Climate Change – Risk Management – Munich Re Foundation: An Introduction

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March 2025

Munich Re Foundation
From Knowledge to Action

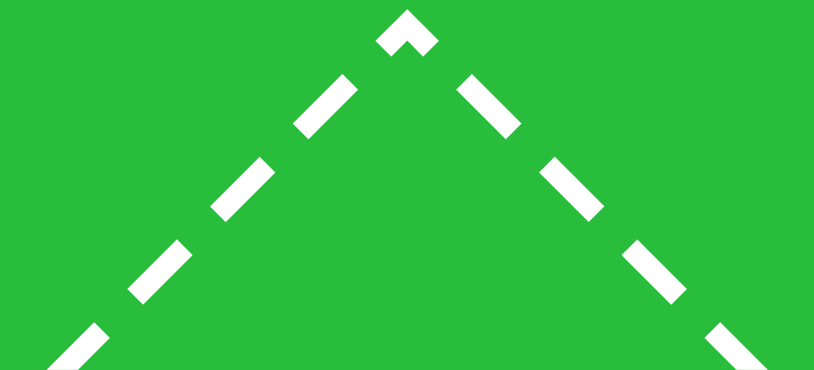
Agenda:

1) Climate Change and Disaster Risk Reduction (DRR)

2) The role of (Re)Insurance in Climate Change

3) Introduction Munich Re Foundation

4) Insights in selected climate change adaptation projects



1) Climate Change and Disaster Risk Reduction (DRR)

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2024 was world's hottest year on record

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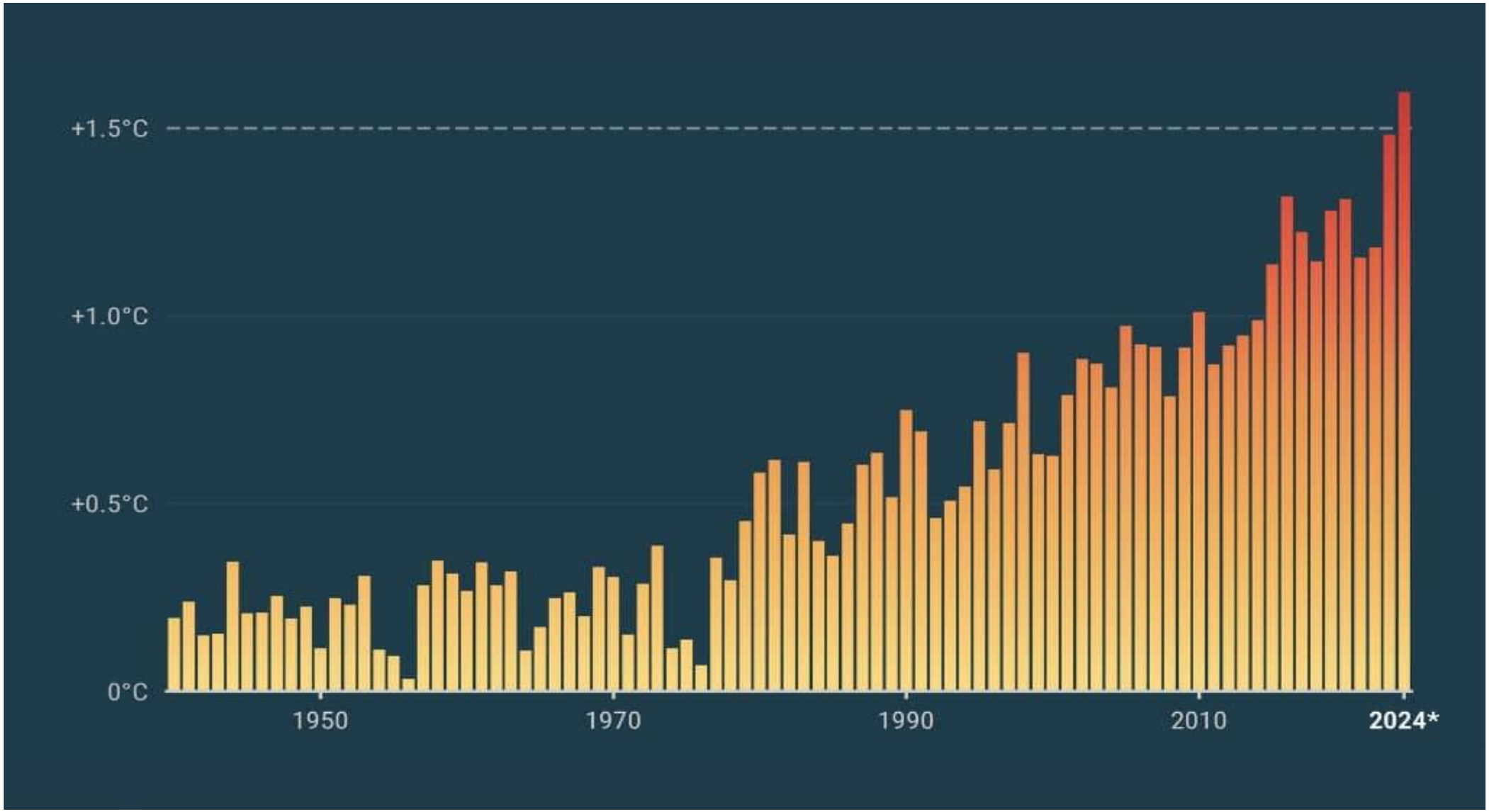
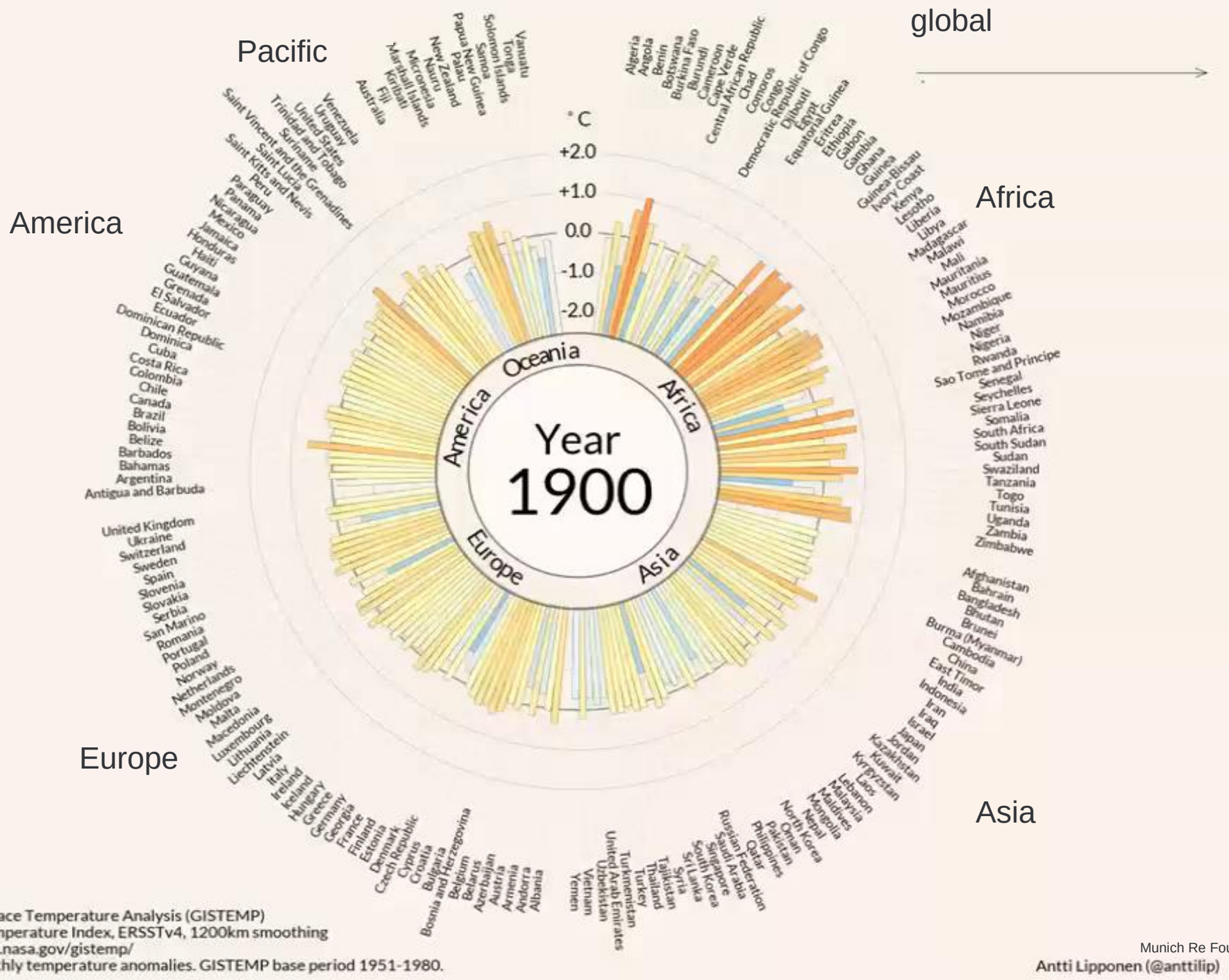


Source: https://earth.org/ (2025)



Data source:
NASA GISS Surface Temperature Analysis (GISTEMP)
Land-Ocean Temperature Index, ERSSTv4, 1200km smoothing
https://data.giss.nasa.gov/gistemp/
Average of monthly temperature anomalies. GISTEMP base period 1951-1980.

Antti Lipponen (@anttilip)

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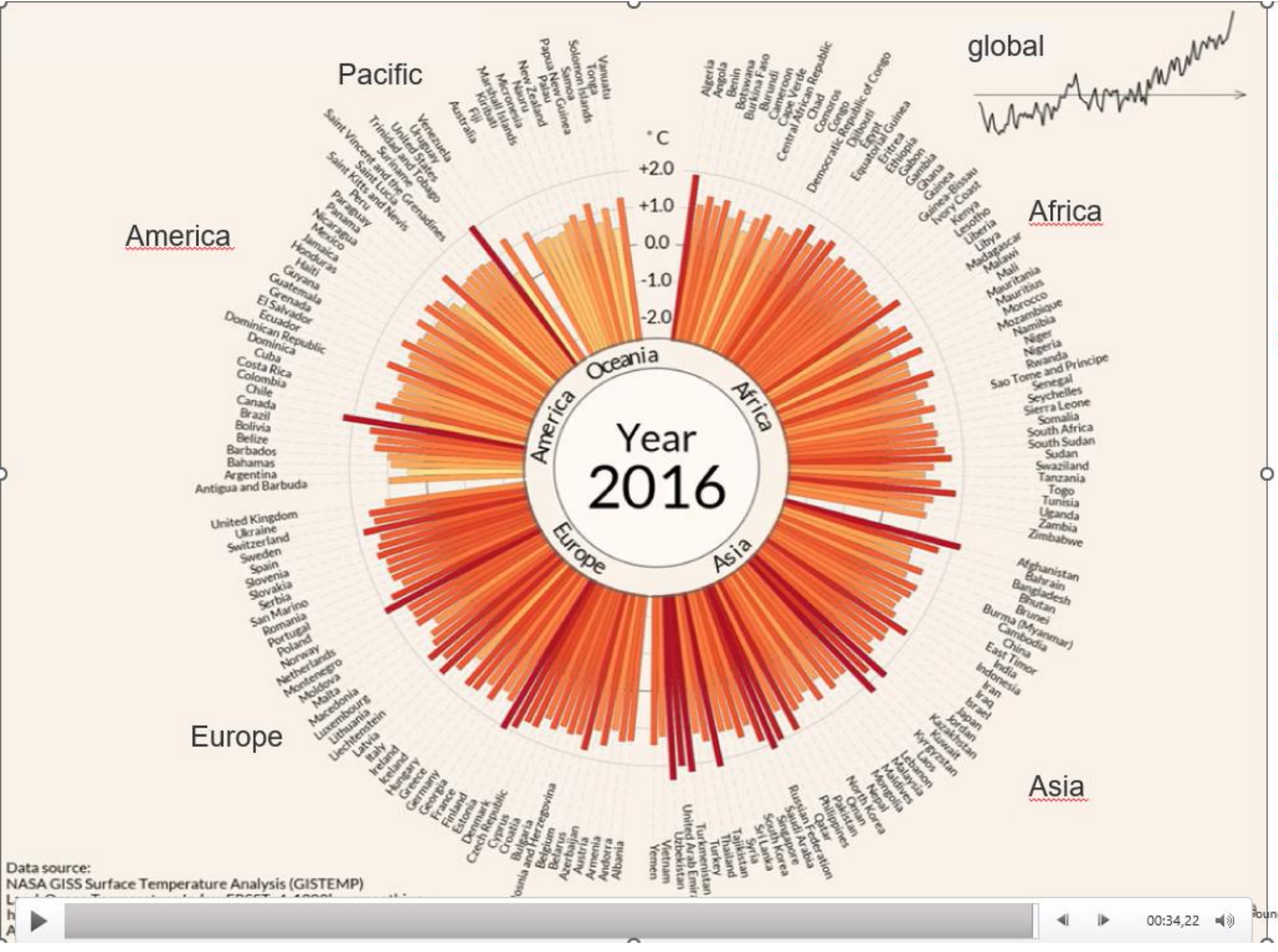
Temperature trends 1906 – 2016

Aggregated monthly anomalies

warmer cooler



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Temperature trends 1906 – 2016

Aggregated monthly anomalies

warmer cooler

Data source:
NASA GISS Surface Temperature Analysis (GISTEMP)

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Climate change – Ecosystem tipping points by PIK

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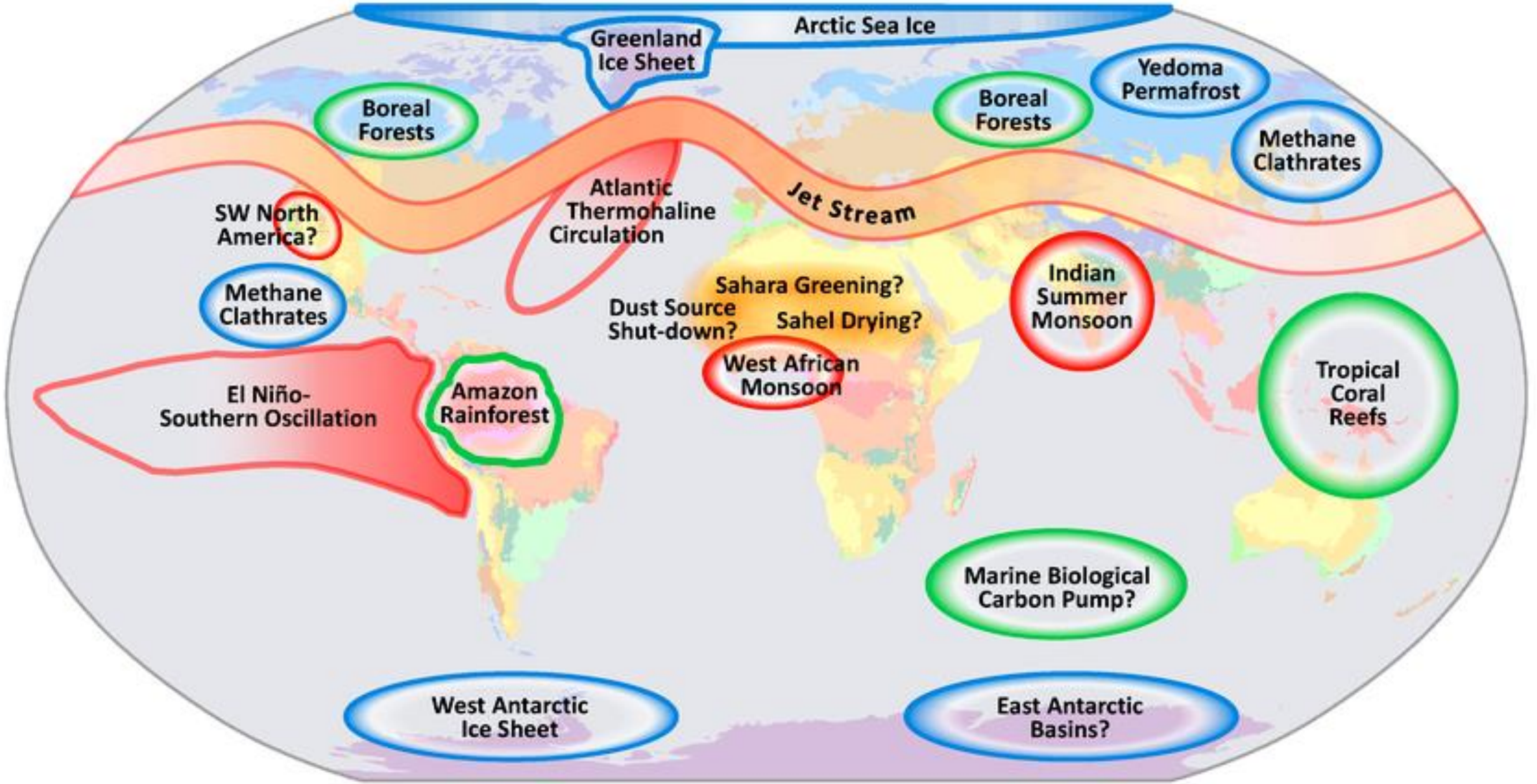

Source: Potsdam Institute for Climate Impact Research, 2018

Tipping points and the 2 degree limit

Huge losses and uncertainty after passing the 2 degree limit

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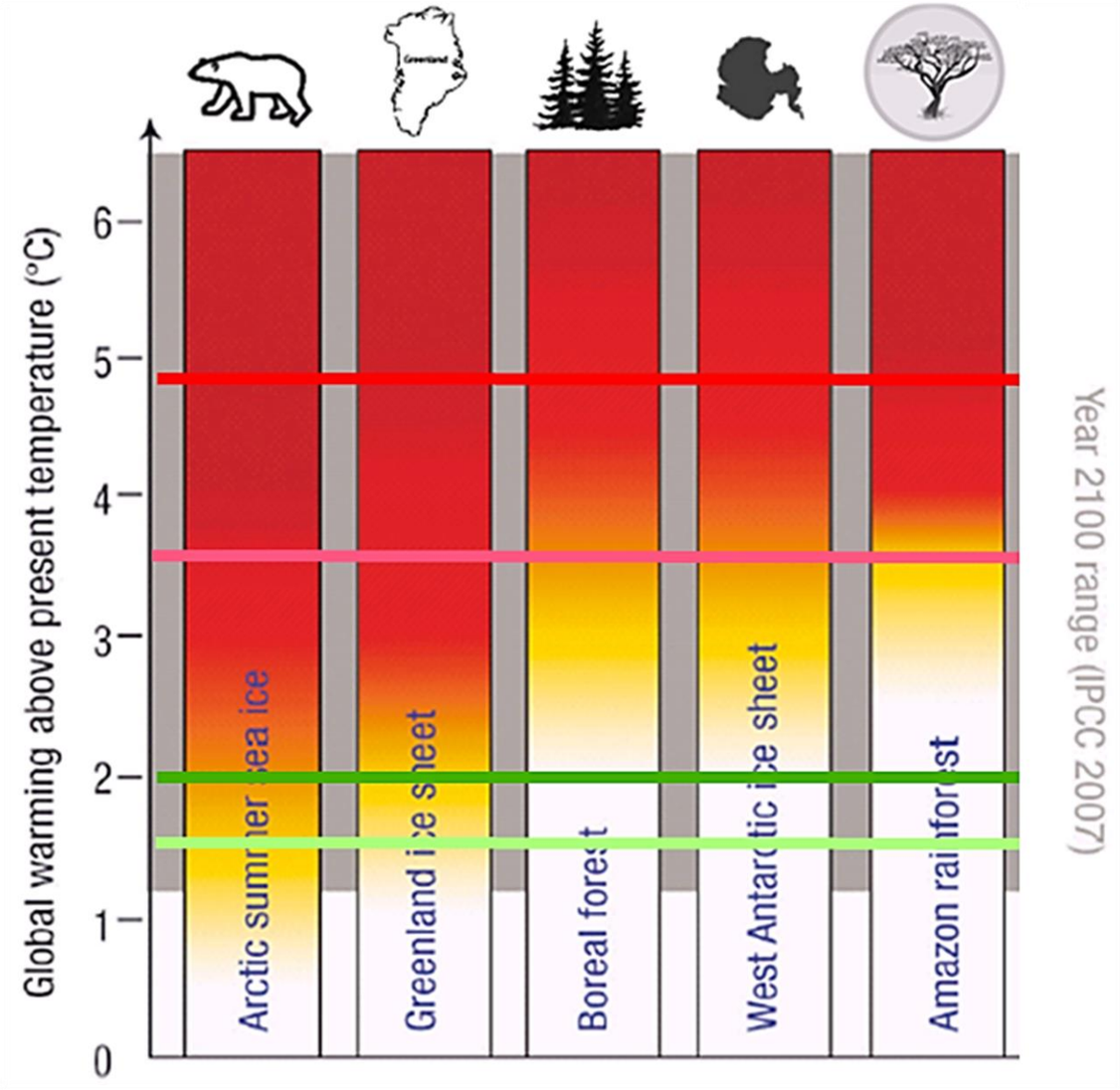

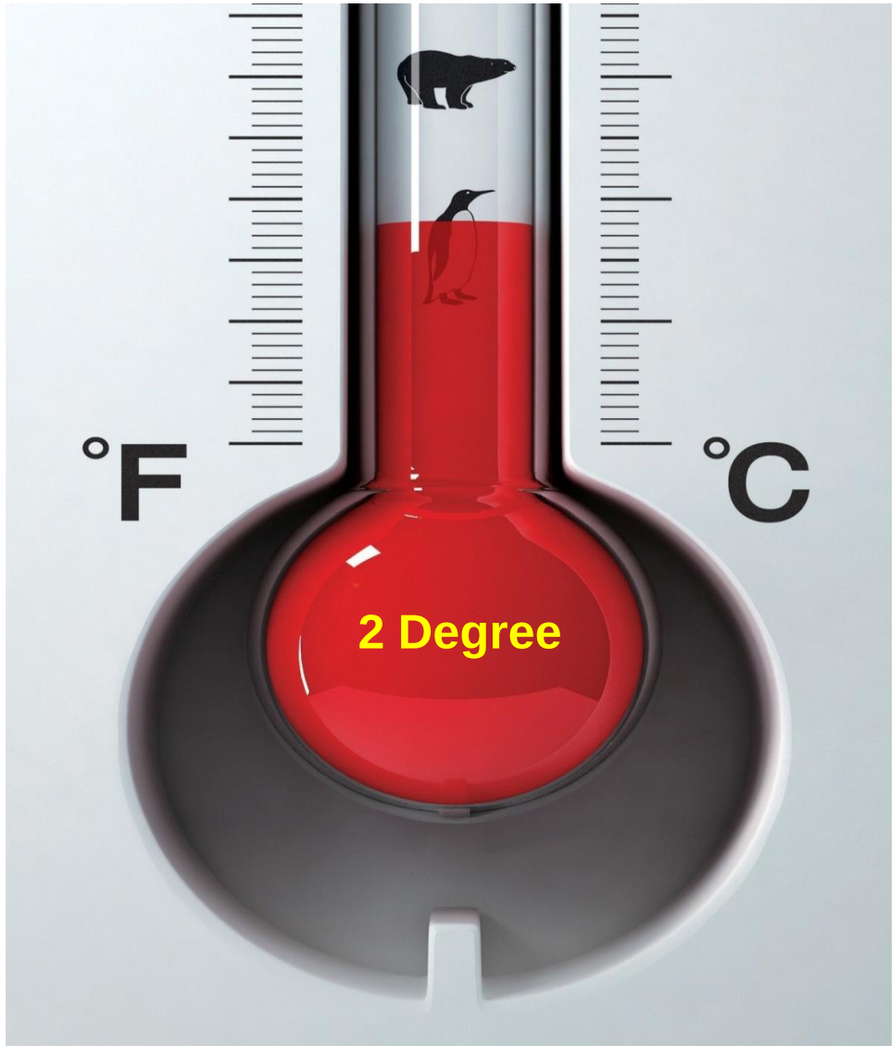

Source: Geomar und Potsdam Institute for Climate Impact Research, 2017

Weather influencer: Jet Stream

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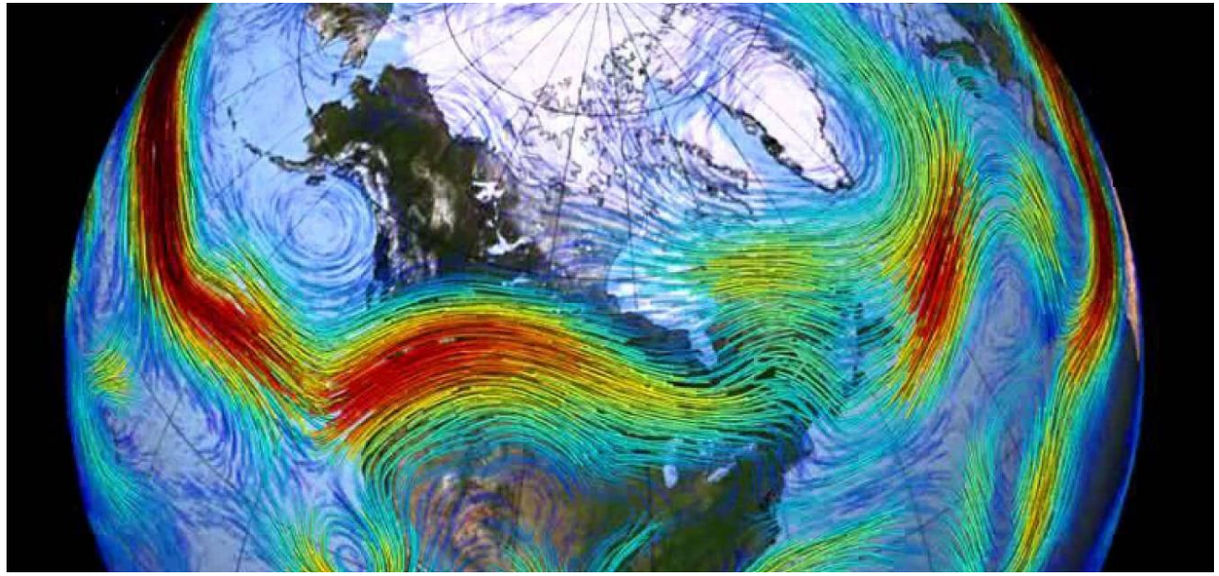

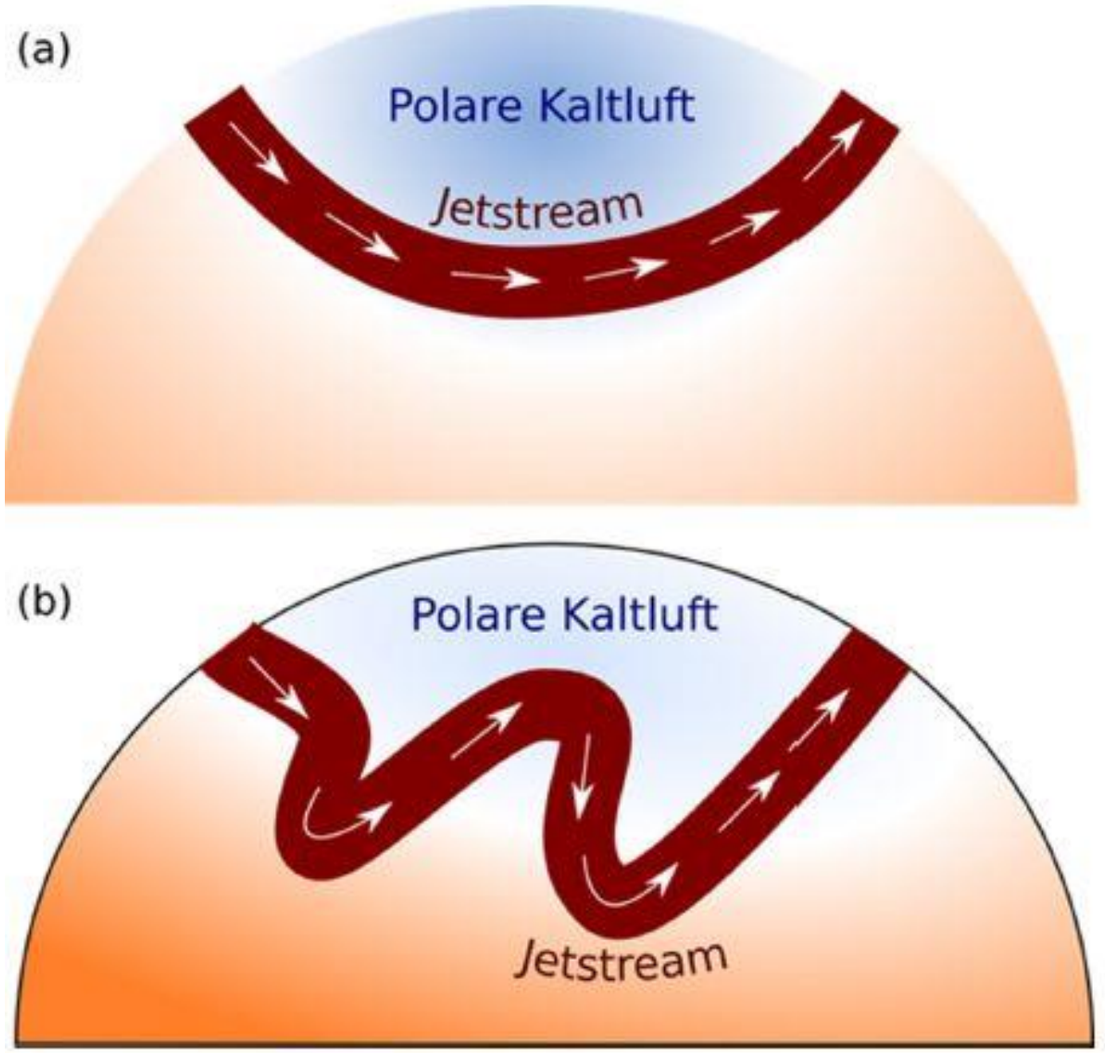

The robustness of the jet stream depends on the temperature difference between the polar region and the moderate latitudes. The polar vortex is more likely to be split under unstable conditions. Consequences can be seen in winter 2022/2023, Europe vs. US.

Source links: https://www.spektrum.de/news/das-wetter-schlaegt-wellen/1214310 //Quelle rechts: : http://www.wettereck-triestingtal.at/2016/11/26/waccy-ursachen-und-wirkung/ [1. Februar 2019]

Weather extremes due to increasing temperatures

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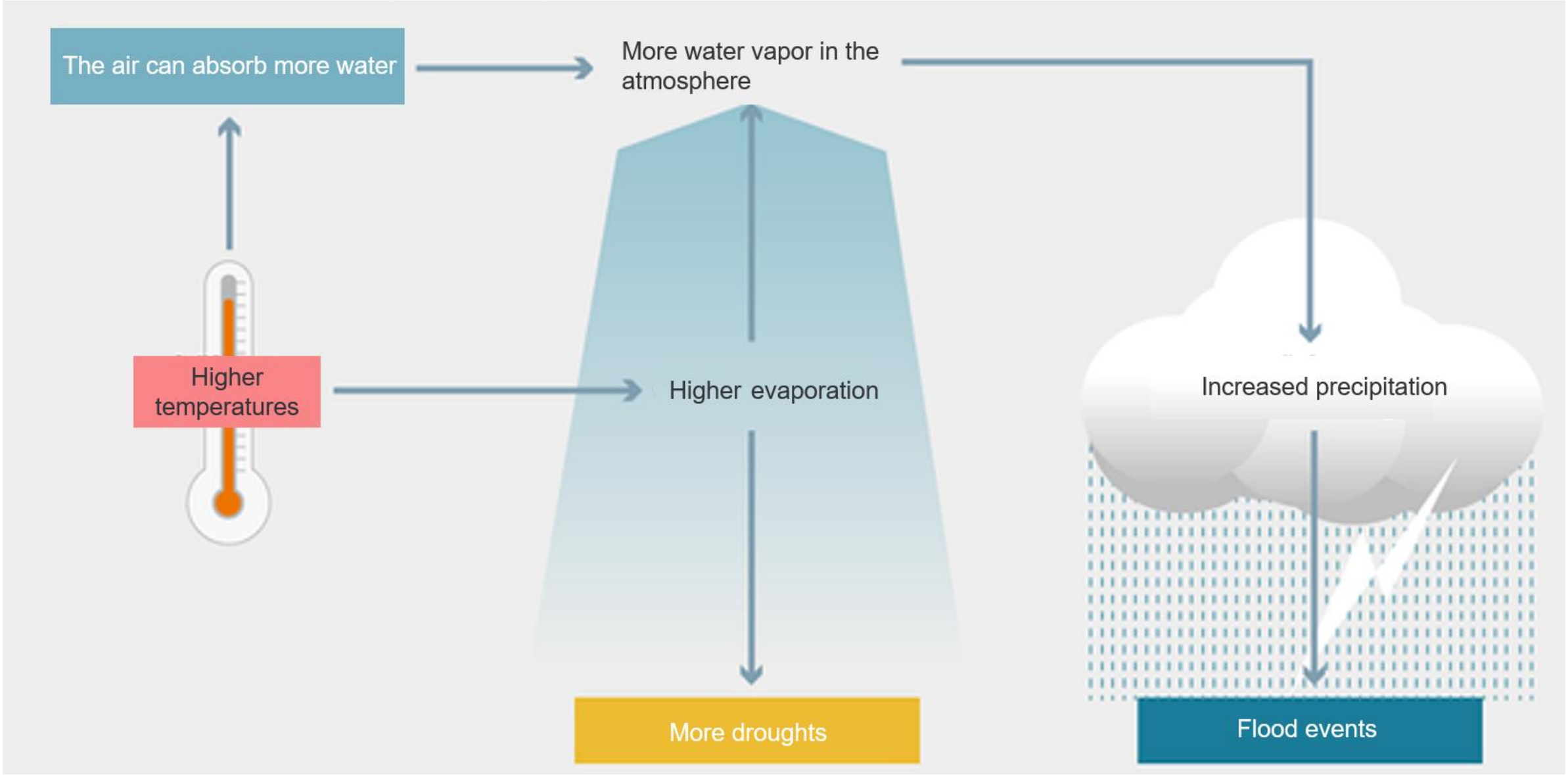

Source: Bayerischer Rundfunk (2017)

Disaster worldwide

Recorded loss events from 1980 to 2018

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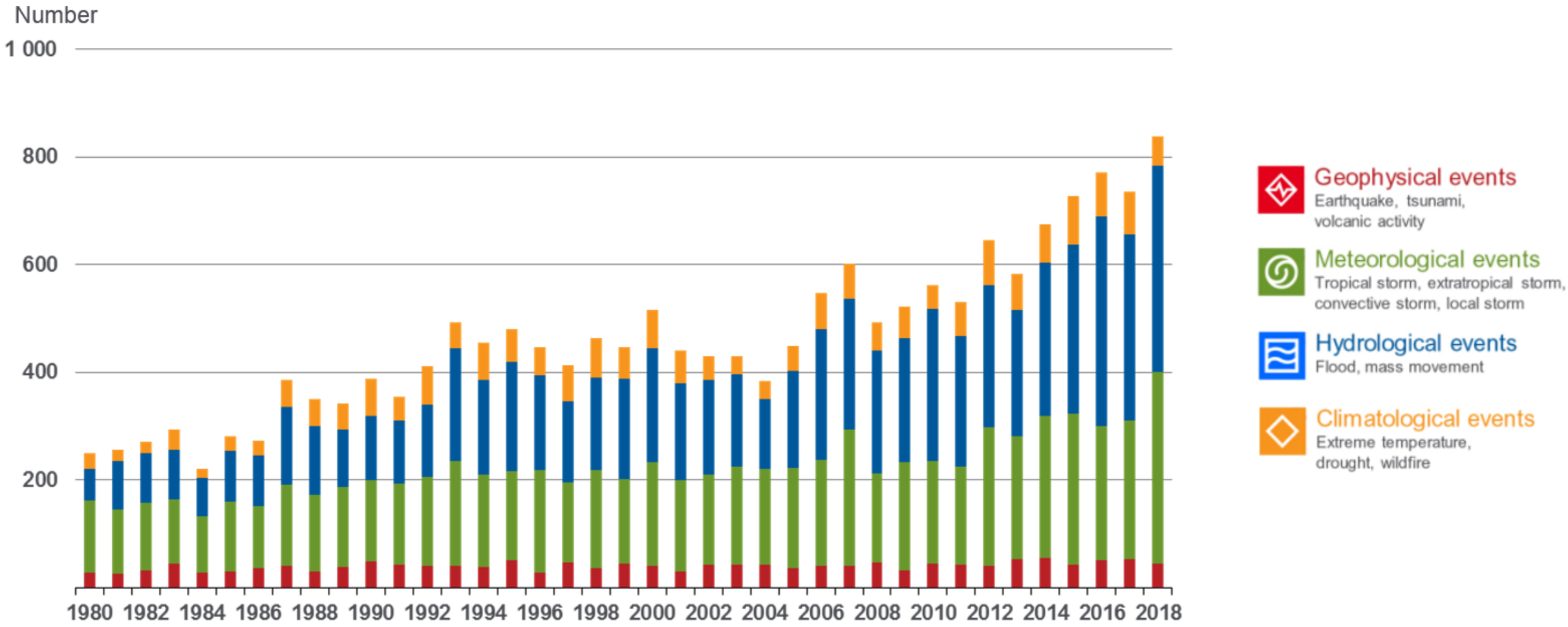

Quelle: P. Löw und M. Steuer; Munich Re NatCat Service; Stand Februar 2019

Nat cat loss events 2023
Disasters caused overall losses of US$ 250bn worldwide

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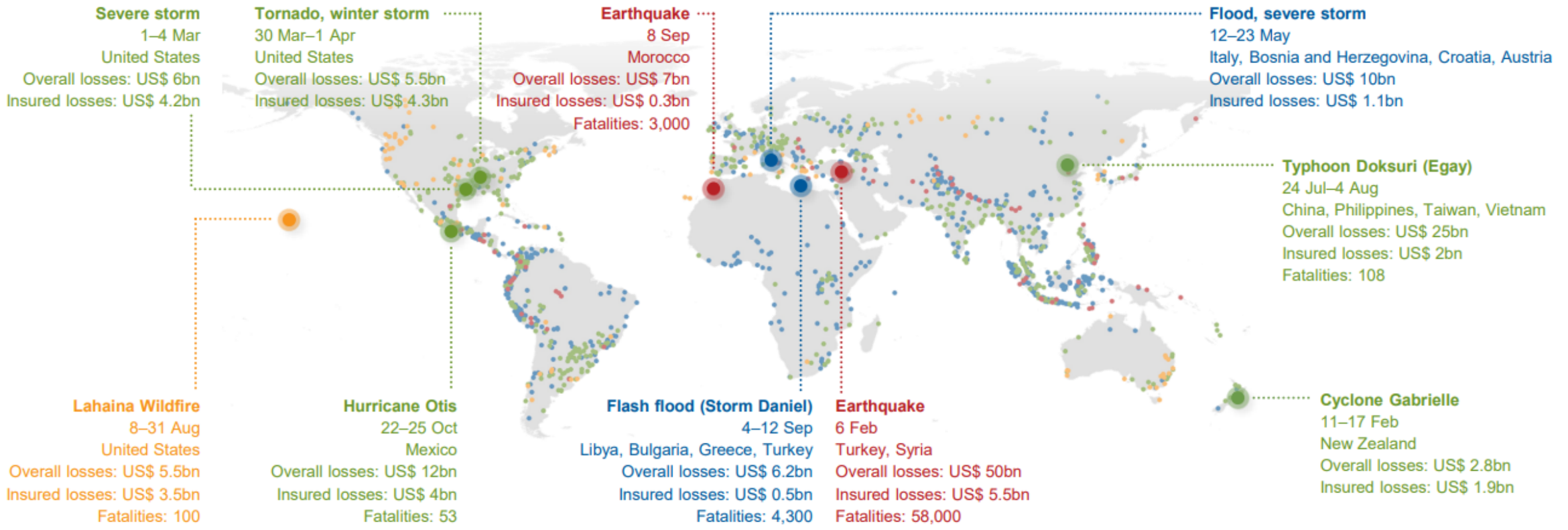


Source: Munich Re, NatCatSERVICE, 2023

Copyright: Zahid Hussain / dpa

Climate change leads to extremes – Examples
Floods in Pakistan (June to October 2022)

- Over 1700 people were killed
- 12,800 were injured
- $30 billion of economic losses (estimated)
- Over 2.1 million people lost their homes
- 33 million people affected

Why?

- Province Sindh received 780% more rainfall than the August average
- Province Balochistan received 500% more rain
- Further:
  - A heatwave in April and May had triggered glacier melting (too much water in the rivers)
  - The same heatwave dried out the soils which caused huge and quick water run-offs

Climate change leads to extremes – Examples
2022 European heat waves

– From June to August 2022, persistent heatwaves affected parts of Europe.
– The highest temperature recorded was 47.0 °C in Pinhão, Portugal, on 14 July.
– Temperatures surpassing 40 °C were recorded for the first time in UK.
– Last heatwave hit France in September, still reaching over 40 °C

Consequences:
- Droughts
- Loss of harvest
- Water scarcity
- Shipping traffic is severely restricted
- Energy production was heavily affected (lack of cooling water in French Nuclear Power Plants)

- We will see how many lives were lost only in a retrospective analyses (problem of slow-onset disasters)

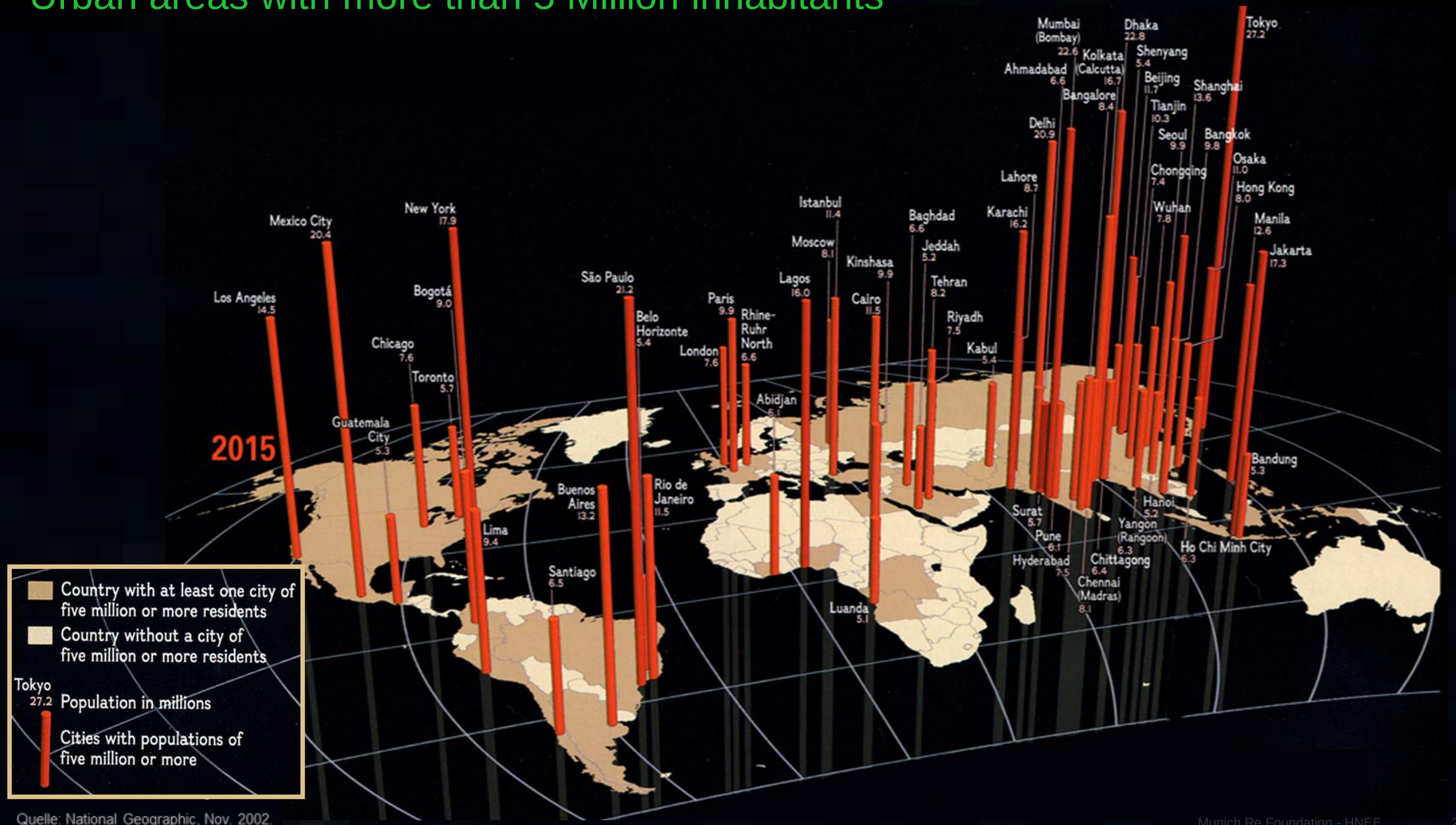
Megacity 1950

Urban areas with more than 5 Million inhabitants

Quelle: National Geographic, Nov. 2002.

Megacity 2015

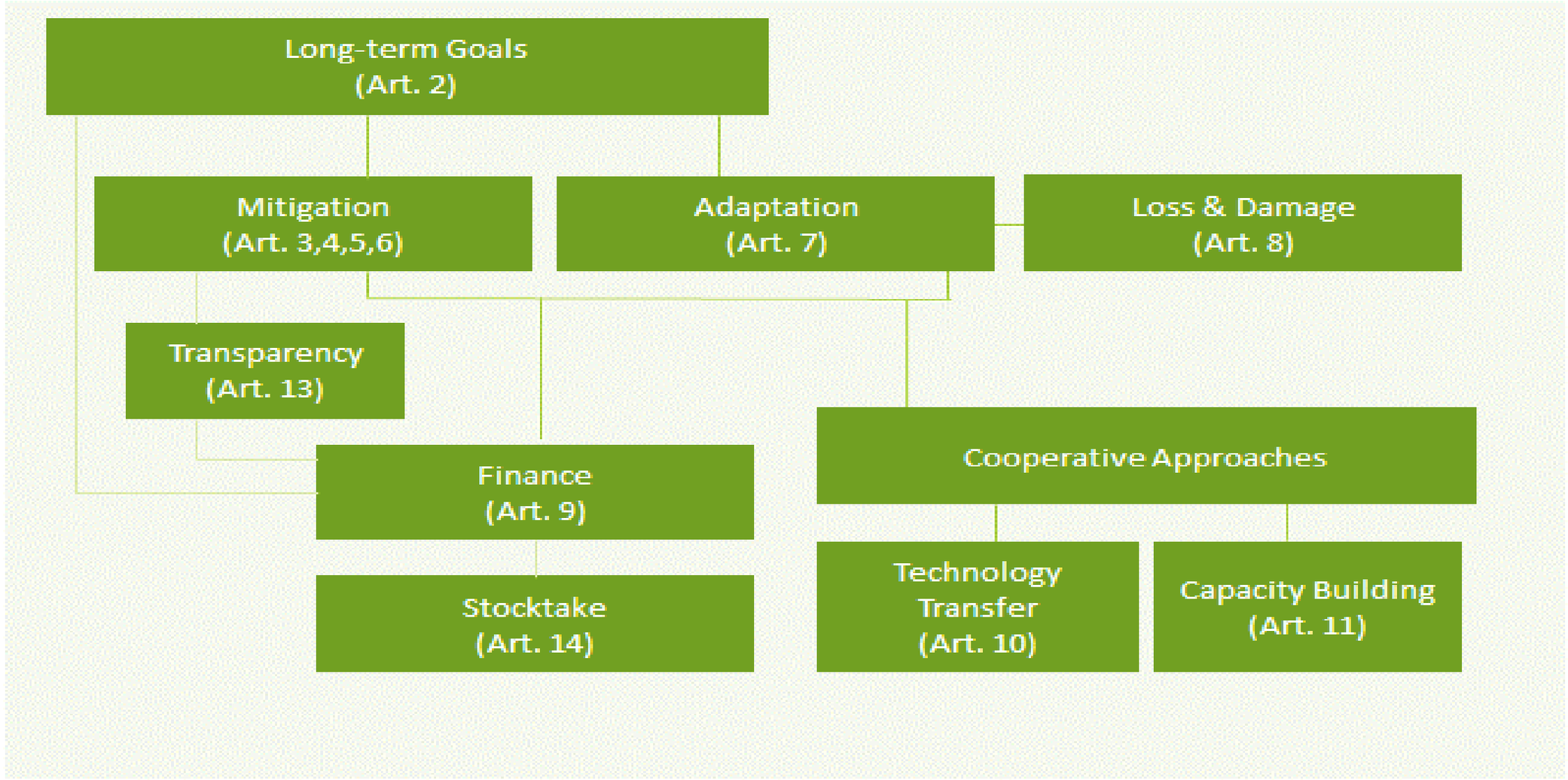
Urban areas with more than 5 Million inhabitants



Quelle: National Geographic, Nov. 2002.

The „easiest“ way out? Climate change mitigation, but …

Source: http://loss-and-damage.net



Responsibilities & Differentiation

Principles

Regime Mechanics
(Art. 15 - 28)

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The Paris Agreement 2015 – The political process is too slow

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Figure 5 NDC Roadmap
Author: Thomas Hirsch, inspired by NDC Partnership Support Unit 2017, p.3

The climate ambitions of different countries (based on data from 2023)

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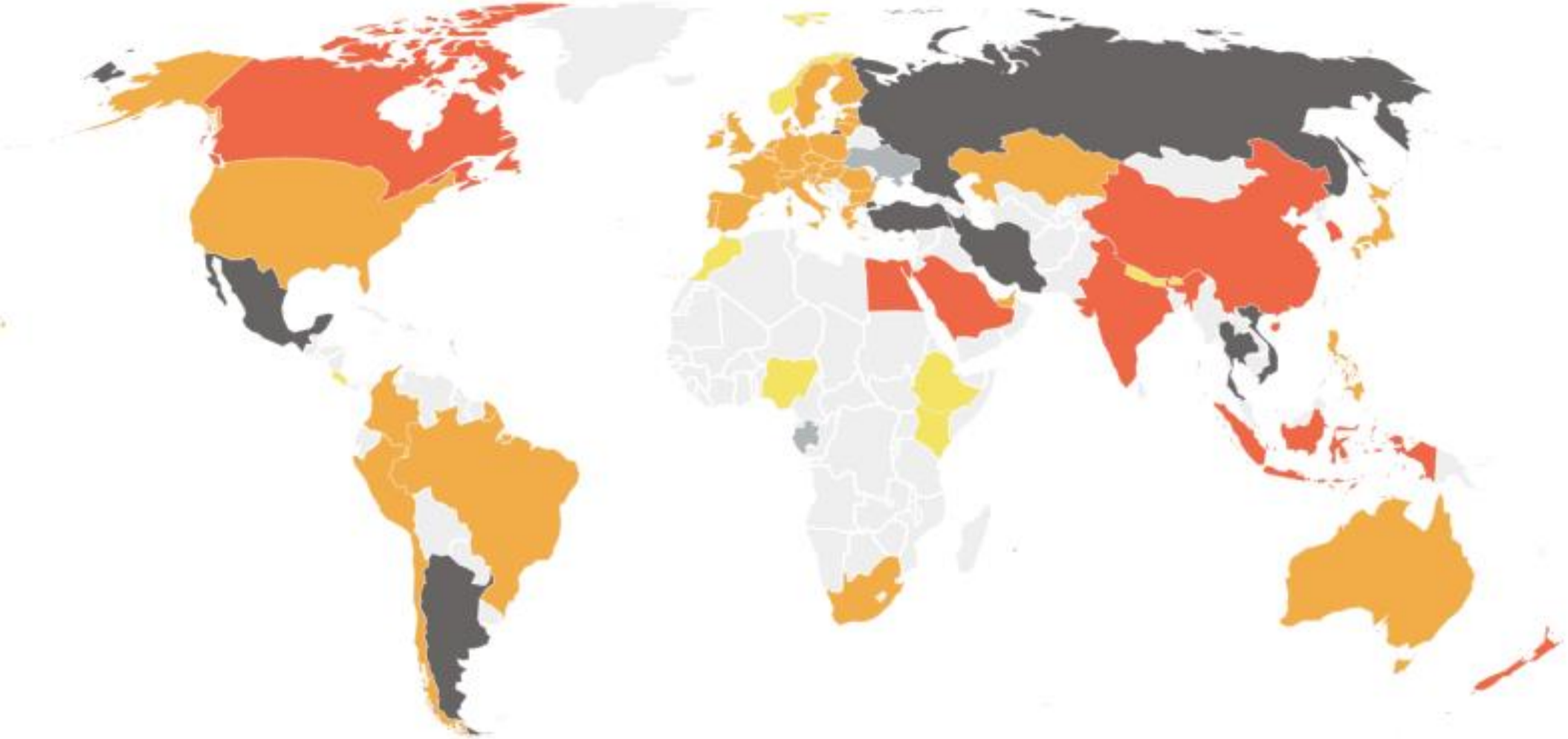

Quelle: https://climateactiontracker.org/countries/ [07.11.2023], Stand: November 2023

Climate change adaptation and risk management

Risk as function of hazard, exposure and vulnerability

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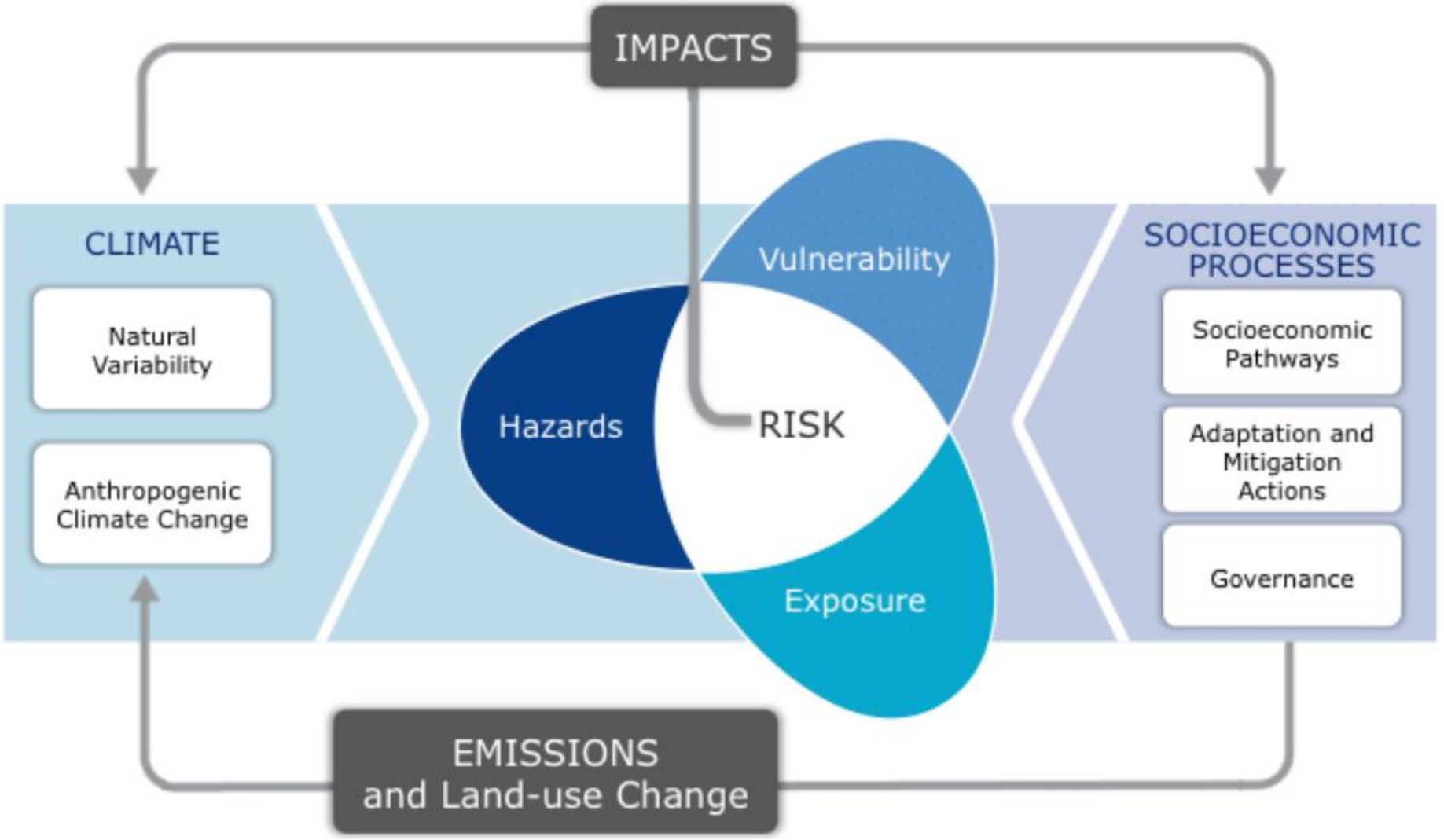

Source: IPCC (2014)

Disaster Risk Management Options

What can be done? – Ex-ante vs. Post-ante

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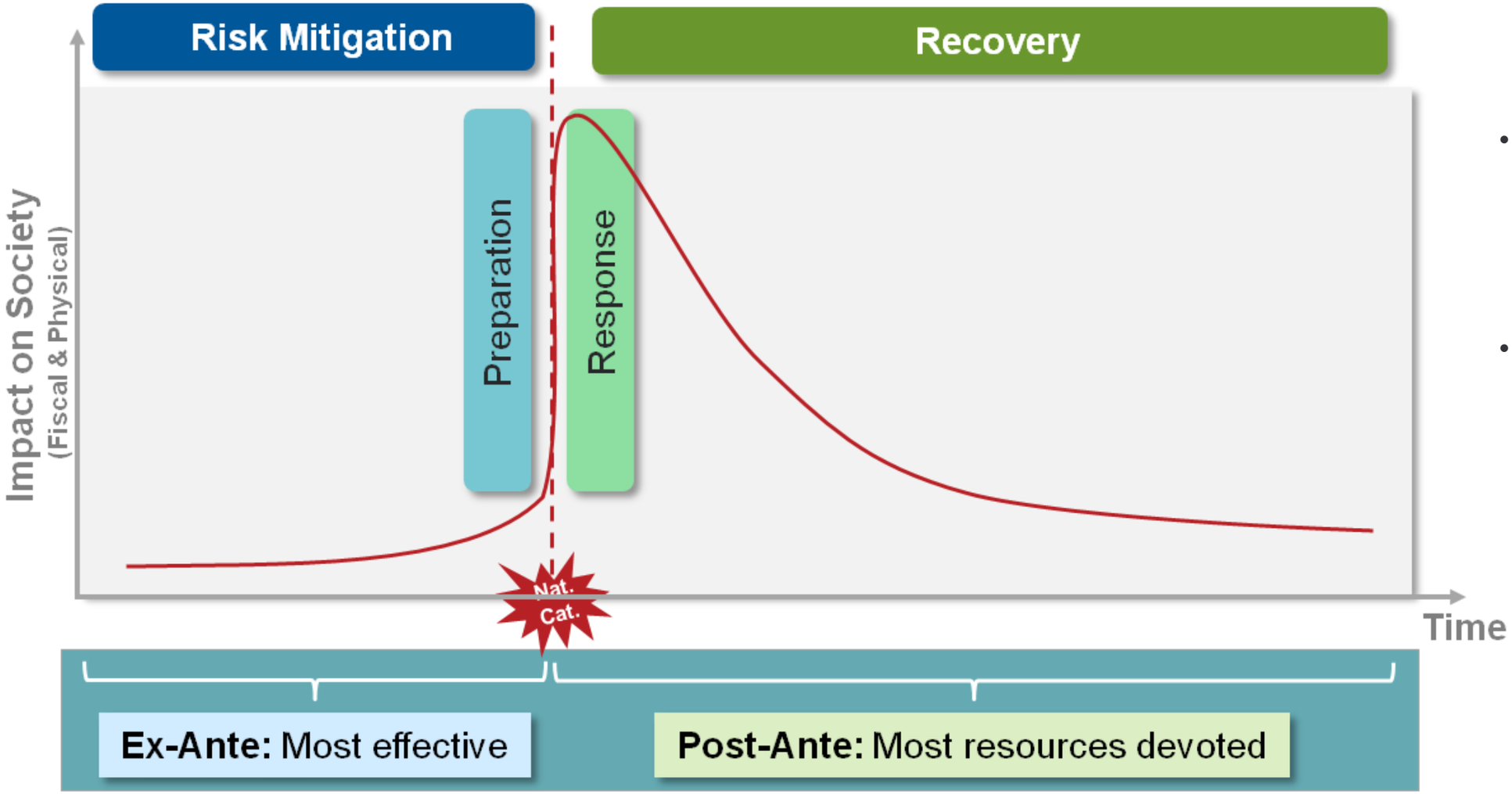

- Governments spend most of their resources & money on post disaster measures, where aid is allocated in haste and under pressure.
- A more efficient and effective way to reduce the impact of natural catastrophes are pre-disaster – or ex-ante – measures, such as risk mitigation & preparation.

Source: World Economic Forum – A Vision on Managing Natural Disaster (2011)

Disaster Risk Management Options

What can be done? – Solutions / Measures

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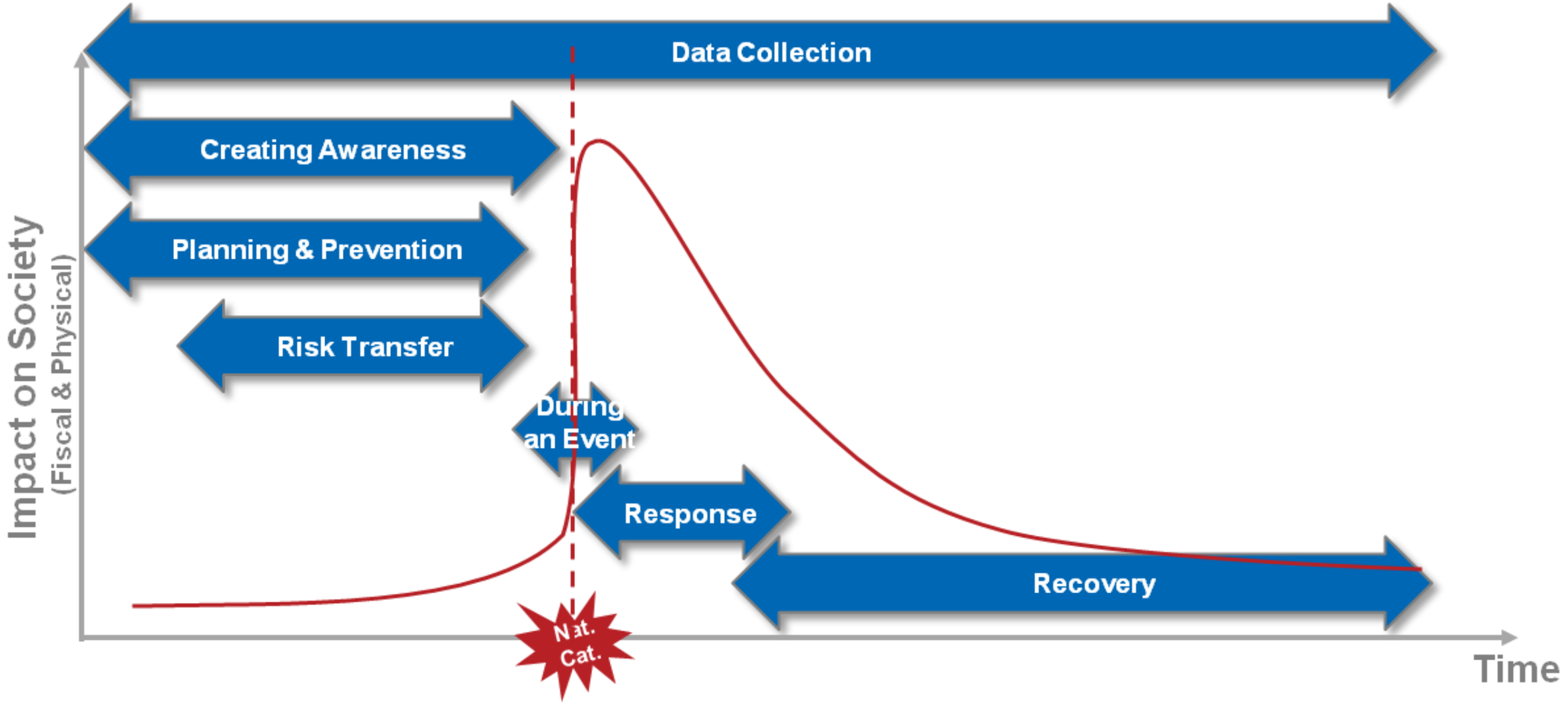
Insurance and reinsurance are an important tool among the ex-ante risk transfer measures



Source: World Economic Forum – A Vision on Managing Natural Disaster (2011)

2) The role of (Re)Insurance in Climate Change

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Basics: What is insurance?

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Insurance basics: How does it work?

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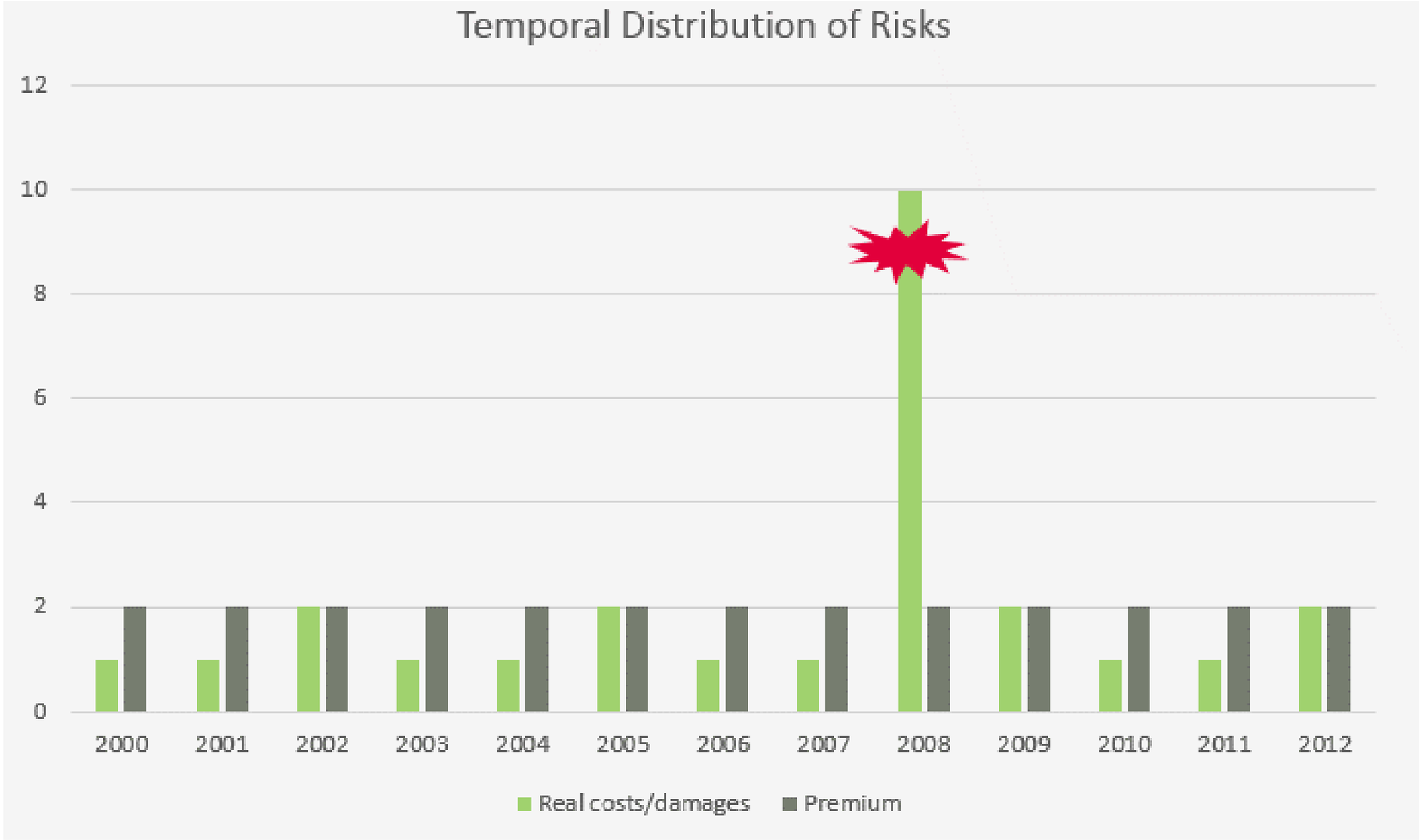

Solidarity principle

Insurance basics: How does it work?

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Spatial Distribution of Risks

e.g. in regional pool solutions against weather risks (crop insurance etc.), African Risk Capacity

Solidarity principle

How do insurers earn money?

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1) Income via premiums

- Depends a lot on the maturity of a market
- Depends significantly on the quality and number of competitors
- The return is based on the cost/premium relation, which in in highly developed market is often around 98%.

2) Income via investments

- Insurance holds large amounts of financial capital, which makes them important investors.
- There are very strong laws and guidelines alongside which insurers may invest this capital.
- Low risk and safety comes first!

Why Reinsurance?

“Reinsurance is insurance that is purchased by an insurance company, in which some part of its own insurance liabilities is passed on to another insurance company”

Tackling the consequences of disasters in the Global South

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Insurance Example African Risk Capacity:
Combining Development Cooperation, (Micro)Insurance and Reinsurance

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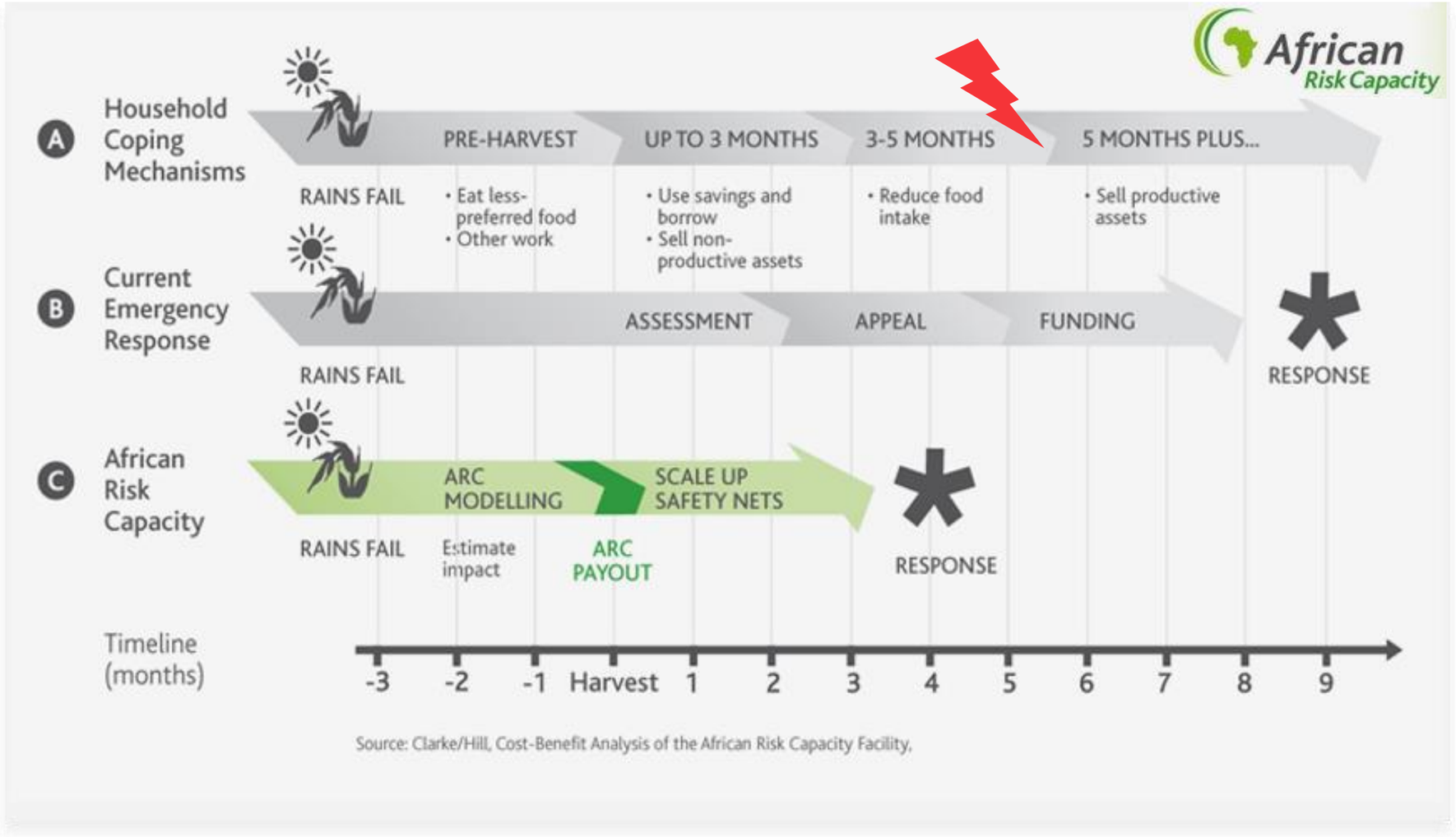

Let‘s have a quick look at Munich Re, our founder

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Munich RE

Munich Re Group “Ambition 2025” and the way to net-zero CO_2 emissions reduction as key element of climate strategy

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	Assets Financed CO_2 emissions	Liabilities Insurance-related CO_2 emissions (primary, direct, fac.)		Own CO_2 emissions from operational processes
Today	**No investment in companies with** ▪ >15% revenue thermal coal[1] ▪ >10% revenue oil sands	**Thermal coal** No insurance for new coal mining, powerplants, related infrastructure[5]	**Oil & gas – exploration and production** No insurance for new and existing oil sand sites and related infrastructure[7], arctic exposure and infrastructure[8]	**Reducing our direct impact** ▪ Carbon neutral since 2015 ▪ Reduction by 25% per employee (2019 to 2021)
April 2023	No direct illiquid investments in new oil & gas fields, midstream oil infrastructure and oil fired power plants Oil & Gas Companies[2] ▪ No new direct investment in pure-play O&G ▪ Required commitment to net-zero from integrated O&G as of 2025[3]		No insurance for new oil & gas fields, midstream oil infrastructure and oil fired power plants[9]	
2025	Total[4]: –25% to –29% emissions Thermal coal[4]: –35% emissions Oil and gas[4]: –25% emissions	–35% emissions[6]	–5% emissions Utilising the expertise of HSB Solomon[10]	–12% emissions per employee of the Munich Re Group
2050	Total: Net-zero by 2050 Thermal coal: Full exit by 2040	Full exit by 2040 (incl. Treaty insurance)	Net-zero emissions by 2050	Net-zero emissions by 2030

1 Exceptions for companies with revenues in thermal coal between 15% and 30% are possible in individual cases, where an active engagement dialogue has been established with the company. 2 For direct investments in listed equities & corporates portfolio only. 3 For companies with highest relative and absolute emissions. 4 Based on sub-portfolio of equities, corporate bonds and real estate at the end of 2019. 5 On single location standalone risks. 6 “Produced tonnes of thermal coal / MW capacity of insureds” used as proxy for emissions: base year 2019. 7 On single location standalone risks, for mixed coverage above a certain threshold. 8 For exclusive coverages; for mixed coverages above a certain threshold. 9 Applicable for contracts/projects exclusively covering the planning, financing, construction or operation which have not yet been under production (fields) or construction or operation (infrastructure and plants) as at 31 December 2022. 5/7/8/9 exceptions can only be granted by board committee. 10 Operational property, scope 1-3 life-cycle emissions, base year 2019.

Source: Munich Re, November 2022

Enable: Solutions for established and emerging technologies
Green Tech Solutions

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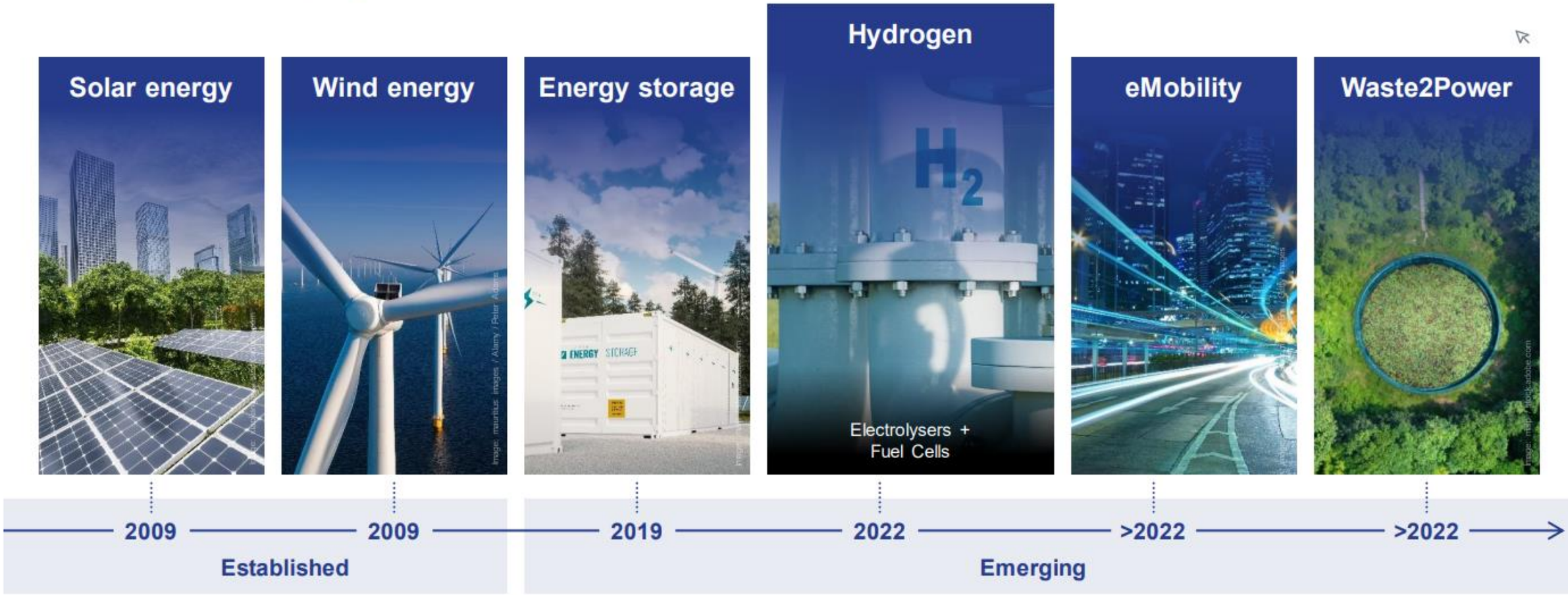
For manufacturers, projects and investors



Source: Munich Re, Monte Carlo 2022

Further information is publicly available in the Munich Re Sustainability Report 2023

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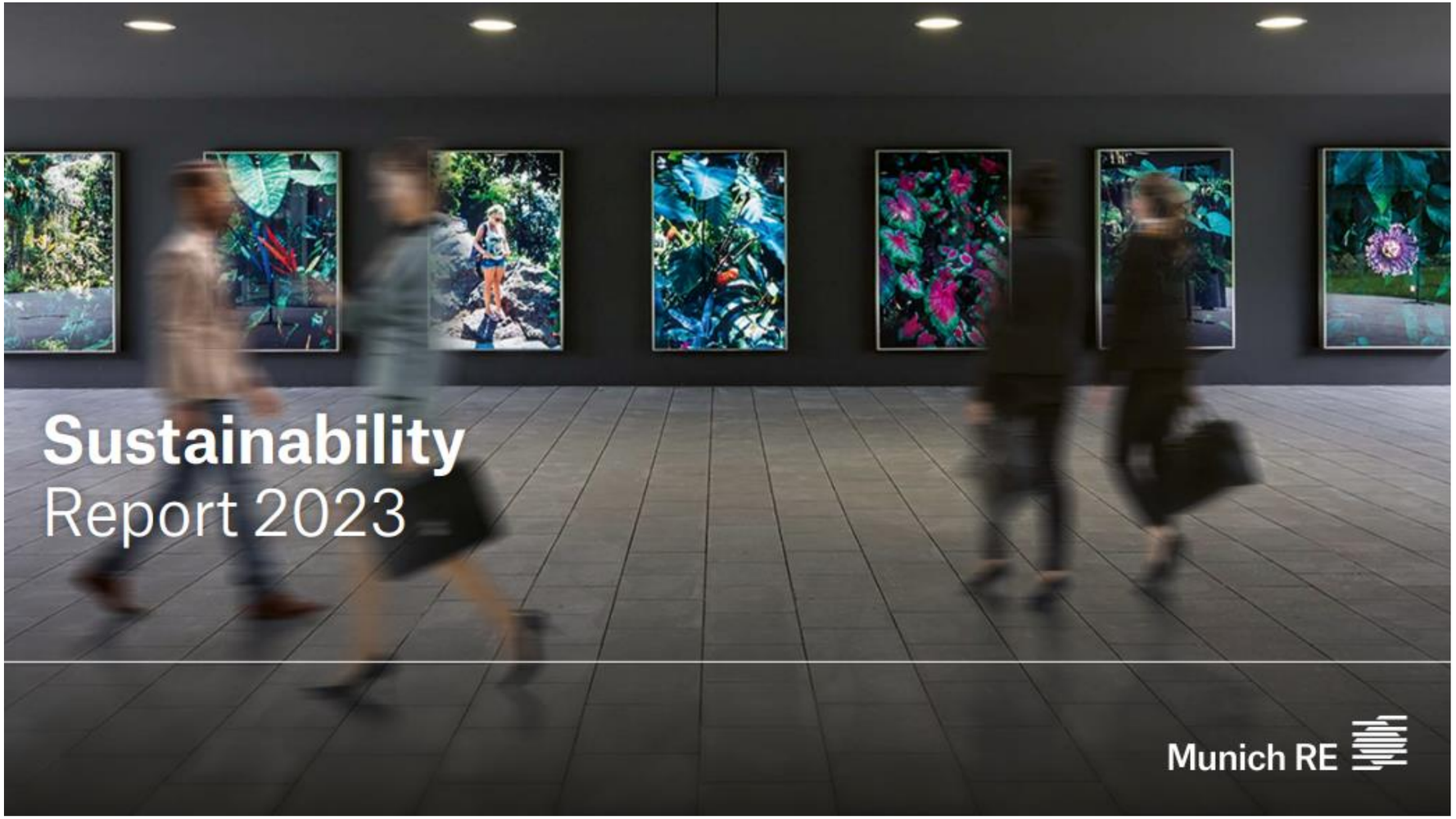

https://www.munichre.com/en/company/sustainability.html

3) Introduction
Munich Re Foundation

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Foundation
From Knowledge
to Action

Munich Re Foundation key facts

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- Going public in 2005
- Financial investment: ~ € 50 million
- Budget: ~ € 1.6 million per year
- Number of projects: ~ 8-12 per year, mostly international
- Staff: 5 employees

Website: https://www.munichre-foundation.org/en.html
Reports: https://www.munichre-foundation.org/en/Media_Centre/annual_reports.html

Our core topics

Munich Re Foundation
From Knowledge to Action

“Improve people‘s current and future living conditions through better management of risks”

“Use Munich Re‘s knowledge to the benefit of society”

Climate risk and adaptation

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Our role

- Support and fund innovative approaches for risk prevention and climate change adaptation on a local level
- Policy advocacy

Our projects

Climate risk and adaptation

RISK Award

→

Climate risk and adaptation

Resilient Agriculture Innovations for Nature (RAIN) Challenge

→

Climate risk and adaptation

Inclusive Early Warning and Response Systems for Villanueva and El Progreso, Honduras

→

Climate risk and adaptation

The Climate Academy

→

Climate change mitigation

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Our role

- Knowledge dissemination
- Education

Our projects

Climate change mitigation

Dialogue Forums

→

Climate change mitigation

Klimaherbst 2023: Exhibition CLIMATE-INDUCED MIGRATION

→

Climate change mitigation

Make.Climate.Fair.

→

Climate change mitigation

Energy School Munich

→

Inclusive Insurance

Munich Re Foundation
From Knowledge to Action

Our role

- Bringing together stakeholders and promoting networks
- Knowledge dissemination

Our projects

Inclusive Insurance

International Conference on Inclusive Insurance

→

Inclusive Insurance

Learning Sessions

→

Inclusive Insurance

The World Map of Microinsurance

→

Inclusive Insurance

Protecting the Poor - A Microinsurance Compendium

→

The Foundation in figures – examples from 2024

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In line with the SDGs

Serving Paris 2015 agreement and the Sendai Framework

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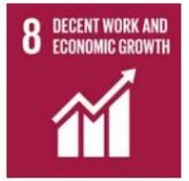
ICII
Learning Sessions

ICII
Learning Sessions

RISK Award
Disaster risk reduction in Honduras
RAIN Challenge
ICII
Learning Sessions

RISK Award

Dialogue Forums
Munich Energy School



ICII
Learning Sessions

Make.Climate.Fair.

RAIN
Challenge

Dialogue Forums
Munich Energy School
Make.Climate.Fair.
Lectures and committees

RISK Award
Climate Academy
Dialogue Forums
Disaster risk reduction in Honduras

RAIN Challenge
Dialogue Forums

RISK Award
RAIN Challenge
Climate Academy
Disaster risk reduction in Honduras
ICII
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RAIN
Challenge

Basis of all
foundation projects

4) Insights in selected climate change adaptation projects

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A) „Strong roots, strong women“ – Community based risk management in Vietnam

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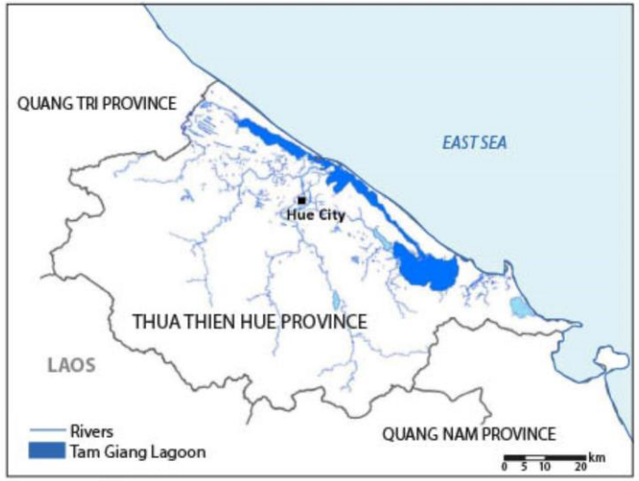
Location: Hue Province, Vietnam

Project size:

- January – December 2021: **€100,000** budget (funding by Munich Re Foundation)
- January 2025- December 2028: **€650,000** budget (follow-up funding by the European Union)

Project partners:

- Center for Social Research and Development (CSRD), Vietnam
- UP Transfer GmbH at the University of Potsdam
- European Union



Vision:

- Strengthening **resilience** of coastal communities towards natural hazards
- Empowerment of **women** through capacity building
- Creation of **green livelihood** opportunities to ensure stable & sustainable income: Mangrove nursery
- Stabilisation of the regional **ecosystem**: mangrove reforestation leading to coastal protection, biodiversity, etc.

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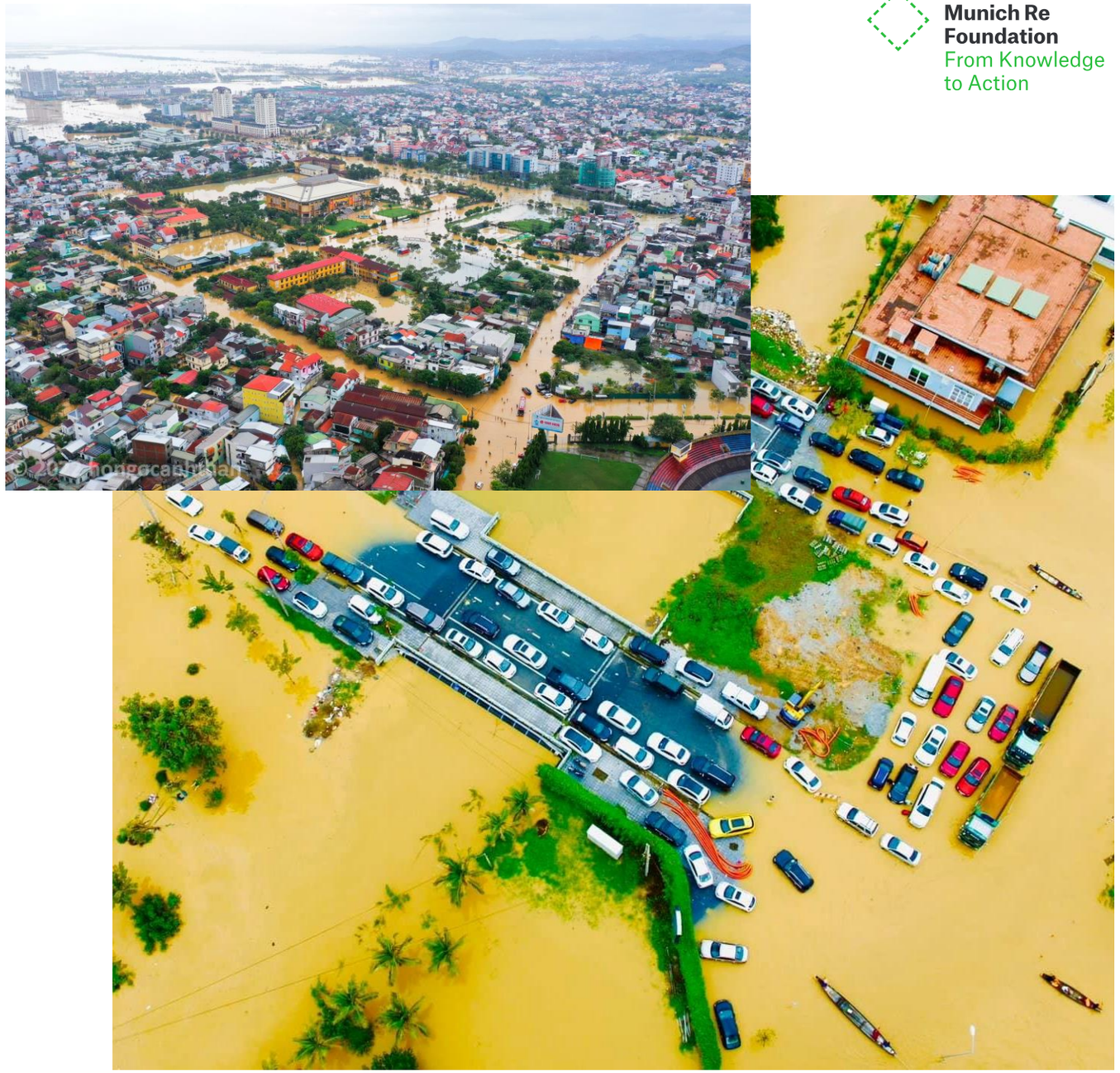
Context:

- Hue Province is severely affected by climate-related hazards: storms, heavy rains, flooding
- Large proportion of Hue´s population: unstable livelihoods & lack in financial savings
- Result: high vulnerability towards shocks and disruptions, especially vulnerable groups (women, poor)

→ Therefore: need for sustainable and equitable Disaster Risk Reduction (DRR) + adaption approaches (NbS & EbA)



Approach & Methods:

- Nature based solutions (NbS) & Ecosystem-based adaptation (EbA) as umbrella concepts
- Development of a mangrove nursery
- Securing land for mangrove reforestation
- Capacity building for women on alternative livelihood opportunities & disaster preparedness
- Creating further green livelihood opportunities

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Nature-based solutions (NbS)

=

Ecosystem-based Mitigation **(EbM)**

Ecosystem-based adaptation **(EbA)**

Ecosystem-based Disaster Risk Reduction **(Eco-DRR)**

Ecosystem-based approaches

- Maintain ecosystem functions and biodiversity
- Improve status of ecosystem services
- Contribute to human well-being and health
- Mitigate risks
- Offer green livelihood options

Sources:
Words into Action: Nature-based Solutions for Disaster Risk Reduction (p. 42-43)
Understanding_ecosystem_based_adaptation_approaccches_DIIS_Working_Paper_2021_09.pdf (p. 2f)

B) Holistic early warning for climate-induced water insecurity in South Africa

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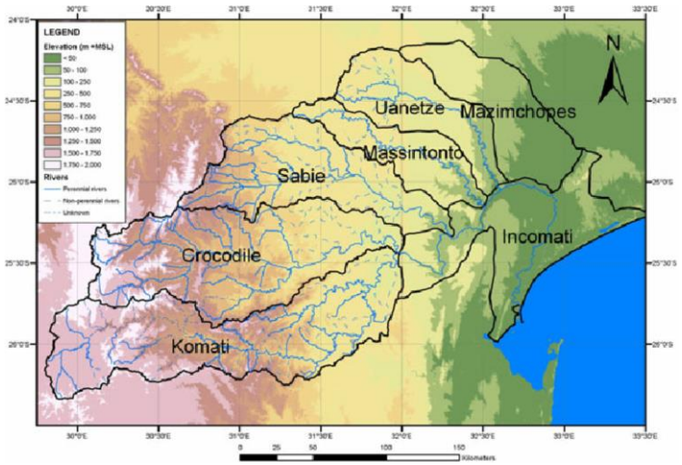
Location: Inkomati River Basin, Mpumalanga, South Africa (SA)

Project duration: October 2023 – October 2025

Project size:
€100,000 budget (RISK Award funding by Munich Re Foundation)

Project partners:
- The Association for Water and Rural Development (AWARD), SA
- City of Mombela, SA
- Inkomati-Usuthu Catchment Management Agency (IUCMA), SA
- UNDRR, UN Office for Disaster Risk Reduction



Vision:
- Update of an existing monitoring system into an **early warning system** for disaster preparedness, including the health factor
- Improvement of **water security**
- Increase of **livelihood security**
- Reducing **health risks** resulting from water contamination

Background & context

- Local villages & communities strongly depend on water from the rivers of the Inkomati basin

- Water used for irrgation and drinking, washing & cooking

Problem:
Fluctuating water levels in rivers (droughts vs. flooding)

As a result of climate change: precipitation patterns are changing

→ Intensity and frequency of rainfall is increasing (summer) while dry phases (winter) turn into long-lasting droughts

Additional risk:

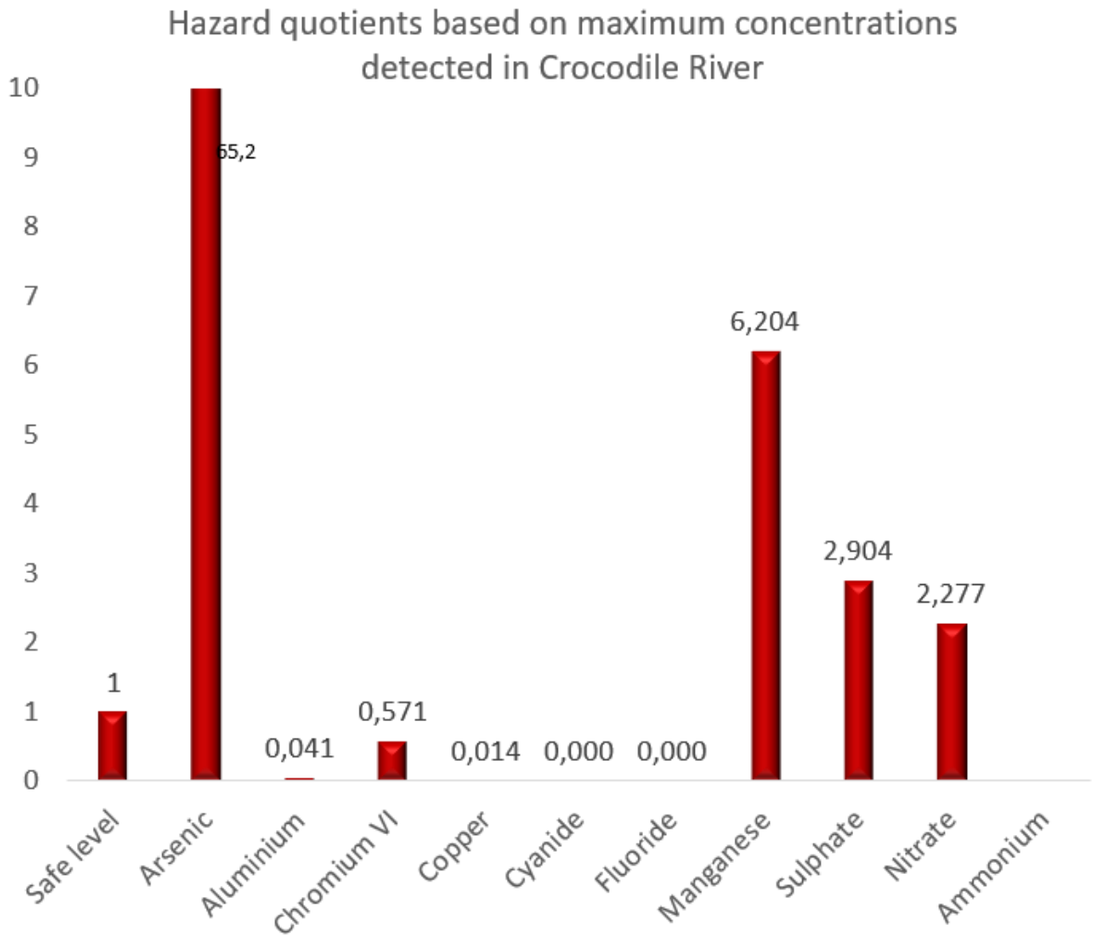
- Absolute volume of water in rivers decreases

- Region is much used for **mining:** release of **toxic substances** (uranium, radium, aresenic)
  → often discharged into the rivers largely unfiltered

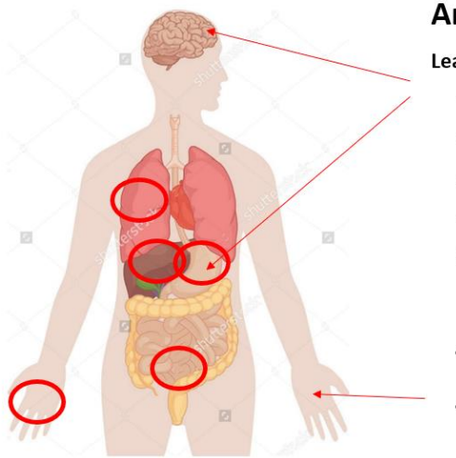
- Water volume decrease + contaminated water discharge: rise in proportion of toxic substances in the water

- Causing **major health risks** for local flora and fauna & people using the water

- Missing **environmental standards** reinforce problems in the project region



Health Risks from Exposure to Arsenic



Arsenic

Leading to:

- Nerve damage
- Increased cancer risks:
  - Lung
  - Bladder
  - Kidney and liver cancers
- Skin damage (e.g. rash, pigment changes)
- Circulatory problems in skin

→ Early warning: essential to protect local people against health & hazard risks!

3) RAIN Challenge – East Africa

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RAIN Innovation Challenge: Resilient Agriculture Innovations for Nature

- → Showcases how **locally led adaption** can reshape agriculture & **strengthen resilience** in the midst of climate uncertainty
- → Promotes **nature-positive solutions** in agriculture, especially in East Africa
- → Supports innovations that build resilience (towards climate risks)
- → Equips leaders with tools needed to **implement sustainable agricultural practices** & achieve lasting changes
- → Confronts obstacles like food security, soil degradation & water scarcity

Partner:

GLOBAL RESILIENCE PARTNERSHIP

Global Resilience Partnership (GRP)

- Operates as partner organisation through two organisational units (GRP Non-Profit Company & Stockholm Resilience Centre)
- Made up of 90+ Partners
- Advances resilience through generating and sharing knowledge, shaping policy & scaling on the ground innovation

RAIN Challenge 2023: Resilience through regeneration in Kenya

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Project location:
Kenya, surrounding area on Nairobi

Project duration:
September 2023 – September 2024

Project size:
€10,000 - €20.000

Project partners:
Itanya Africa Group, Kenya
Global Resilience Partnership (GRP)

Vision:

- Economic empowerment of female smallholder farmers
- Strengthening of climate resilience
- Improvement of water infrastructure
- Promotion of sustainable agriculture & farming
- Improvement of financial literacy

Measures & Activities

- Capacity training on sustainable agriculture for female smallholder farmers
- Construction of water pans
- Construction of a demonstration farm for sustainable agriculture practices
- Construction of vertical gardens
- Financial literacy training

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Questions?

Thank you.

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