Weather extremes, climate change and net-zero: Perspectives from Munich Re

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Munich Re as early warner on climate change

Research on human-induced climate change since the early 1970s

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1880 Foundation of Munich Re

1899 First Natural hazard cover (storm, flood)

1906 San Francisco EQ and Fire: MR pays ~7% of GPI for the fin. year

1973 Munich Re's first global warming "alert"

1974 Establishment of Geo Risks Research Department

1978 „World Map of Natural Hazards" based on Munich Re Know-How

2000 First CD-ROM „World map of Natural Hazards"

2001 MR contributes to IPCC Climate Assessment Report

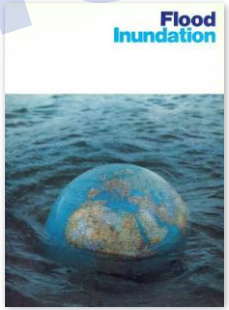
2007 Climate change defined as strategic topic for Munich Re; Former head of Geo Risks Research honoured with 2007 Nobel Peace Prize

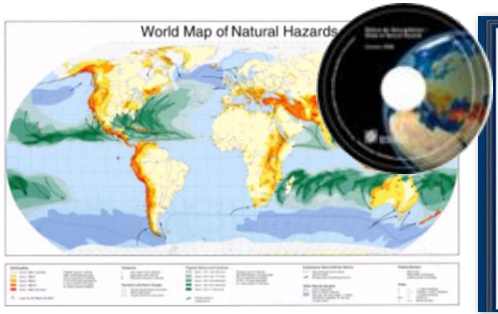
2014 MR contributes to IPCC Climate Assessment Report

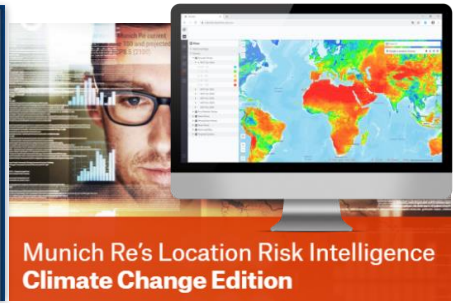
2020 Climate Risk Score (SaaS)

2020 MR Ambition 2025


Carl von Thieme
Chair of the B.o.M.







Agenda

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01

Natural Catastrophes and Climate Change

02

Insurability of a Changing World

03

Coping with Climate Change: Strategy & Solutions

Natural Catastrophes and Climate Change

01

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US$ 100bn insured loss years on the rise

Development of annual natural disaster losses worldwide since 1980

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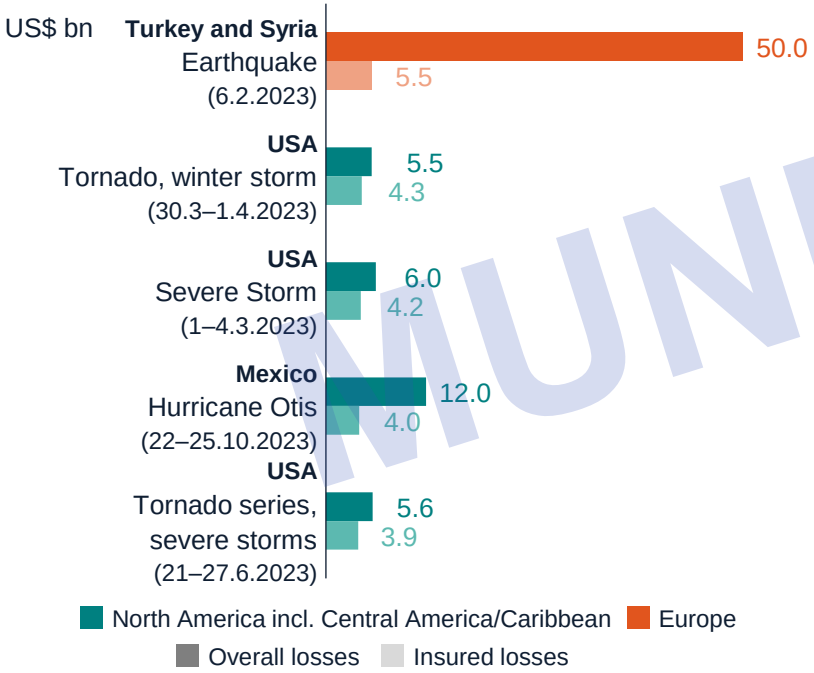
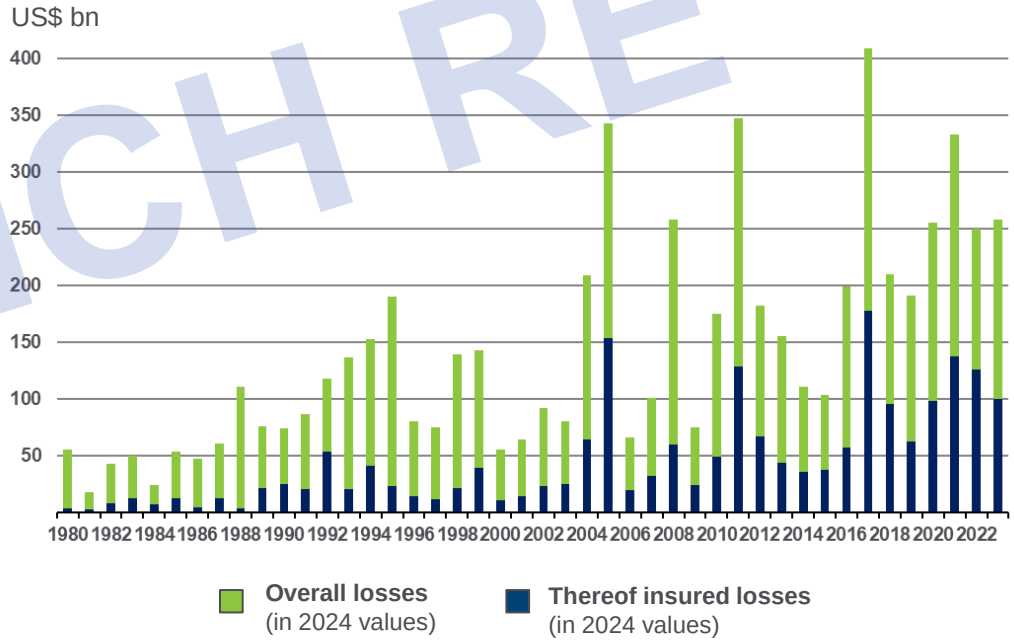
Significant loss events 2023 by insured losses and region and development of natural disaster losses since 1980





Inflation adjusted via country-specific consumer price index and consideration of exchange rate fluctuations between local currency and US$.
Excludes famine, heatwave, drought

Losses from non-peak perils* on the rise

Severe convective storm (SCS), wildfire, flood

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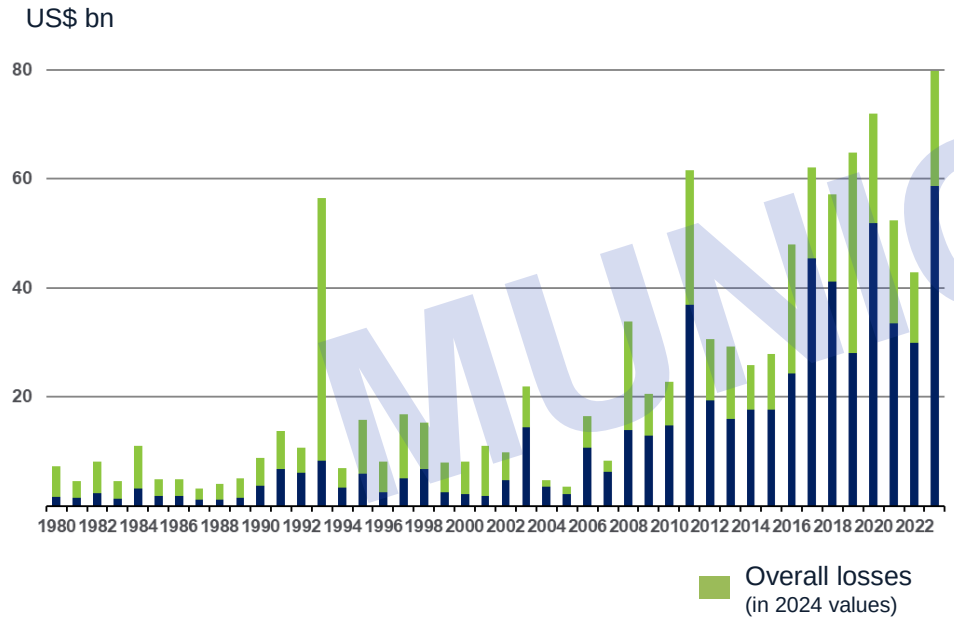
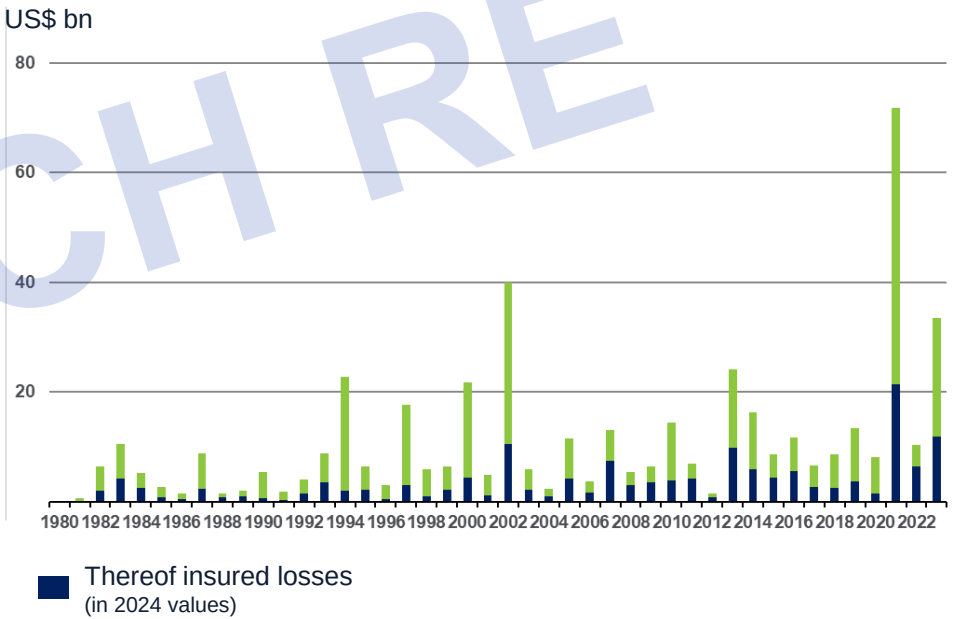
… in the USA**



… and in Europe



Overall losses
(in 2024 values)

Thereof insured losses
(in 2024 values)

Inflation adjusted via country-specific consumer price index and consideration of exchange rate fluctuations between local currency and US$

* Drought and heatwave are excluded **excluding Virgin Islands U.S., Puerto Rico

Climate Change = Risk of Change

Small increase in average temperature – large increase in probability of extremes

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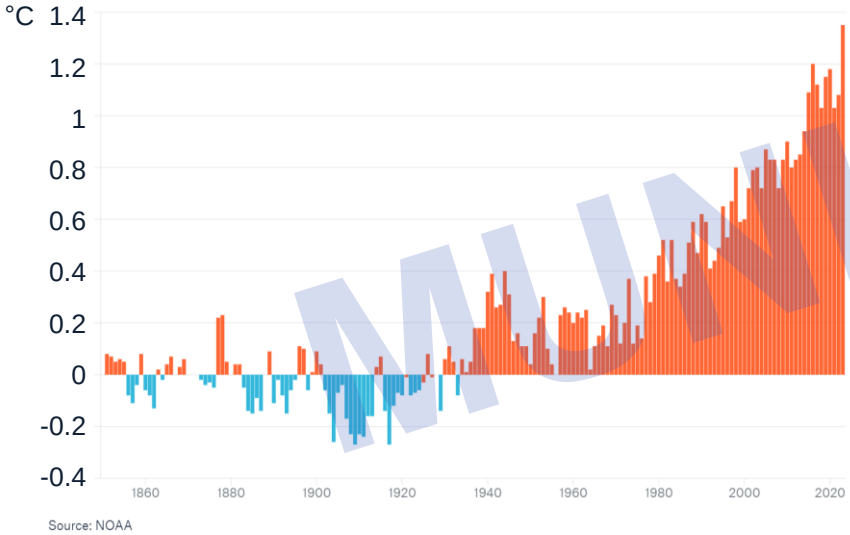
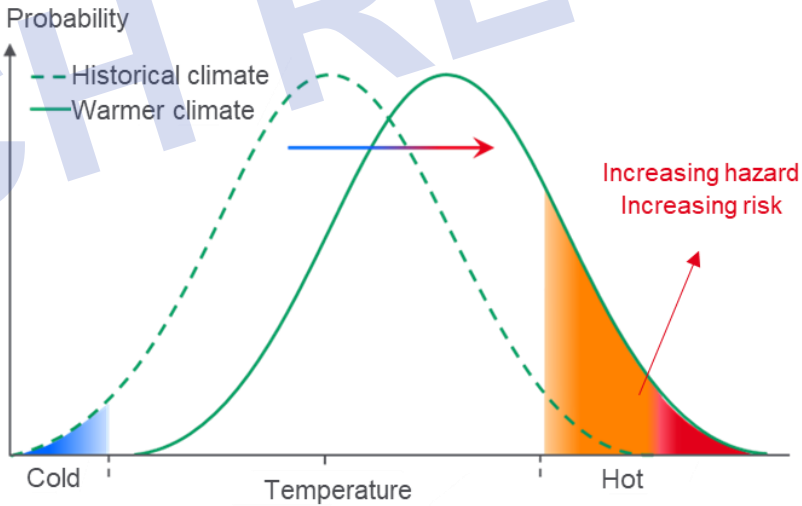
2023: hottest year on record!
Last 10 years warmest on record



Global temperature anomalies* (°C) compared to 1850-1900 average

Increase in the probability of extreme temperatures and new extremes

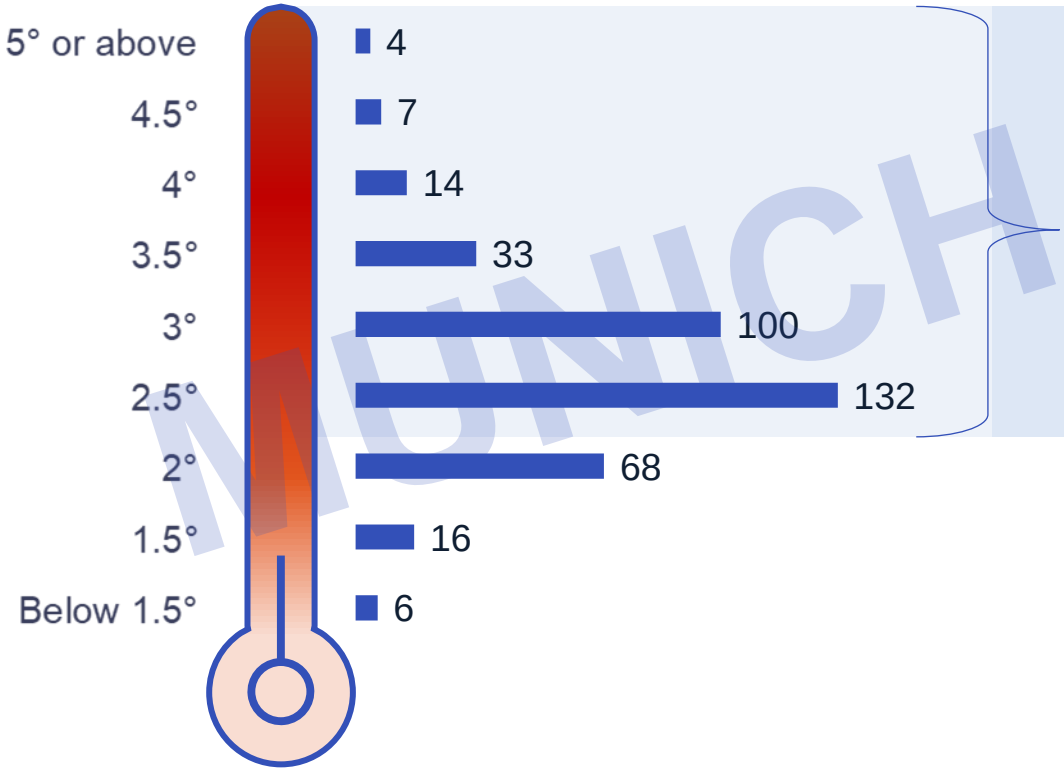


Increase in global average temperature - change in probabilities

Source(s): Munich Re, based on National Centers for Environmental Information NOAA; IPCC

Reaching the 1.5° limit increasingly unlikely?

Most of IPCC climate scientist experts assume 2.5°C increase till 2100



Over 75% of the 380 IPCC scientist respondents expected an average global temperature increase of at least 2.5°C or even higher

Source(s): Munich Re, based on The Guardian's Survey on Climate Failure (https://www.theguardian.com/environment/article/2024/may/08/world-scientists-climate-failure-survey-global-temperature)

Effect of global warming: Global impact on natural hazards

Latest science: Increase in frequency and/or intensity of natural perils

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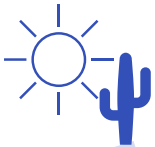
More frequent temperature extremes

Increase in wildfire hazard



Increase in extreme drought conditions

Sea level rise and increase in storm surge risk

Environments favorable to severe thunderstorms, shifts in tornado activity and severe hail (“Severe Convective Storms”)

Increase in frequency and intensity of heavy rainfall events

More intense tropical cyclones with more rain and higher storm surges

Longer persistence of weather patterns due to slowdown in west-east movement

Source(s): Munich Re, based on latest state climate science (IPCC)

Increase in natural disaster losses globally

Driven by the severity of extreme weather and socio-economic factors

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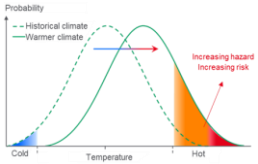
HAZARD

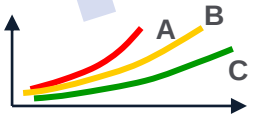
Characteristics of extreme weather, e.g. precipitation amount, hail size, flood height, wind speed, heat, drought, water shortage ...

→ Climate Change

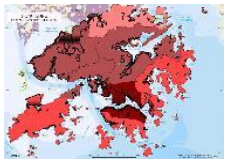


VULNERABILITY

- Building regulations & building standards
- Land use & compensation areas
- Protective green and gray infrastructure
- Warning systems and emergency services



EXPOSURE



- Value of real estate, equipment inventory & vehicle fleet
- Disruption to supply chains and business operations

Insurability of a Changing World

02

Source: john finney photography / Getty Images
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Natural catastrophe protection gap[1] – large regional differences

Decreasing in industrial countries; unchanged in developing countries

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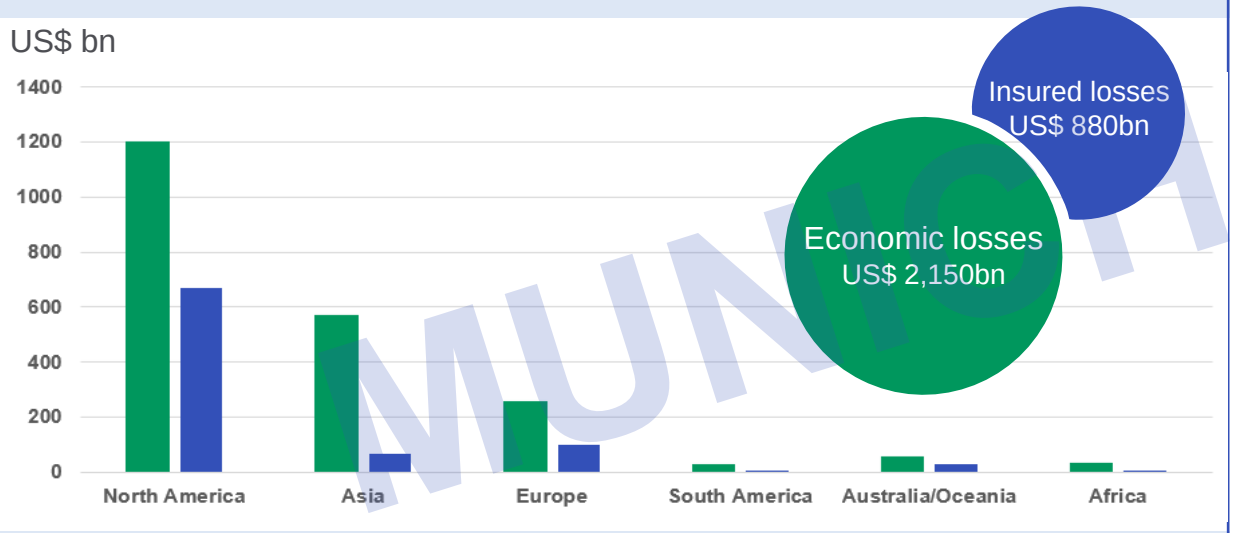
Weather-related natural catastrophe losses by continent 2013 – 2023



Worldwide only about 1/3 of losses are insured (~37% insured)

Three major factors influencing global natural disaster losses

- Fluctuating asset values and accumulation risks through socioeconomic shifts
- Increasing intensity and/or frequency of extreme weather events through climate change
- \+ Improving adaptation measures, e.g. improved building safety standards

1) Protection gap definition in line with Geneva Association: the broader risk protection gap which describes the difference between total losses and insured losses
Source(s): Munich Re NatCatSERVICE 2024, in 2024 values

Share of uninsured catastrophe losses varies significantly by region

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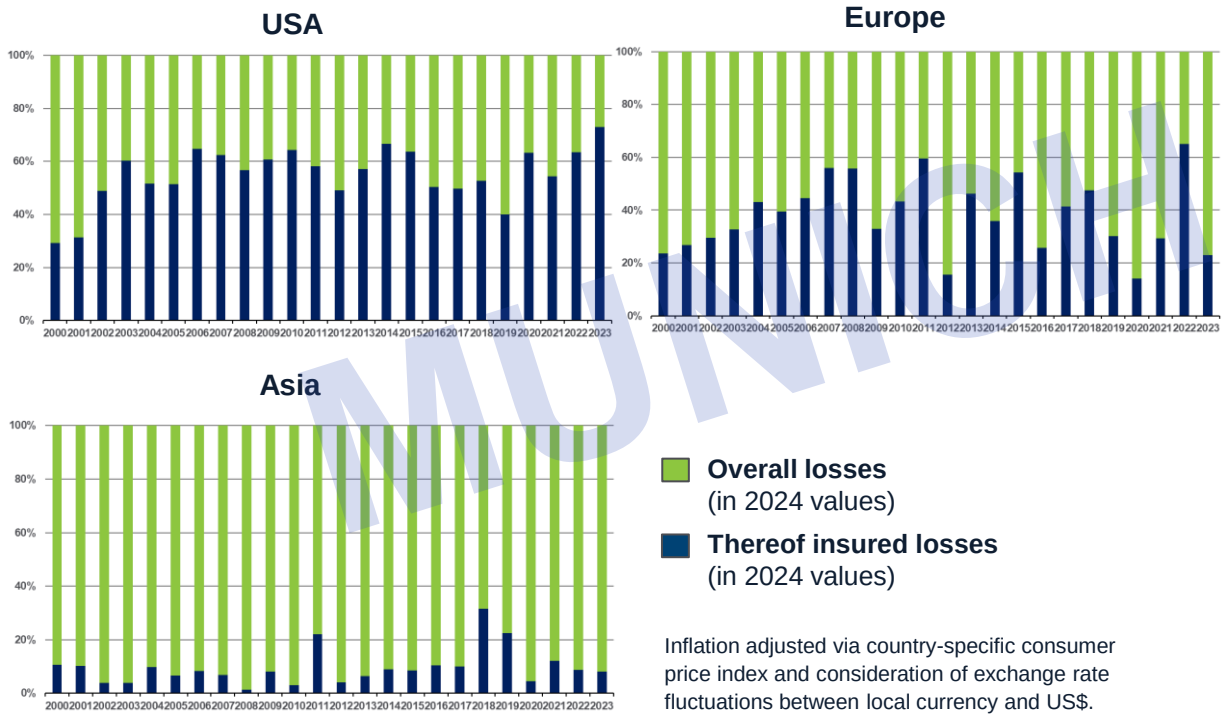
Natural catastrophe protection gap[1] 2000-2023



Inflation adjusted via country-specific consumer price index and consideration of exchange rate fluctuations between local currency and US$.

Closing the protection gap

The challenge:

Availability

Capacity limitation

Affordability

Holistic concepts for affordable insurance cover

Risks remain insurable at a price adequate to the risk

1) Protection gap definition in line with Geneva Association: the broader risk protection gap which describes the difference between total losses and insured losses

Coping with Climate Change: Strategy and Solutions

03

Source: john finney photography / Getty Images
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Climate change: Munich Re's strategic elements

Disabling and focus on enabling/business development

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DISABLING

Liabilities:
Underwriting guidelines

Assets:
Responsible investment guideline

Own emissions

ENABLING

Know-how and data sharing (SaaS)

Partnerships and cooperations (PPPs)

Products and services (Green tech / parametric solutions)

Munich Re decarbonisation targets and achievements

Our decarbonisation journey until 2050

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Today	2025	Long-term	As per financial year 2023
Assets | Financed GHG emmissions[1]	**Target**	**Target**	**Achievement**
No direct investment in listed companies with >15% revenue thermal coal[2] >10% revenue oil sands	Thermal coal[7] -35% emissions	Thermal coal Full exit by 2040	Thermal coal -54% emissions
Oil and gas companies[3] ▪ No new direct investment in pure-play oil and gas[4] ▪ Net-zero commitment from integrated oil and gas companies required as of 2025[5] No direct illiquid investments in new oil and gas fields, midstream oil infrastructure and oil-fired power plants[6]	Oil and gas[7] -25% emissions		Oil and gas -55% emissions
	Total[7] -25% to -29% emissions	**Total** Net-zero by 2050	**Total** -47% emissions
Liabilities | Insurance-related GHG emissions[8]	**Target**	**Target**	**Achievement**
Thermal coal No insurance for new coal mining, power plants, related infrastructure[9]	Thermal coal -35% emissions[12]	Thermal coal Full exit by 2040 (incl. treaty reinsurance)	Coal-fired power plants -41% emissions Thermal coal mining -41% emissions
Oil and gas – exploration and production No insurance for new and existing oil sand sites and related infrastructure[10], arctic exposure and infrastructure[11] No insurance for new oil and gas fields, midstream oil infrastructure and oil-fired power plants[6]	Oil and gas -5% emissions[13]		Oil and gas -80% emissions
		Total Net-zero by 2050	
Own Operations | GHG emissions from operational processes[14]	**Target**	**Target**	**Achievement**
Group headquarters net-zero emissions (via carbon removal certificates) **All other Group's recognised GHG emissions from business activities:** GHG neutral (through GHG emissions reduction certificates)	Per employee -12% emissions	**Total** Net-zero by 2030	Per employee -34% emissions

All Greenhouse Gas (GHG) emissions are measured in CO_2-equivalent (CO_2e). Base year 2019 for all target and achievement numbers. Exceptions to policies can only be granted by a committee at Board level.

1 Scope 1 and 2.
2 Exceptions are possible in individual cases for companies with revenues in thermal coal between 15% and 30% on the basis of an active engagement dialogue.
3 Direct investments in equities or corporate bonds from listed oil and gas companies.
4 Publicly traded companies listed under the Global Industry Classification Standard (GICS) Oil & Gas sub-industries with the exception of Integrated Oil & Gas.
5 For companies with the highest relative and absolute emissions.
6 Applies to contracts/projects exclusively covering the planning, financing, construction or operation which have not yet been under production (oil & gas fields) or construction or operation (infrastructure and plants) as at 31 December 2022.
7 Listed equities, corporate bonds and - for total - direct real estate.
8 Applies to primary insurance, direct and facultative (re)insurance business.
9 For single location stand-alone risks.
10 For single location stand-alone risks; for mixed coverage above a certain threshold.
11 For exclusive coverages also incl. treaty business; for mixed coverages above a certain threshold.
12 Metric tonnes of thermal coal produced annually by insureds/installed operational capacity (in MW) of insured coal-fired power plants of insureds (used as an equivalent for approximate development of the GHG emissions.
13 Operational property business, scope 1-3 life-cycle emissions.
14 Scope 1, 2 and 3 (business travel, paper, water, waste).

Disclosure of taxonomy eligibility and alignment

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Non-life insurance revenues[1]	**100%** €37.0bn		**100%** €156.1bn	Assets within the scope of application of the taxonomy KPI[3]	
			~61%	Assets not used to assess taxonomy eligibility Non-EU and SME exposures and derivatives	
Non-eligible business Lines of business not explicitly related to climate-risk perils	**~44%**	Taxonomy regulation	**Turnover-based** **~16%**	**CapEx-based** **~14%**	Non-eligible assets[4] Assets assessed as non-eligible mainly in financial assets and infrastructure
Taxonomy-eligible business Munich Re's eligible lines of business[2]	**~56%**	Activities which have been identified as eligible/aligned in accordance with the EU taxonomy	**~21%**	**~20%**	Taxonomy-eligible assets Includes direct investments in non-financial assets (e.g., real estate, forest), mortgage loans and financial assets
Taxonomy-aligned business Munich Re's taxonomy aligned business (climate related)	**~7.9%**		**~2.2%**	**~2.5%**	Taxonomy-aligned assets Includes direct investments, e.g., mortgage loans, real estate

1 Only non-life insurance revenues are relevant for taxonomy reporting. 2 LoBs: marine, aviation and transport; other than MTPL motor; fire and other damage to property.
3 Taxonomy regulation excludes government exposure, as well as other assets (e.g., receivables on reinsurance business, DTAs and cash) from numerator and denominator.
4 Assets from financial investee undertakings not used to assess taxonomy-eligibility are excluded from the eligibility assessment (~ 3% for turnover- and 5% for CapEx-based).

Munich Re Location Risk Intelligence

Understanding current risk situation and future climate impact analysis

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Advanced decision making with the comprehensive risk assessment and management solution

Natural Hazard

Current physical risks
(based on historical data and science)

Climate Change

Risk of future climate change
(based on IPCC scenarios)

Climate Financial Impact

Financial impact caused
by natural hazards

Source / More info: https://www.munichre.com/rmp/en/products/location-risk-intelligence.html

Innovative catastrophe risk transfer

Three solutions to manage risks

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	Parametric trigger solutions	Public-private partnerships	Catastrophe (“Cat”) Bonds
	**Define trigger** (temperature, drought, precipitation...) and correlate to risk location → **transparency through independent data** collection and easy tracking		Cat bonds are **risk-linked securities** that transfer a specified set of risks to investors
	**Fast payout (when trigger is activated)** allows quick recovery and is structured to clients’ needs	Public sector intervention can **prevent market failures** by taking on risks the private sector is not able to absorb on its own (high NatCat exposures, pandemics…)	**Investors receive a yield in return** for taking on the risk of large losses in case of a natural disaster
	Efficient option to **reduce the insurance gap** in developing/emerging countries: easily understandable system, lower premiums (no damage investigation costs)	Effective way to **close the protection gap** and to provide cover for risks that otherwise would remain uninsured	Used by the insurance industry to **diversify exposure to natural disasters** and **optimize capital efficiency**
	**Remaining basic risk** (deviation of claims payment from actual loss amount)	**Better understanding required** by policymakers of the role that the (insurance industry) private sector can play with win-win partnerships	Three types of payout triggers: **parametric, indemnity base** and **market-loss**

All established and emerging technologies can be covered by our Performance Guarantee Insurance

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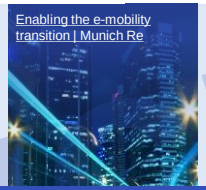
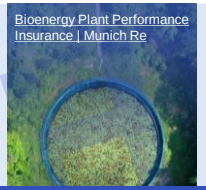
For manufacturers, projects and investors

Solar Energy	Wind Energy	Energy Storage	Hydrogen	E-Mobility	Waste2Value	Geothermal risks	Outlook
PV Warranty Insurance backing your solar investment | Munich Re	Wind farm insurance: on- and off-shore | Munich Re	Electrical Energy Storage Systems Insurance | Munich Re	Securing the power of Green Hydrogen | Munich Re	Enabling the e-mobility transition | Munich Re	Bioenergy Plant Performance Insurance | Munich Re		Carbon capture + storage Carbon Credits




Established Green Tech Solutions | Emerging Green Tech Solutions

2009 | 2009 | 2019 | **2022** | **2022** | >2022 | >2023

New deals – dynamic market growth

New product development emerging tech

GTS

~ 1400 projects in green tech

~ 75 GW insured

Projects in **~ 90** countries

What is needed from the insurance industry?

Strong role to play as risk taker and partner to enable the low-carbon transition

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Manage
Strengthening resilience with risk transfer solutions and supporting prevention measures

Measure
Expanding state-of-the-art modelling

Support
Improving bankability of climate technologies with innovative de-risking solutions

Understand
Identifying risks, sharing data and knowledge

Invest
Allocating capital to renewable projects and ESG-related investments, issuing green bonds

Role of Insurance Industry

Today
Fossil

Transition

Transformation

Future
Renewables
Fossil
CCS

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