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# How the IPCC6 report informs nat cat modelling: a reinsurer's perspective

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Swiss Reinsurance Company

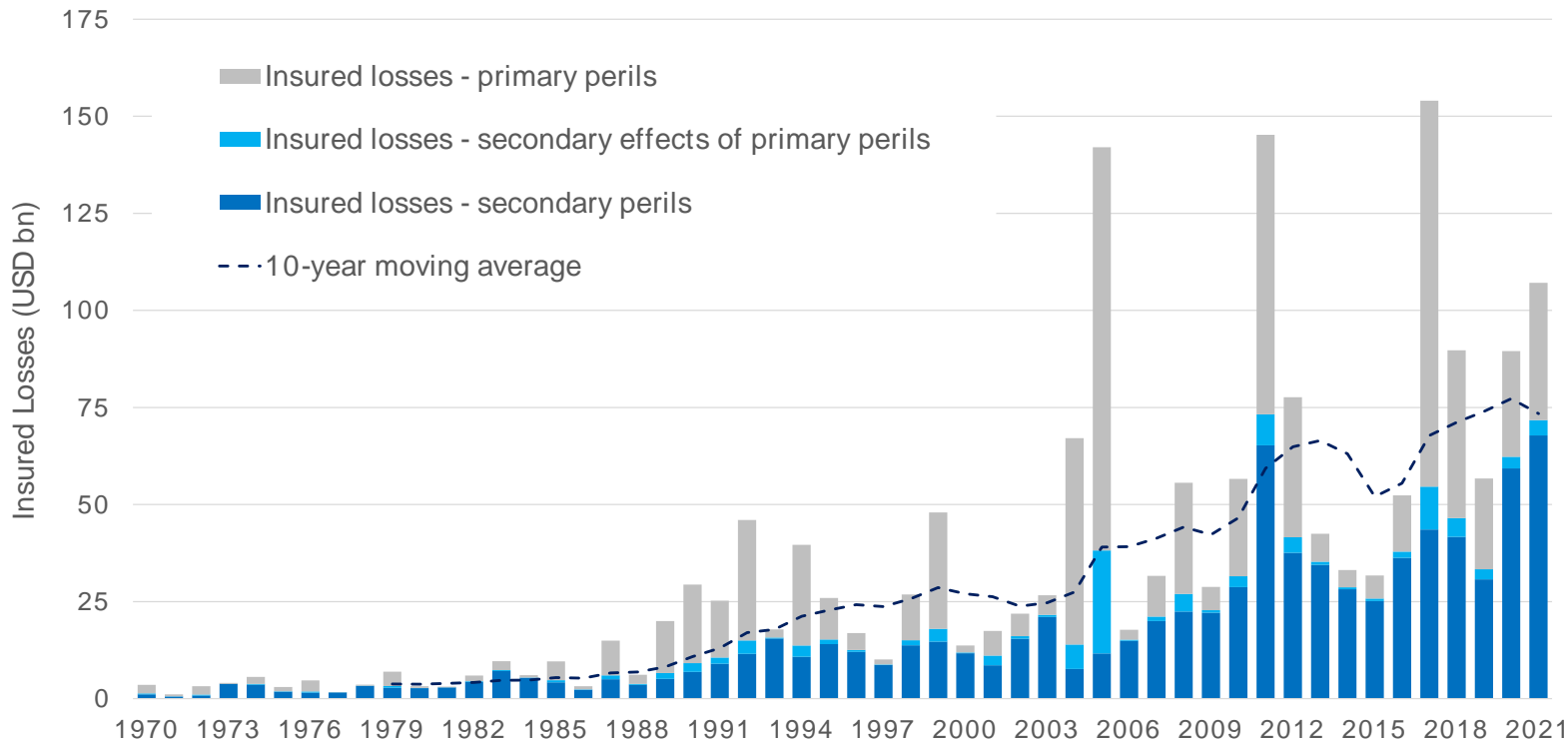
# Setting the scene

Natural Catastrophe risk on the rise: business as usual or a new normal?





# Reverting to “normal”: Nat Cat insured losses continue to rise at 5-7% p.a.



- USD 111bn in 2021: fourth costliest year on record
- Insured Nat Cat loss today<sup>1</sup> is approximately 10 times bigger than 30 years ago
- 2012 to 2016 – unusually quiet period globally
- Secondary perils<sup>2</sup> represent 56% of the total insured Nat Cat losses since 1970 (2021: 73%)

Source: SRI, sigma loss database

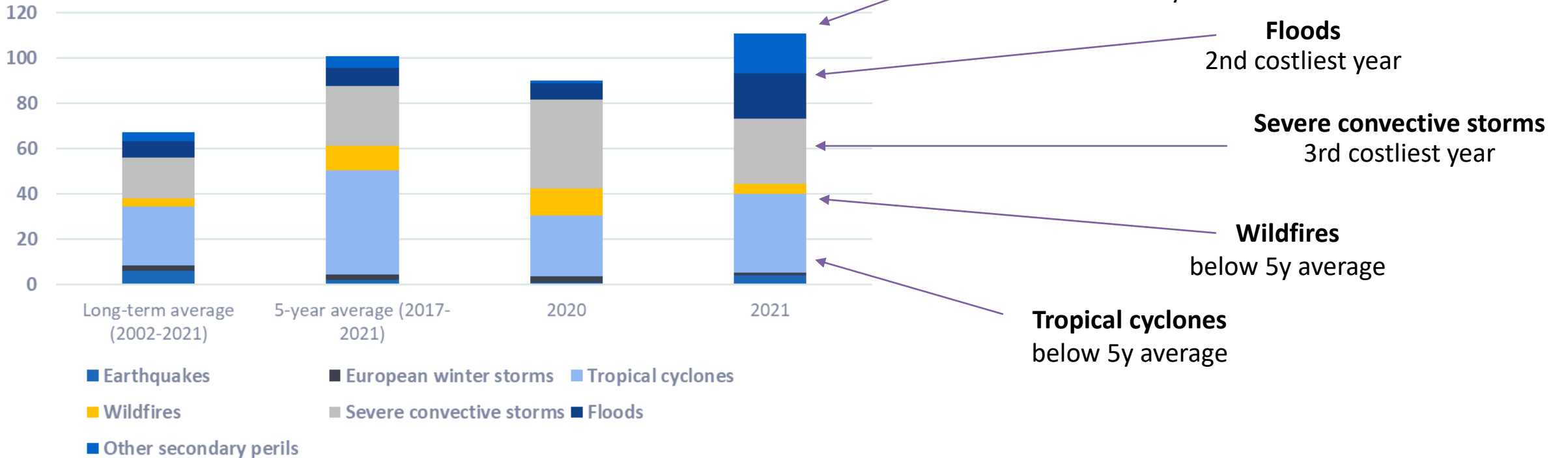
<sup>1</sup> 10-year moving average.

<sup>2</sup> Secondary perils refer to: 1) perils that generate event losses of low-to-medium magnitude that happen relatively frequently, such as hail, tornado, drought, wildfire, snow, flash floods, and landslides, as well as 2) secondary effects of primary perils such as storm surge, heavy precipitation in the wake of a tropical cyclone, fire following EQ or tsunamis.



# All perils at play in 2021

Natural catastrophes insured losses by peril, in USD bn at 2021 prices



# Rising losses are the result of complex interplay of various macro risk drivers

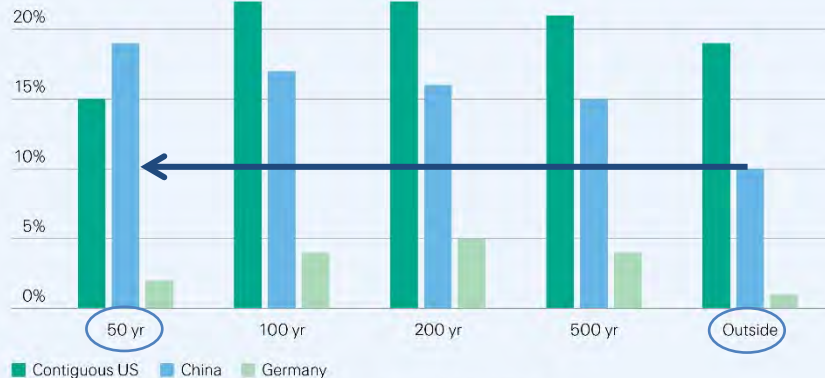


Shanghai, 1990



Shanghai, today

Growth rate of population exposed to inland flooding at different return periods between 2000 and 2020



Source: Swiss Re CatNet®, GHS population grid multitemporal, World Pop



## Economic development

Increasing values in line with GDP growth



## Concentration in exposed areas

Urbanisation, population growth



## Insurance penetration

Take-up rates, broader coverage, social inflation, regulatory changes



## Changing vulnerability

Sealing of surfaces, overbuilding in flood-prone areas, flood protection measures



## Changing hazard

Natural climate variability, anthropogenic climate change

# Today

How much of the warming has materialised?





# Nat cat models support underwriting decisions today

## What does IPCC6 report tell us?

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- 1.09°C higher than pre-industrial levels (1850-1900)
- Observed warming is a consequence of human activities
- Climate change is affecting every region on earth in multiple ways
- Human influence is making many extreme climate events more frequent and severe (heatwaves, heavy rainfall, droughts)

## Nat Cat modeller's view

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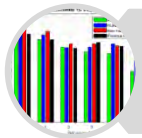
- Current state of climate (natural variability and anthropogenic climate change)
- Need to correct for trends in historical data, and chose our observation periods carefully
  - high-active hurricane phase in the North Atlantic since the late 90s
- Loss drivers other than anthropogenic climate change



# A model should reflect all relevant risk drivers in today's risk landscape

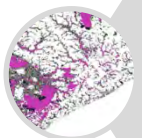
## Climate related

Expected impact



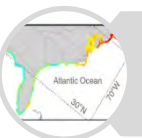
**Current state of climate**, e.g. higher activity post-1995, explicitly considered in event set generation and modelling of contributing sub-perils

High



Brand new **TC induced flood** model introduced in the US to properly capture correlation between **wind, storm surge, rainfall** induced flood sub-perils for events such as Hurricane Harvey

Medium

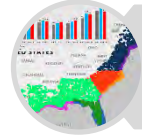


Consideration of the **current level of sea level rise** in the hazard component of the storm surge model

Low

## Other risk drivers

Expected impact



**Relative vulnerabilities** in line with building codes, new secondary modifiers

Medium to High



Improved risk selection by considering **latest macro-trends**: influence of urbanisation on wind speed (roughness) and discharge rates (sealing of surfaces)

Low, Medium for single risk

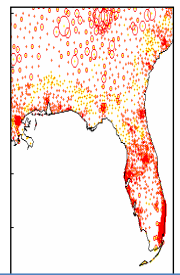
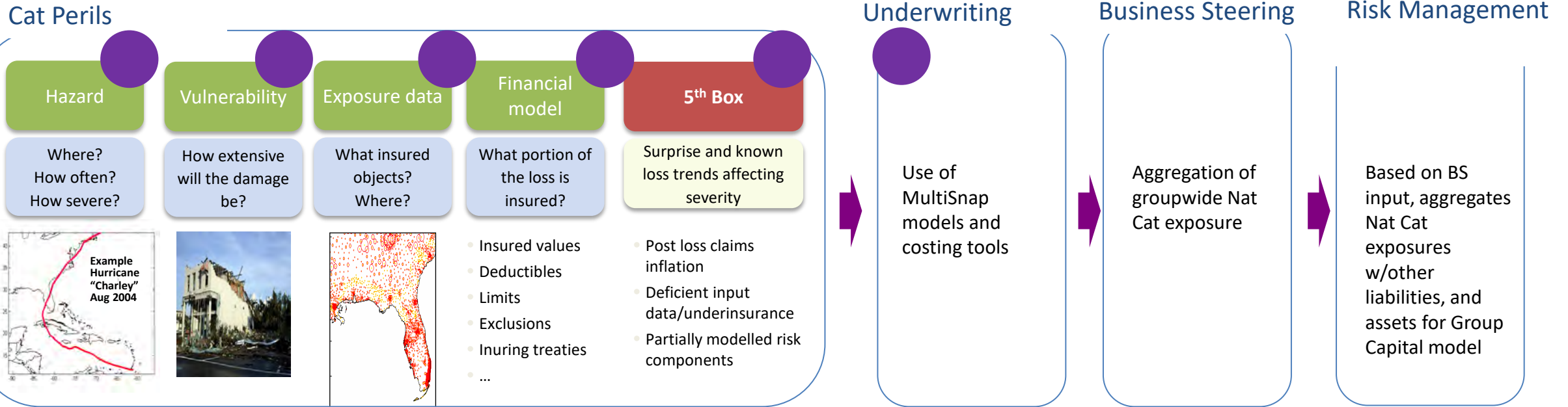


**Social/claims inflation effects**, as for example observed in Florida post Hurricane Irma, are explicitly incorporated

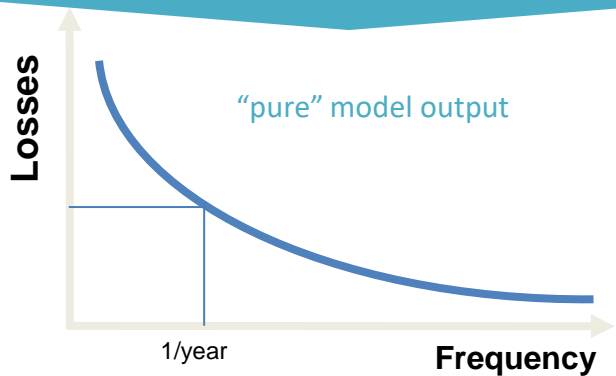
Medium to High



# Relevant trends are captured at different steps of the Nat Cat underwriting process



- Insured values
- Deductibles
- Limits
- Exclusions
- Inuring treaties
- ...
- Post loss claims inflation
- Deficient input data/underinsurance
- Partially modelled risk components



● Trends capture in the Nat Cat underwriting process

# Future

“Past does not appropriately represent the future.”





# Resilience under different climate scenarios

## What does IPCC6 report tell us?

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- Provides the most up-to-date and comprehensive physical understanding of the climate systems and key perils
- Defines different climate scenarios
- Defines ranges of possible future changes, and creates transparency on state of knowledge
- Substantial overlaps between scenarios up to at least 2050

## Our aspiration in the Pilot studies<sup>1</sup>

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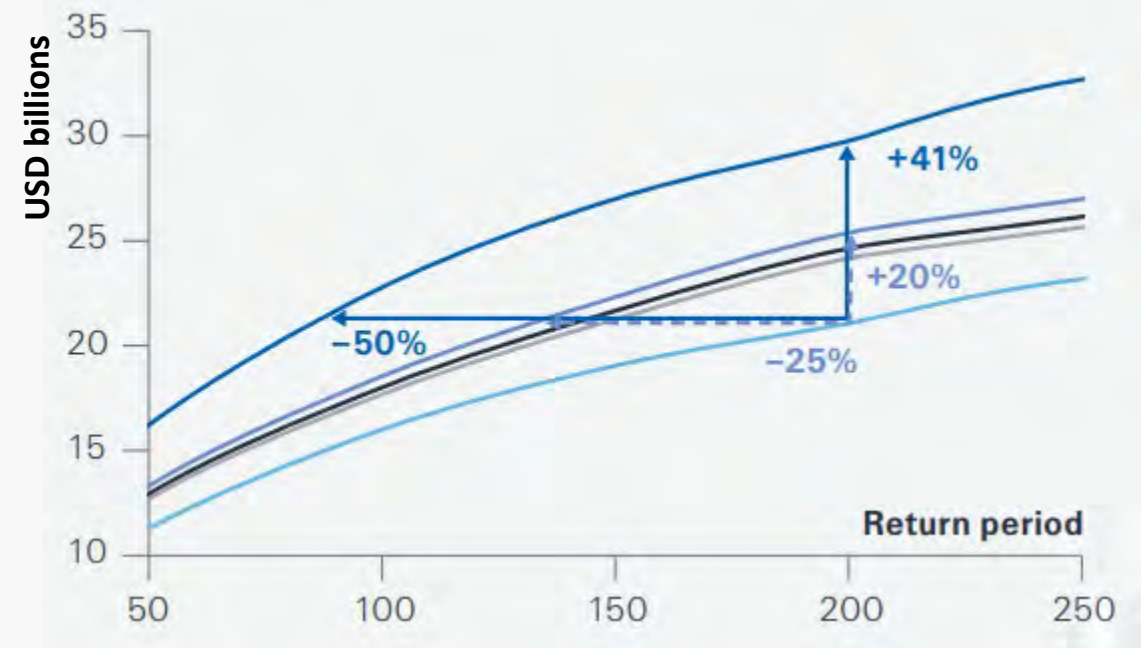
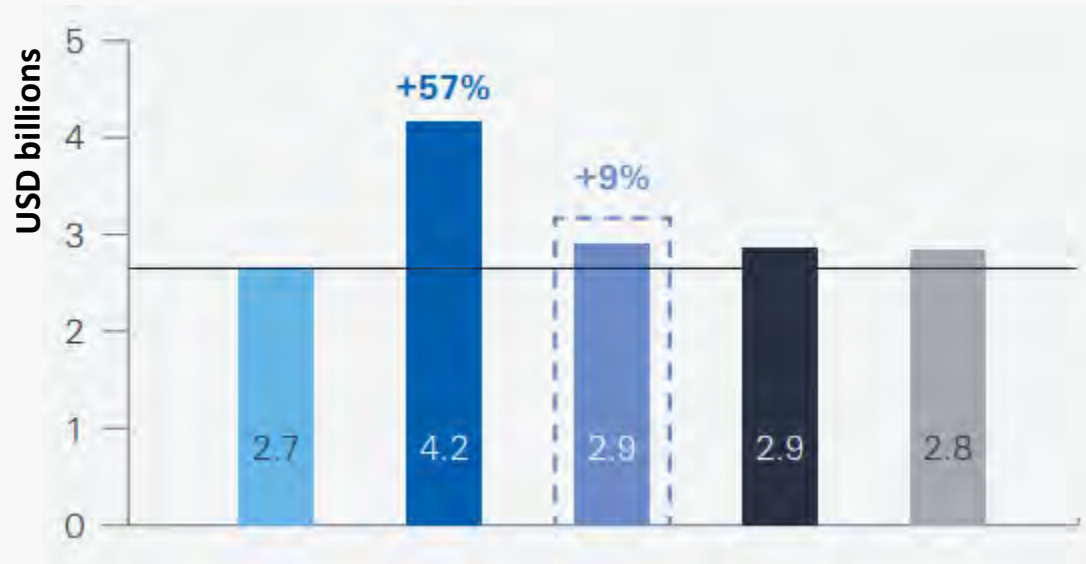
1. Has climate change **already created physical risk hot spots** in the current business landscape?
2. Does the **current costing and underwriting practice capture the climate change impact**, if material?
3. If so, **does the risk appetite need to change** in response to the existing physical or transition risks related to climate change?
4. Do any lines of business where the gradually accumulating impact of physical climate change risk over future decades **require taking action today**?
5. Does Swiss Re's **risk management framework capture the impact of climate change** adequately for key lines of business?

<sup>1</sup> Source: Swiss Re Climate-related financial disclosure 2021



# Pilot scenario analysis: findings are consistent with similar analyses done by other industry players

Japan tropical cyclone Annual Expected Losses and loss frequency curve for four different scenarios by 2050 vs today (market portfolio)



- Current
- 1a Strong warming, severe impact, RCP8.5
- 1b Strong warming, medium impact, RCP8.5
- Hot house scenarios
- 2 Moderate warming, RCP4.6
- 3 Low warming, RCP2.6

<sup>1</sup>Source: Swiss Re Climate-related financial disclosure 2021

## Concluding remarks

Climate change is one of the macro risk drivers

IPCC reports: the authority on climate change

2050+ analytics to support strategic decisions today

