

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

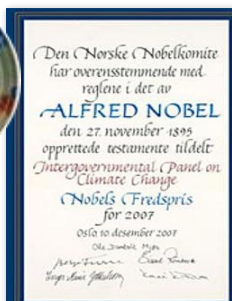
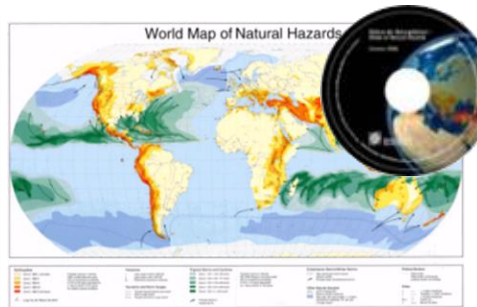
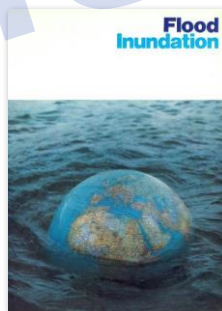
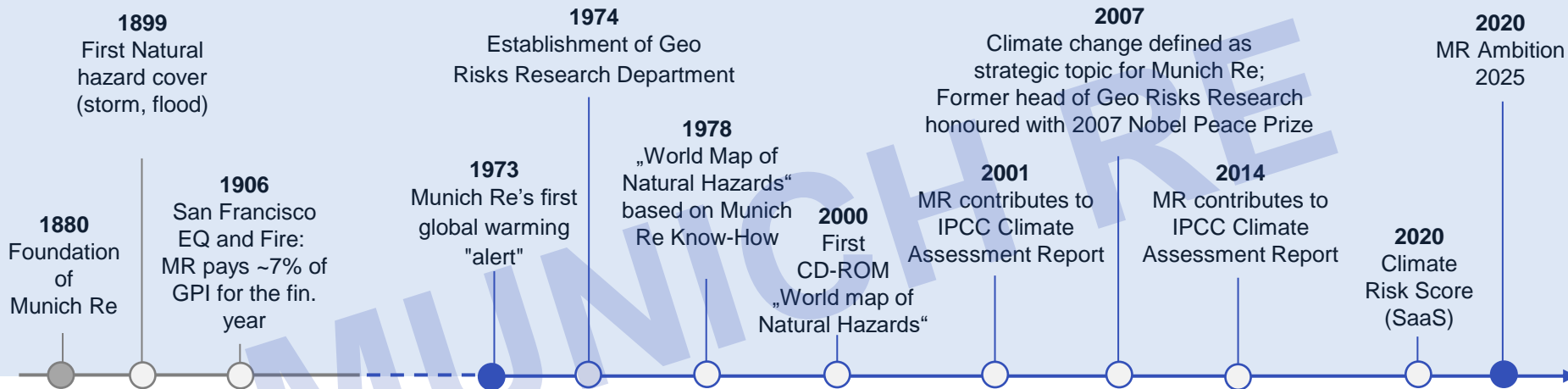
June 2024

Tobias Grimm
Head Climate Advisory & NatCat Data

Munich RE 

Munich Re as early warner on climate change

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



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

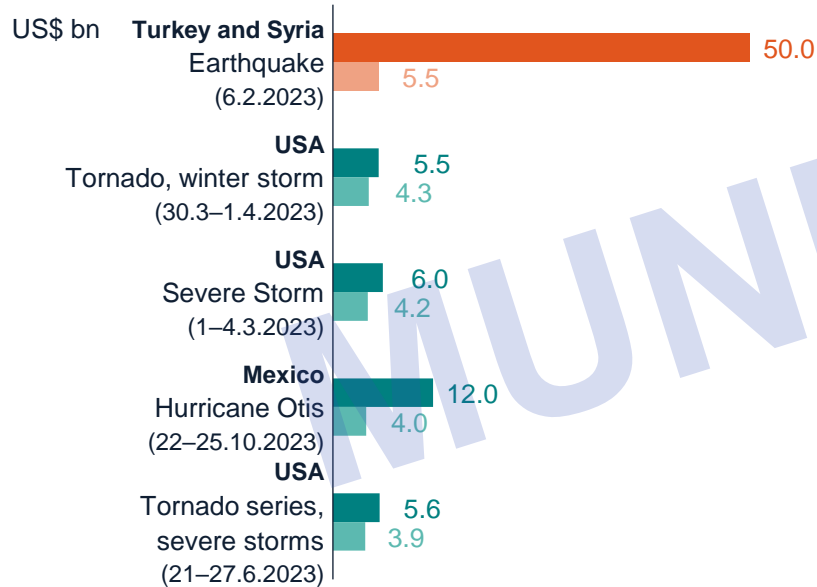


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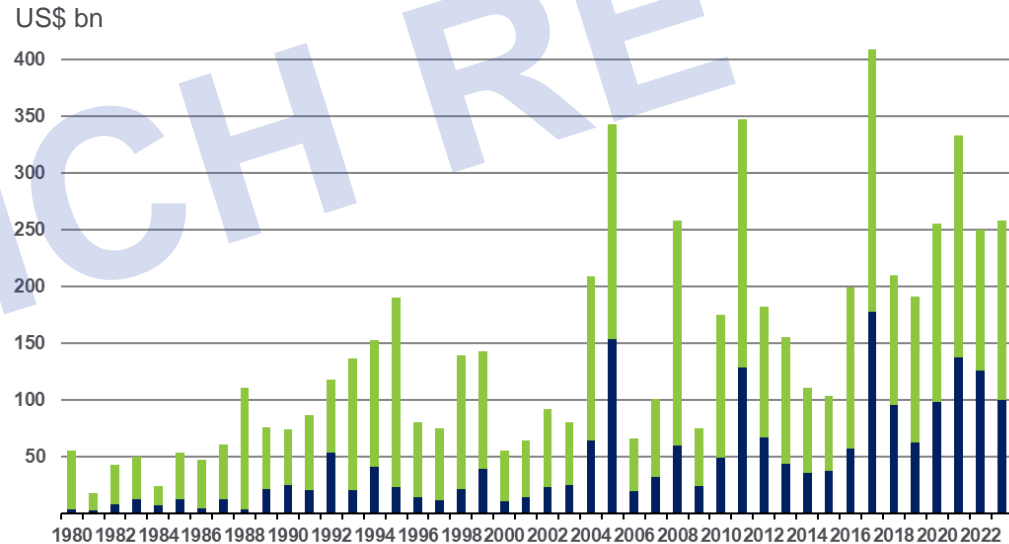
US\$ 100bn insured loss years on the rise

Development of annual natural disaster losses worldwide since 1980

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



■ North America incl. Central America/Caribbean
 ■ Europe
■ Overall losses
 ■ Insured losses



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

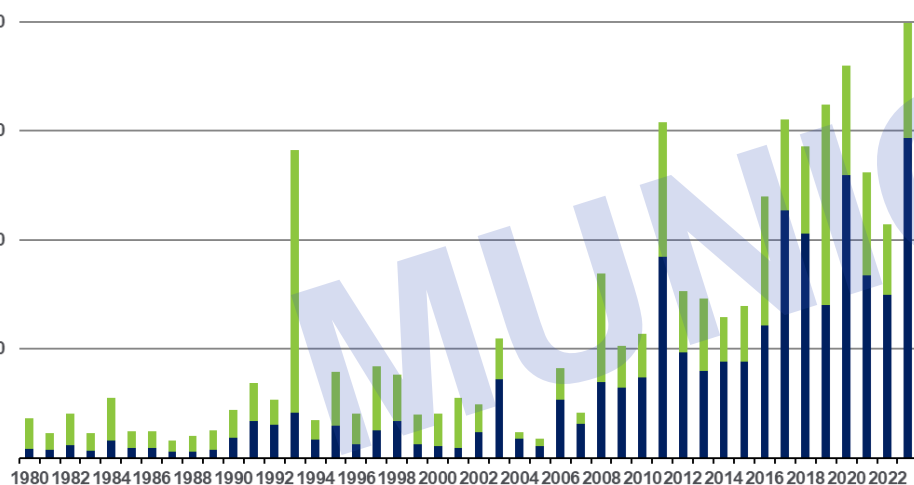
Losses from non-peak perils* on the rise

Severe convective storm (SCS), wildfire, flood

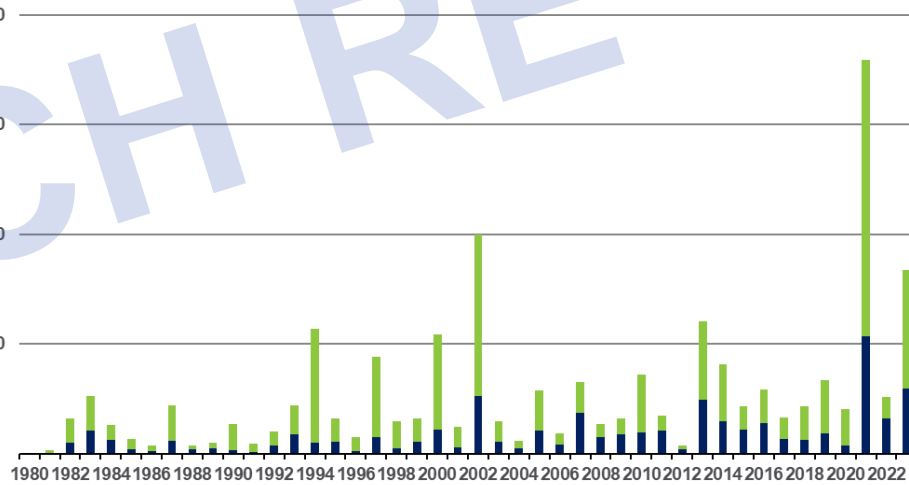
... in the USA**

... and in Europe

US\$ bn



US\$ bn



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\$

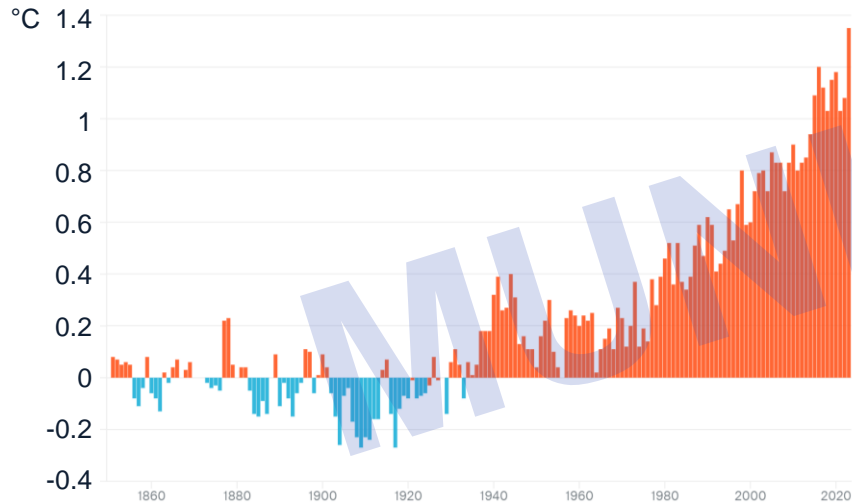
* Drought and heatwave are excluded **excluding Virgin Islands U.S., Puerto Rico

Climate Change = Risk of Change

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

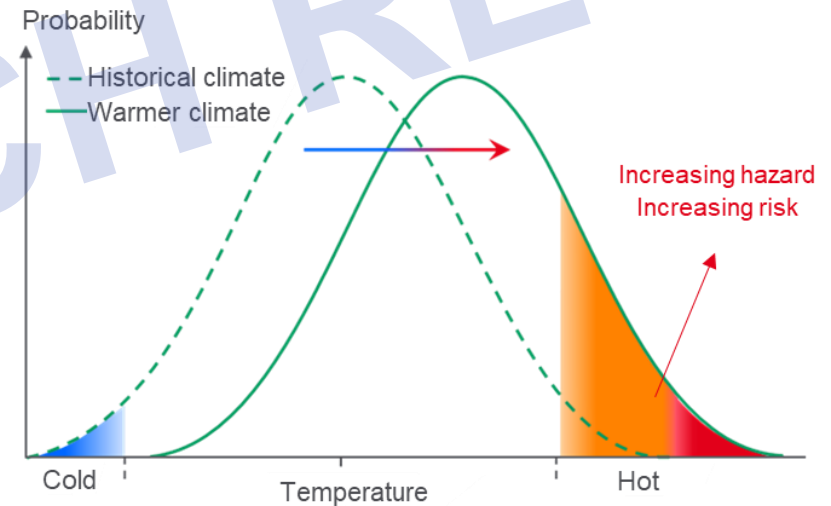
2023: hottest year on record!
Last 10 years warmest on record

Increase in the probability of extreme temperatures
and new extremes



Source: NOAA

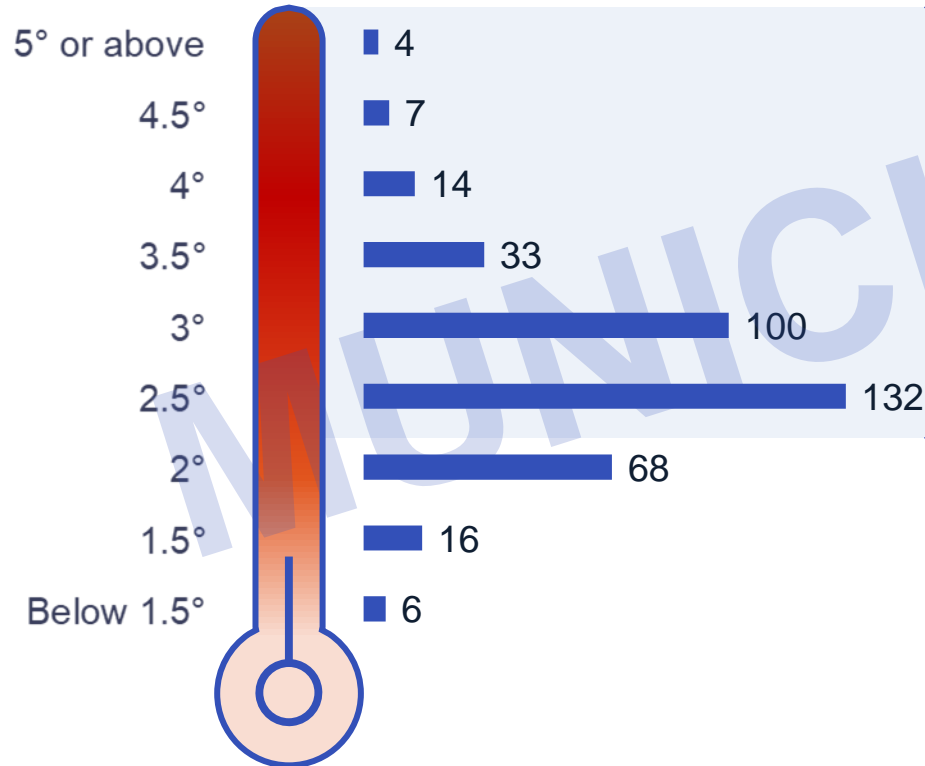
Global temperature anomalies* (°C) compared to 1850-1900 average



Increase in global average temperature - change in probabilities

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

Effect of global warming: Global impact on natural hazards

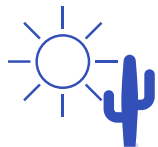
Latest science: Increase in frequency and/or intensity of natural perils



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

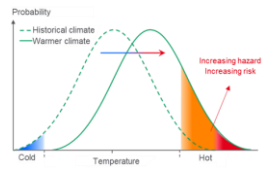
Increase in natural disaster losses globally

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

HAZARD

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

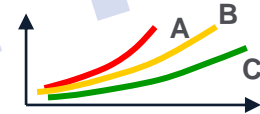
→ Climate Change



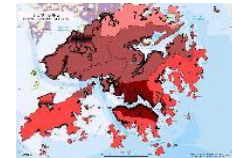
RISK

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

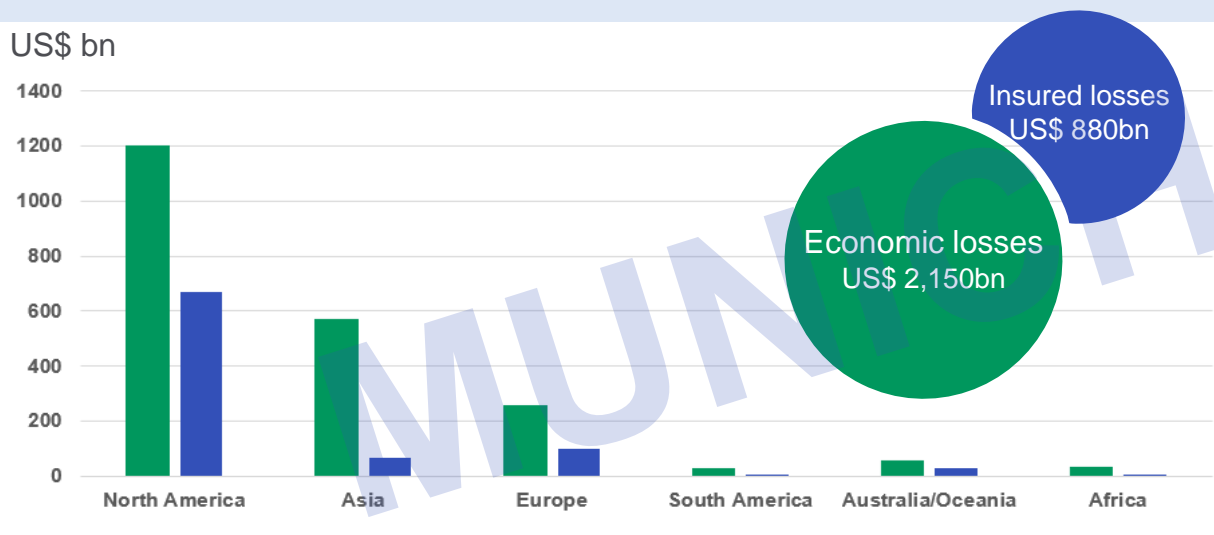


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Natural catastrophe protection gap¹ – large regional differences




Decreasing in industrial countries; unchanged in developing countries

Weather-related natural catastrophe losses by continent 2013 – 2023



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

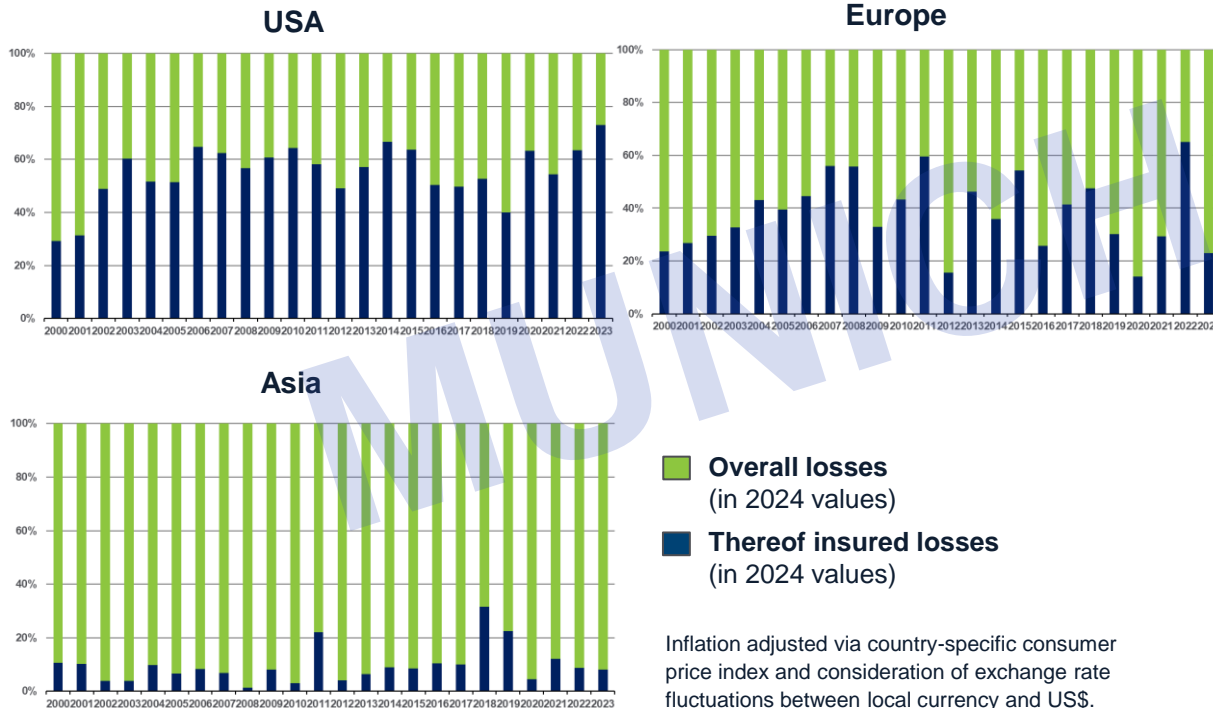
Three major factors influencing global natural disaster losses

-  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

Natural catastrophe protection gap¹ 2000-2023



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
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Coping with Climate Change: Strategy and Solutions

03



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DISABLING

Liabilities:
Underwriting guidelines

Assets:
Responsible investment
guideline

Own emissions



Munich Re's
strategic
elements



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



Assets Financed GHG emissions ¹	Target	Target	Achievement
No direct investment in listed companies with >15% revenue thermal coal² >10% revenue oil sands	Thermal coal ⁷ -35% emissions	Thermal coal Full exit by 2040	Thermal coal -54% emissions
Oil and gas companies³	Oil and gas ⁷ -25% emissions		Oil and gas -55% emissions
<ul style="list-style-type: none"> No new direct investment in pure-play oil and gas⁴ Net-zero commitment from integrated oil and gas companies required as of 2025⁵ 			
No direct illiquid investments in new oil and gas fields, midstream oil infrastructure and oil-fired power plants ⁶	Total⁷ -25% to -29% emissions	Total Net-zero by 2050	Total -47% emissions
Liabilities Insurance-related GHG emissions⁸	Target	Target	Achievement
Thermal coal	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
No insurance for new coal mining, power plants, related infrastructure ⁹			
Oil and gas – exploration and production	Oil and gas -5% emissions ¹³		Oil and gas -80% emissions
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		Total Net-zero by 2050	
Own Operations GHG emissions from operational processes¹⁴	Target	Target	Achievement
Group headquarters net-zero emissions (via carbon removal certificates)	Per employee -12% emissions		Per employee -34% emissions
All other Group's recognised GHG emissions from business activities: GHG neutral (through GHG emissions reduction certificates)		Total Net-zero by 2030	

All Greenhouse Gas (GHG) emissions are measured in CO₂-equivalent (CO₂e). 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.

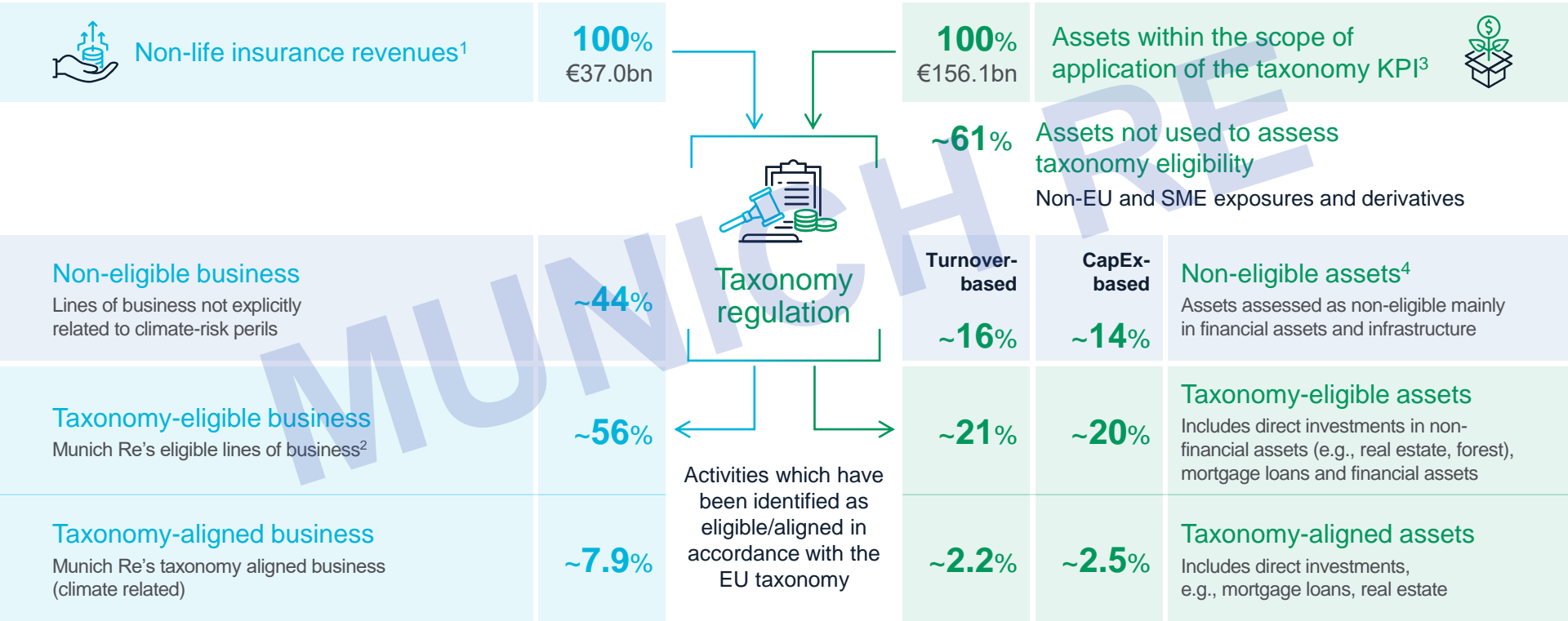
11 For exclusive coverages also incl. treaty business; for mixed coverages above a certain threshold.

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



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).

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

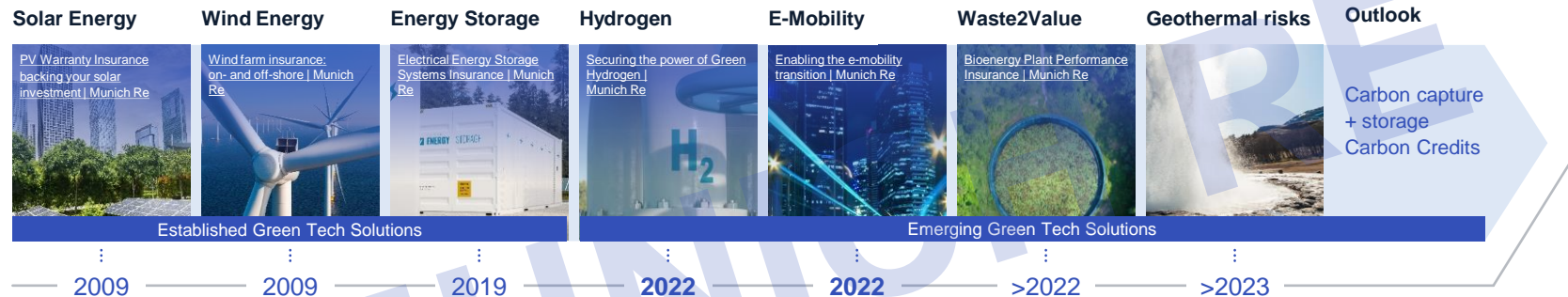
Innovative catastrophe risk transfer

Three solutions to manage risks

	Parametric trigger solutions	Public-private partnerships	Catastrophe (“Cat”) Bonds
	<p>Define trigger (temperature, drought, precipitation...) and correlate to risk location → transparency through independent data collection and easy tracking</p>		<p>Cat bonds are risk-linked securities that transfer a specified set of risks to investors</p>
	<p>Fast payout (when trigger is activated) allows quick recovery and is structured to clients’ needs</p>	<p>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...)</p>	<p>Investors receive a yield in return for taking on the risk of large losses in case of a natural disaster</p>
	<p>Efficient option to reduce the insurance gap in developing/emerging countries: easily understandable system, lower premiums (no damage investigation costs)</p>	<p>Effective way to close the protection gap and to provide cover for risks that otherwise would remain uninsured</p>	<p>Used by the insurance industry to diversify exposure to natural disasters and optimize capital efficiency</p>
	<p>Remaining basic risk (deviation of claims payment from actual loss amount)</p>	<p>Better understanding required by policymakers of the role that the (insurance industry) private sector can play with win-win partnerships</p>	<p>Three types of payout triggers: parametric, indemnity base and market-loss</p>

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

For manufacturers, projects and investors



New deals – dynamic market growth

New product development emerging tech



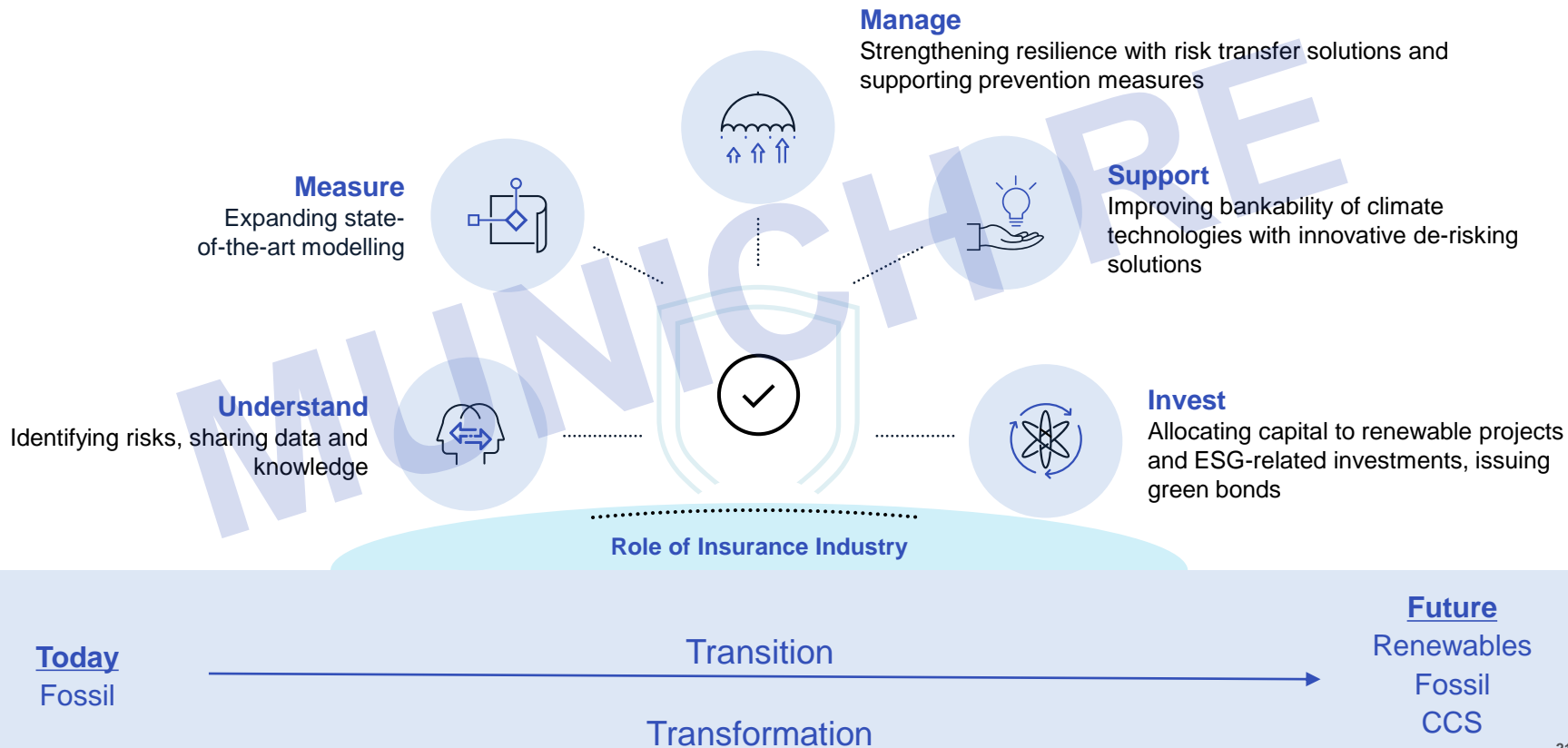
~ 1400 projects in green tech

~ 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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