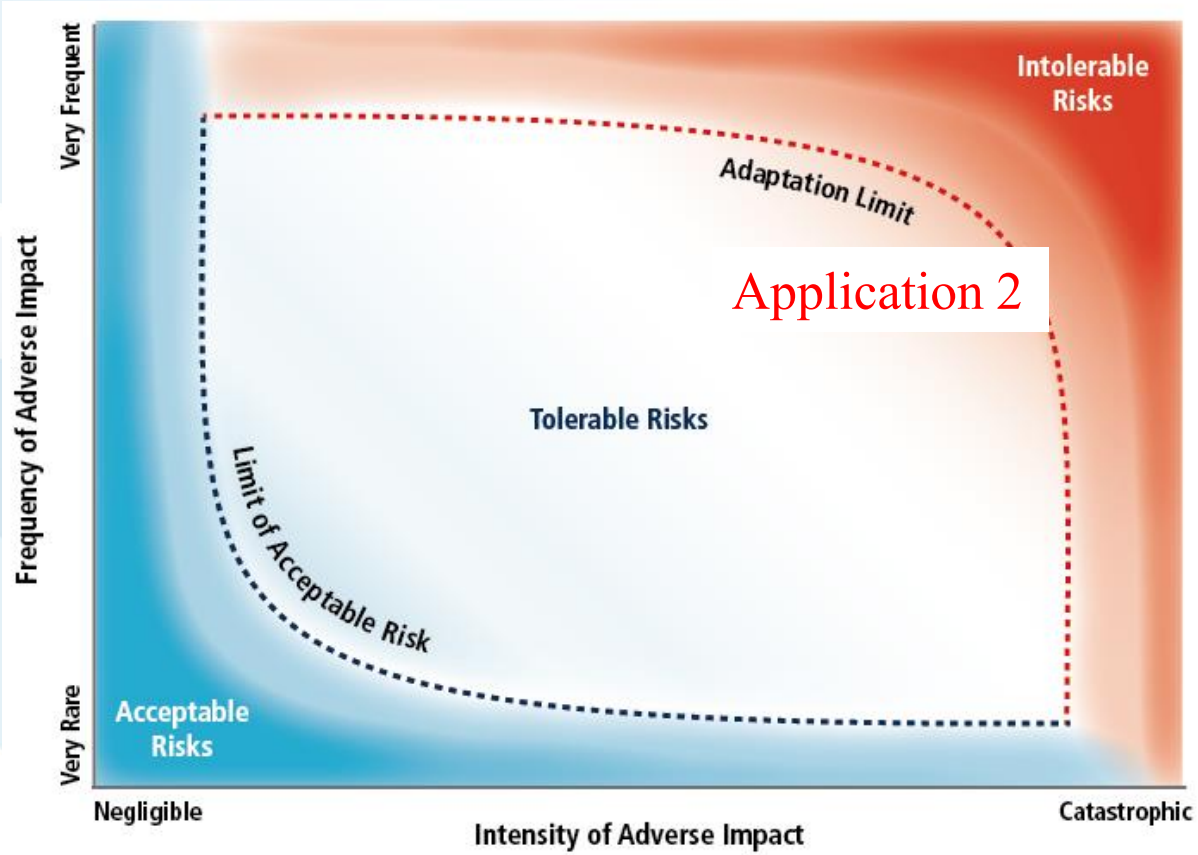


Schinko et al., 2016

Next

- Incorporate climate risks into budgetary projections – qualitatively
- Consider risks in the balance sheet
- Level playing field for risks of climate mitigation and adaptation

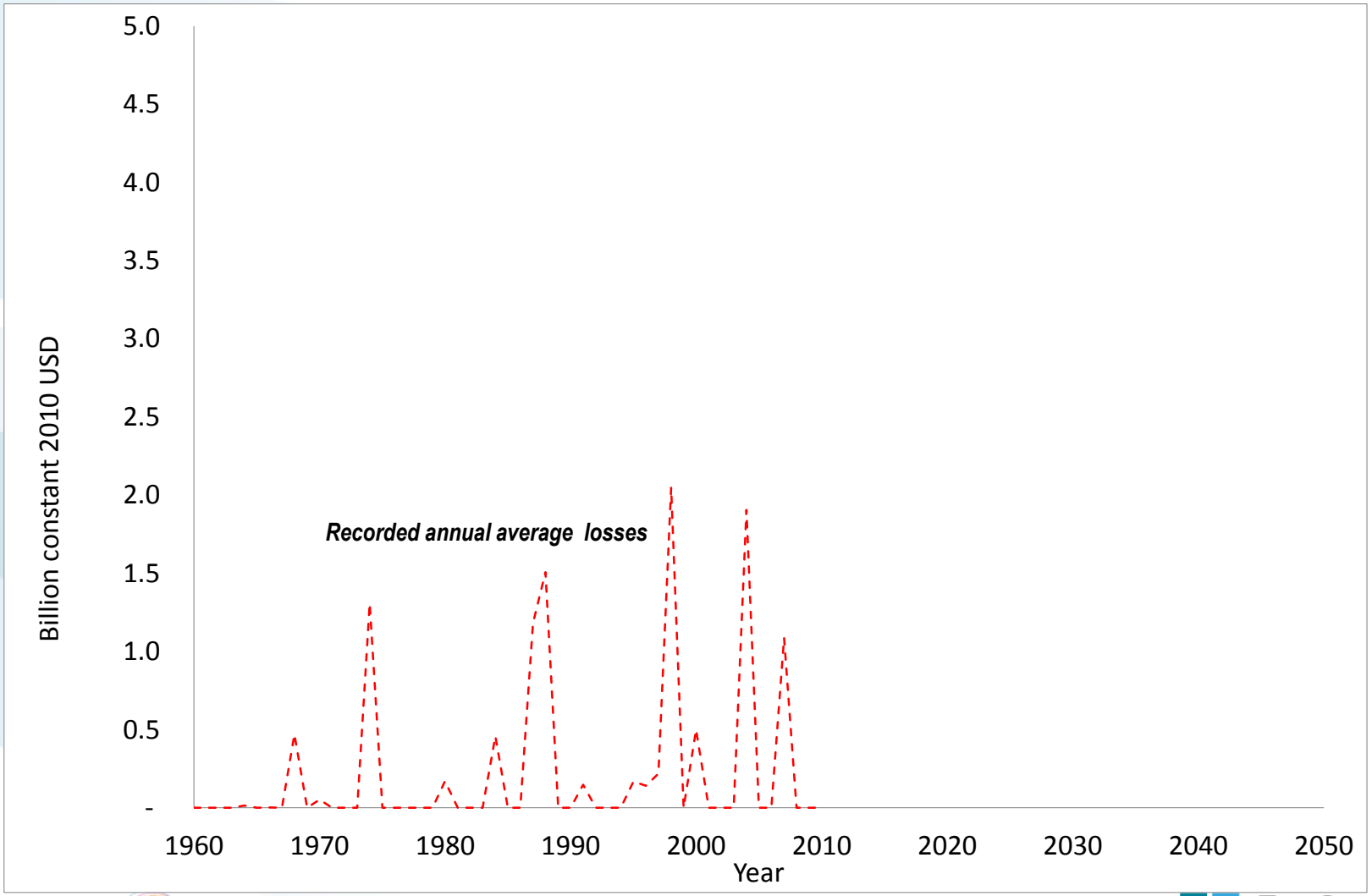
Case of Bangladesh



Multiple lines of evidence

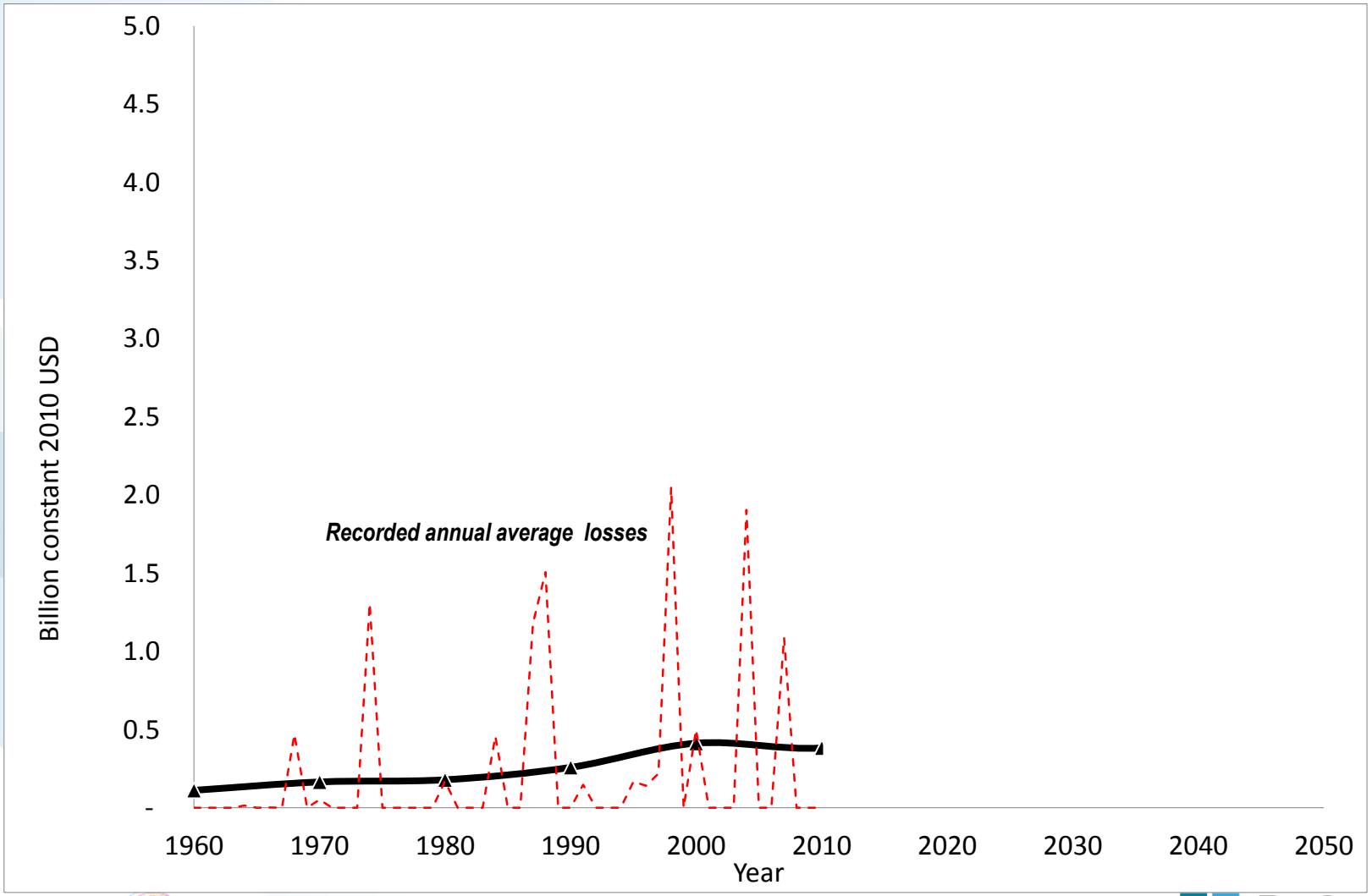
- Review of disaster statistics
- Constructing Vulnerability
- Scenarios
- Modelling disaster risk
- Risk layering

Country perspective
Projecting risks: Bangladesh



Mechler and Bouwer, *Climatic Change*, 2015
Hochrainer et al., 2013

Projecting risks: Bangladesh



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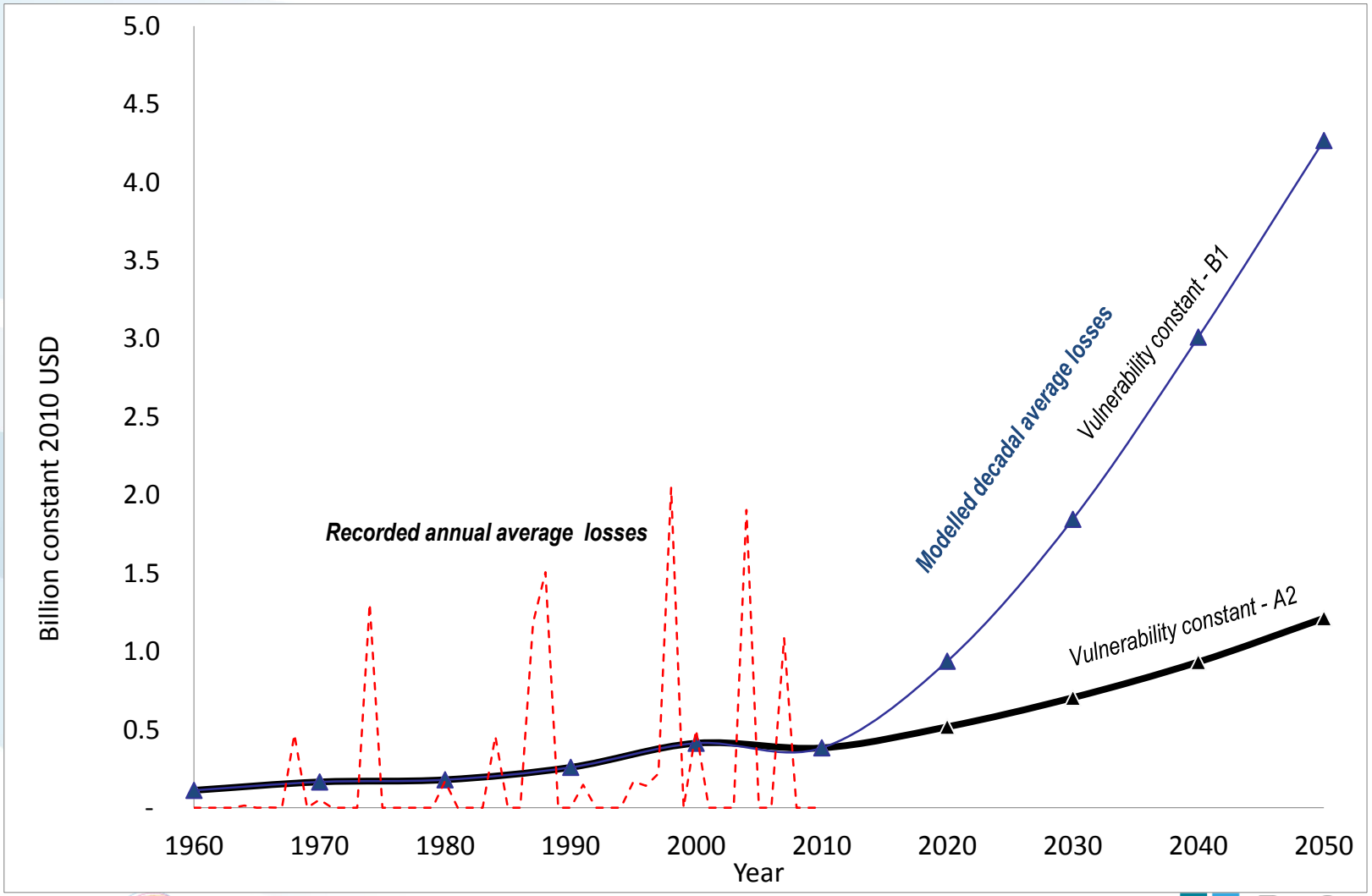

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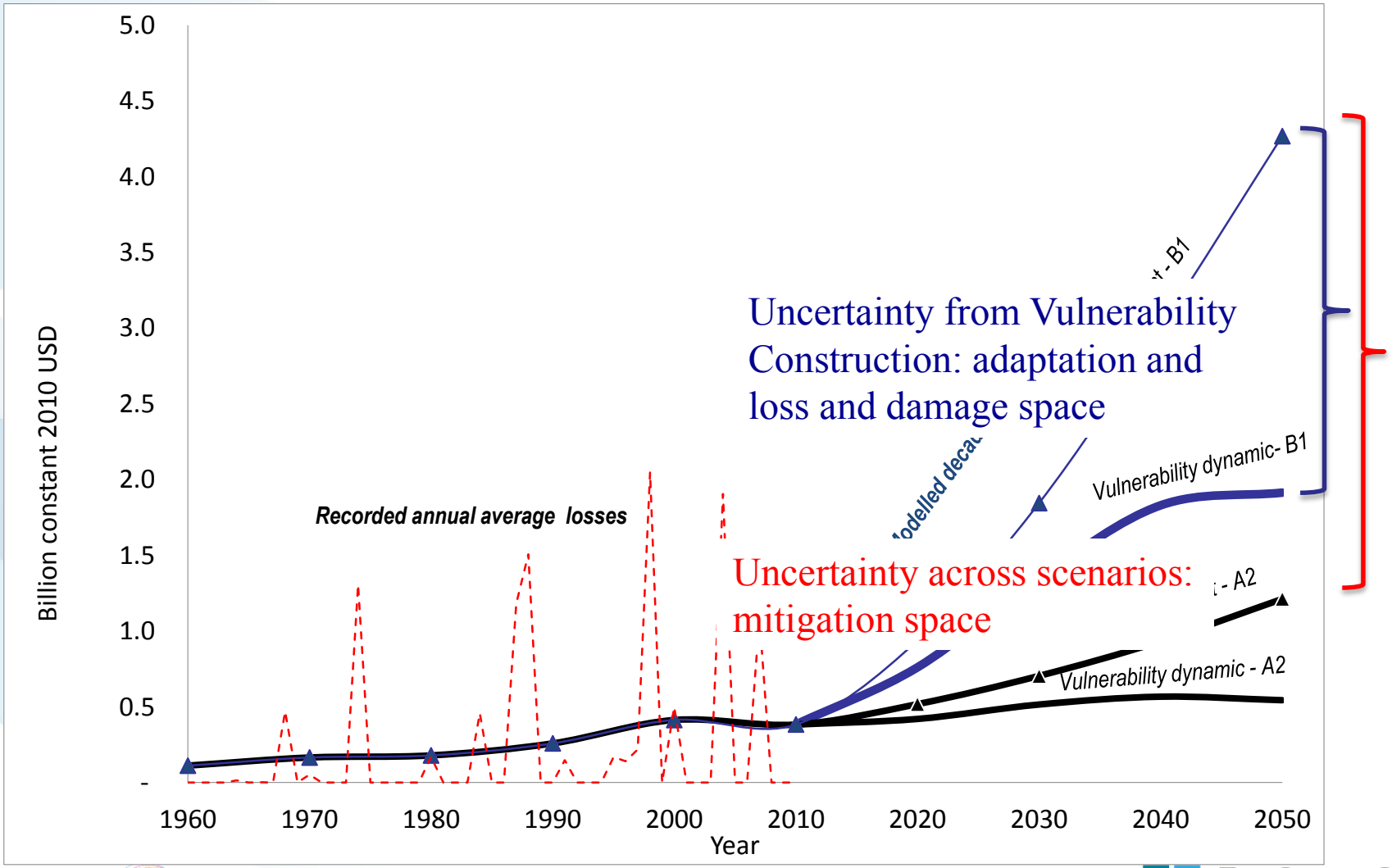
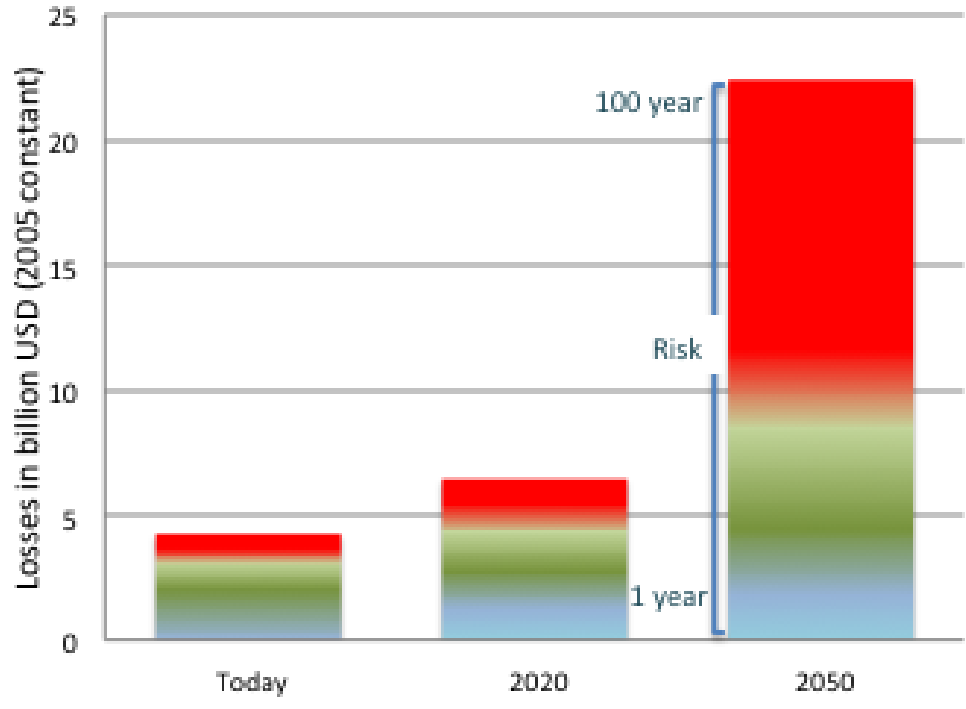


Mechler and Bouwer, *Climatic Change*, 2015
Hochrainer *et al., 2013*

enhance Partnership for Risk Reduction

PACINAS Public Adaptation to Climate Change

Example Bangladesh



Risk beyond social and physical limits of adaptation

Risk layers with climate change
(B1 scenario and no additional risk reduction)

Based on Mechler and Bouwer, 2015

Loss & Damage Mechanism: Compensation and/or risk reduction?

- Establishment of the “Warsaw international mechanism for loss and damage:” to deal with support for residual climate-related damages after adaptation
- **Contested terrain**
  - ‘Southern countries’ at risk (such as AOSIS) demand climate justice
  - OECD negotiators willing to support good risk management, but liability and compensation considered red lines
- L&D included in Paris agreement
- **“3rd pillar of the work under the UNFCCC in addition to mitigation and adaptation”**

Uncertainty typology and debates on risk

	Consequences	
Probabilities	Known	Unknown
Known	**Risk**	**Ambiguity**
	DRR: instrumental	**(subjective risk)**
	Iterative CRM: reflexive	
Unknown	**Uncertainty**	Reasons for Concern: epistemological

Final remarks

- As climate change has become real, real action required
- Risk perspective useful to inform decisions on
  - short-medium term DRR and CCA,
  - Medium-longer transformation,
  - Mitigation
- As DRR and CCCA meet, increasing attention given to time scales, ambiguity, uncertainty and ignorance
- Iterative risk management as broad conceptualization which can provide entry points for learning and action on climate-related risks

Reading

Own paper

- Schinko, T., Mechler, R., Hochrainer-Stigler, S. (2016). A methodological framework to operationalize Climate Risk Management: Managing sovereign climate-related extreme event risk in Austria. Mitigation and Adaptation Strategies for Global Change. DOI 10.1007/s11027-016-9713-0

IPCC reference on risk construction

- Jones RN, Patwardhan A, Cohen SJ, Dessai S, Lammel A, Lempert RJ, Mirza MMQ, von Storch H (2014) Foundations for decision making. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 195-228.