



EUROPEAN CENTRAL BANK

EUROSYSTEM



ESRB

European Systemic Risk Board

European System of Financial Supervision

# The macroprudential challenge of climate change



NBS-Bank of Finland-SUERF Research Conference: “20  
years of Macroprudential Policy in Europe –Looking back  
and looking ahead”

Bratislava, 22 September 2023

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## Outline

- 1 | The evidence
- 2 | Macroprudential policy considerations
- 3 | Summary

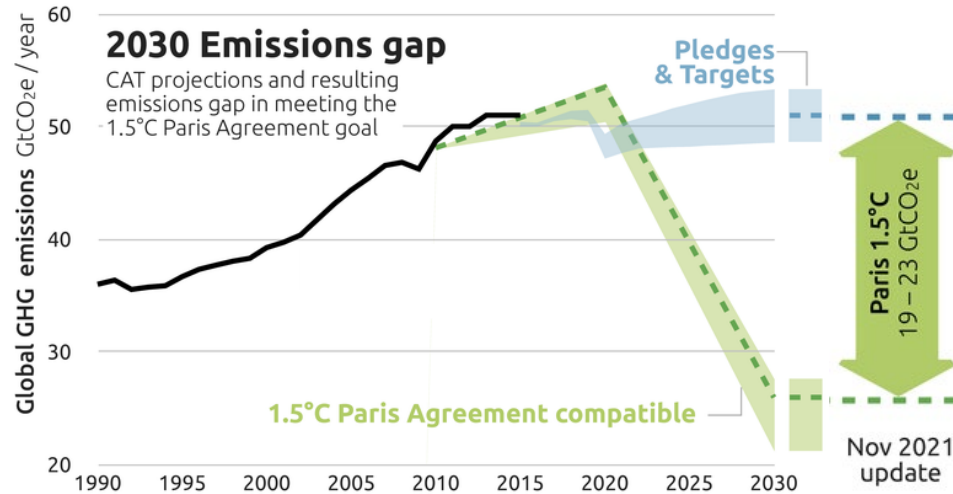
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# Climate shocks on the horizon, one way or another

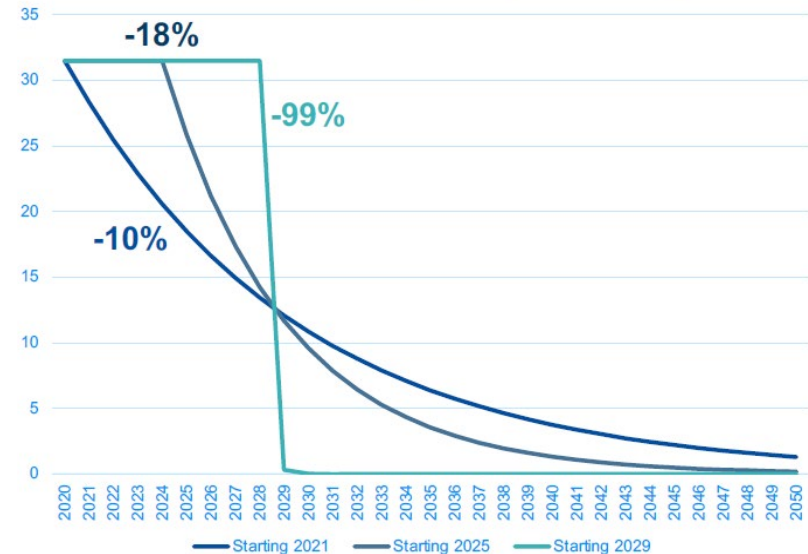
## Projections for carbon emissions & warming

(Emissions in gigatonnes of CO<sub>2</sub> per year)



Source: Climate Action Tracker

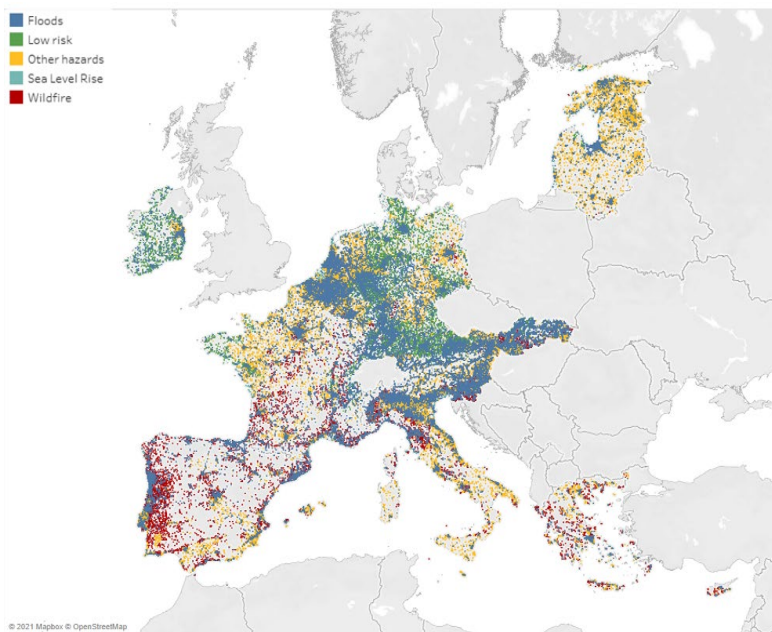
## Required decarbonisation rates depend on entry point



Source: Bolton, P., Kacperczyk, M., and Samama, F. (2022). Net-zero carbon portfolio alignment. SSRN Mimeo, see <https://ssrn.com/abstract=3922686>

# Physical risk exposures: Regional concentration of climate hazards, amid uneven (existing) insurance

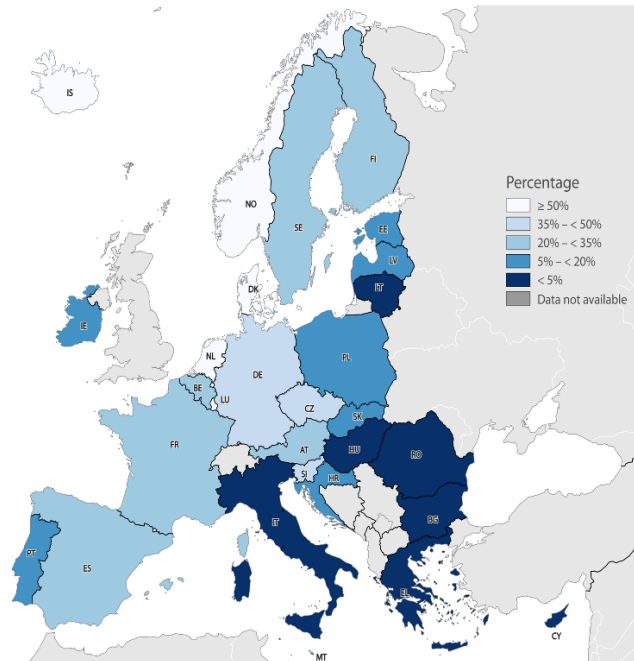
## Mapping firm exposures to physical hazards



### Sources

- ECB/ESRB (2021), [Climate-related risk and financial stability](#) based on AnaCredit, 427, ECB calculations. Notes: Physical risk hazard scopes reflect a 20-year horizon.
- ECB/EIOPA(2023), [Policy options to reduce the climate insurance protection gap](#), Discussion Paper (April).

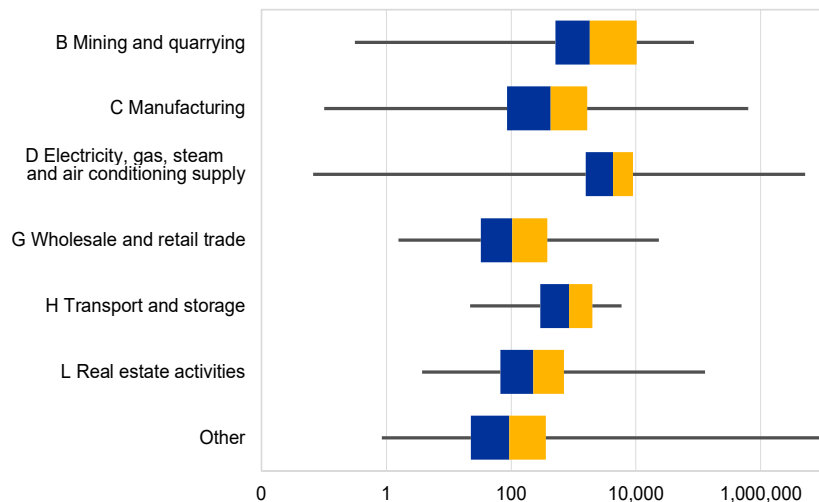
## Average share of insured economic losses caused by weather-related events in Europe



# Transition risk financial exposures: Sector and firm level concentrations, most strongly in banks

## Firm-level emission intensities across and within euro area sectors

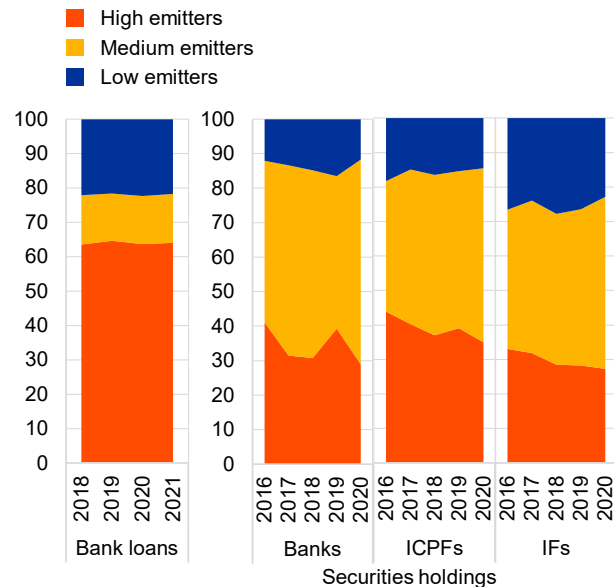
(Emissions in tonnes of CO2 equivalents per USD million revenue)



Source: ECB/ESRB (2021), [Climate-related risk and financial stability](#), based on Urgentem data Note: Only firms directly reporting emissions are considered (approximately 3,000 European firms)

## Euro area credit exposures to, and securities holdings of high and low emitters

(2018-21, 2016-20, percentages of total exposures and securities holdings)



Sources: Urgentem, ECB (AnaCredit), Bureau van Dijk – Orbis database and ECB calculations. – see [ECB Financial Stability Review](#), May 2022.

## Exposure dimension

## Risk dimension

### Institution-specific

Non-financial

**Transition:** Emissions (actual & forward-looking)

**Physical:** Climate-related hazards  
(floods, wildfires, heatwaves,...)

**Transition:** Impact on profits & costs,  
technological obsolescence, risk perceptions

**Physical:** Asset damages, insurance costs, production  
disruption

Financial

**To non-financial sectors**

- credit instruments (loans, debt sec., equity,...)
- contingent liabilities (insurance, derivatives)

**Vulnerability of counterparts:** indebtedness,  
leverage, provisions  
*climate-related impact on credit risk (PD, LGD), market  
risk (asset valuation)*

### System-wide

**Climate:** interdependent hazards

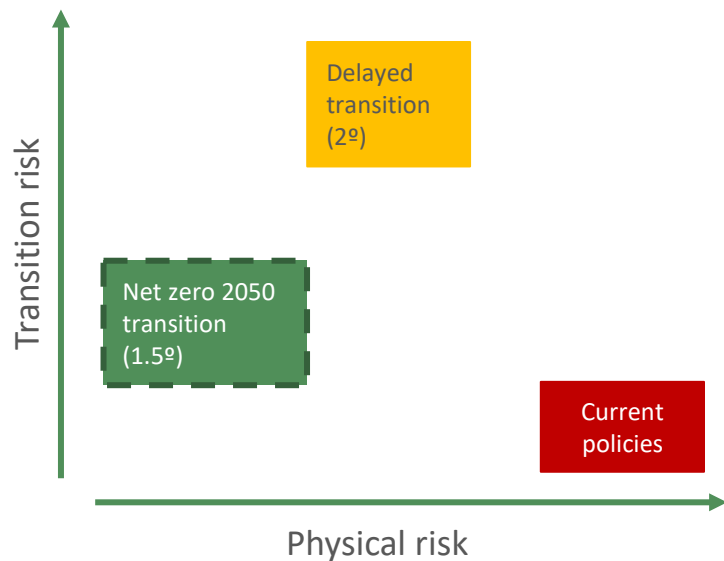
**NFCs:** In-/output interdependencies

**Financial Institutions:** overlapping exposures

**Clustered risks, interconnectedness**  
*Dynamic risk amplification & propagation  
(joint defaults, contagion, fire sales)*

# Importance of scenario analysis, with past not a good guide

Network for Greening the Financial System scenarios



Source: NGFS.

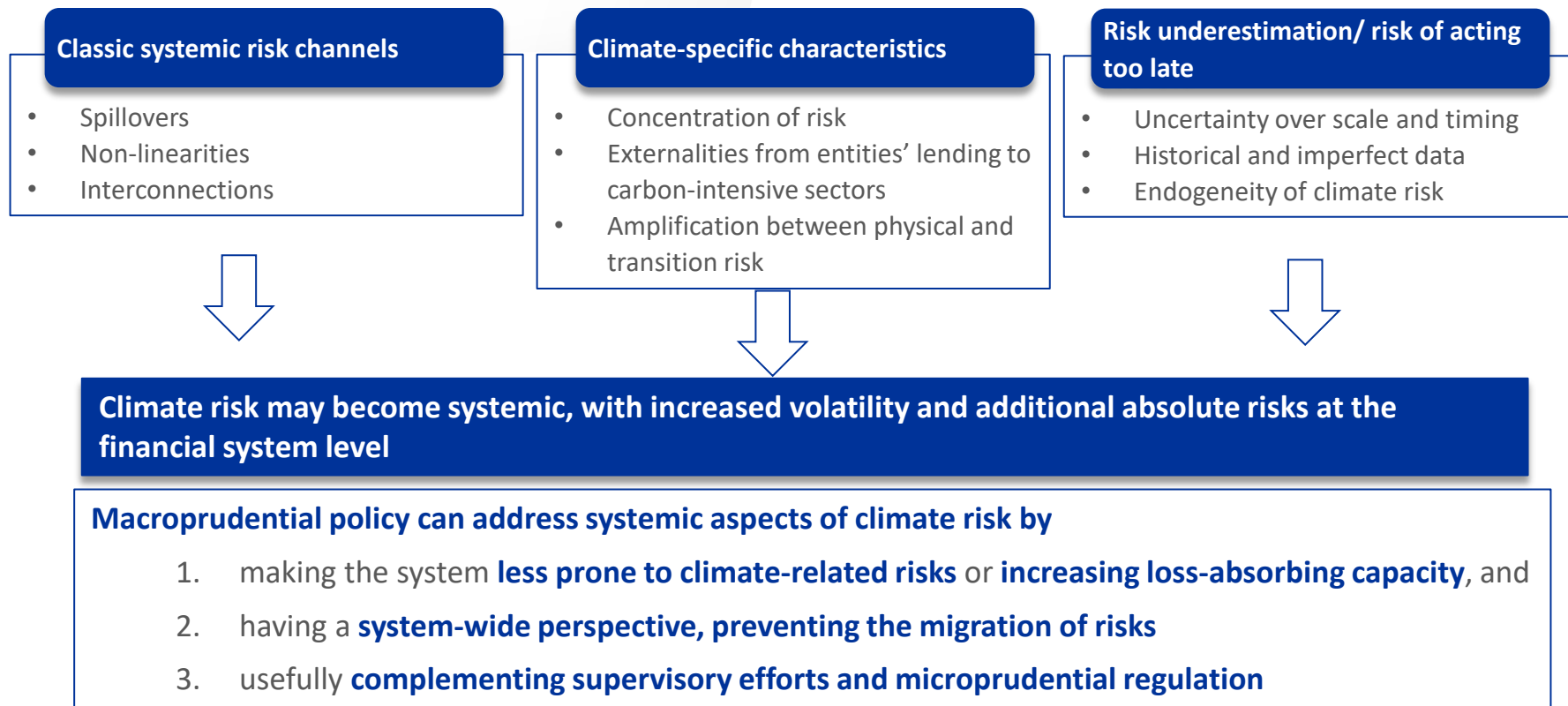
## Path dependence, and scope for amplification

- Scenario analyses explore trade-offs between physical and transition risk, and examine possible contours of climate transition
  - [\*ECB \(2021\): Top down climate stress test \(banks\)\*](#)
  - [\*SSM \(2022\): Bottom up climate stress test \(banks\)\*](#)
  - [\*ECB \(2023\): Short term transition dynamics \(banks\)\*](#)
  - [\*ECB/ESRB \(2022\): System-wide considerations\*](#)
- Results confirm that the path to reduced climate risk may be bumpy, with net benefits from climate action only accruing with time, amid strong distributional forces

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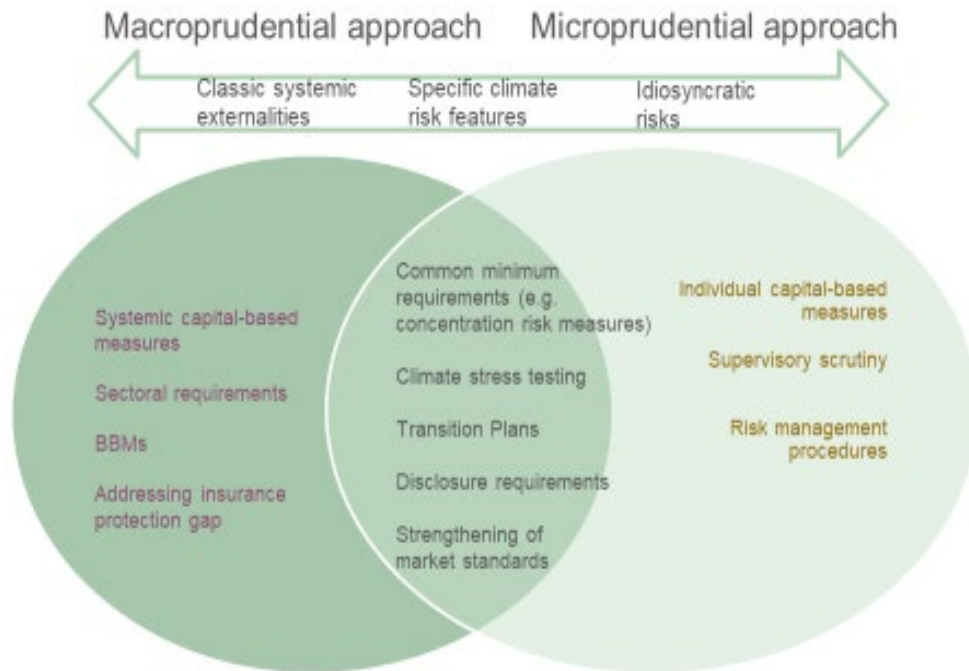
## The rationale for a macroprudential approach



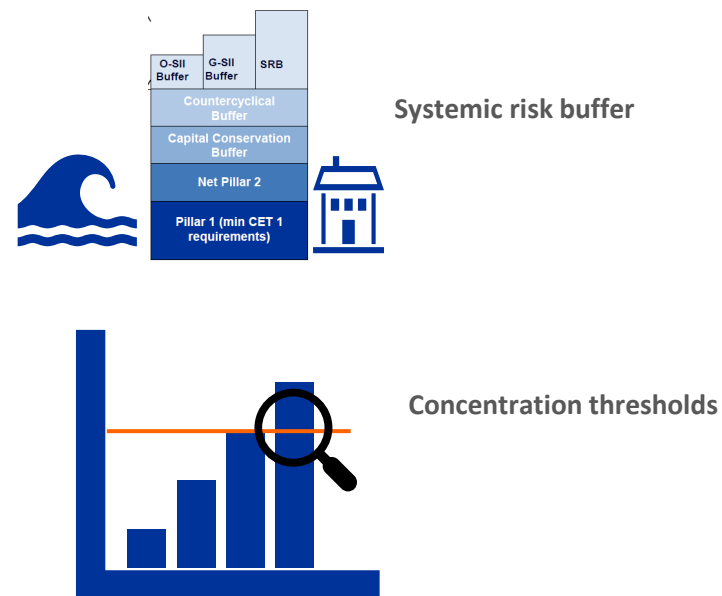
# Three broad classes of macroprudential policy for climate risk

- 
- 1. Lender vulnerabilities**
    - *absolute risk | relative risk*
    - *capital | non-capital based*
  - 2. Borrower vulnerabilities**
    - *borrower based measures*
  - 3. Nonbank financial intermediation**
    - *Informational market failures*
    - *Insurance protection gaps*

## Macroprudential policy – Looking into the existing toolkit for the banking sector



*Range of tools possible, two instruments particularly adaptable:*



# Candidate macroprudential tools for the banking sector

■ Strong rationale  
■ Neutral  
■ Less suitable

Options	Intermediate Policy objective (ESRB/2013/1)	Possible application	Selected helpful attributes	Selected drawbacks
<span style="color: green;">■</span> <b>(Sectoral) Systemic risk buffer (SyRB)</b>	Increase resilience; Limit concentration (for sectoral application)	increase resilience against materialization of risks from such exposures; Discourage exposure to certain geographical areas for physical risk and/or carbon critical "sector" for transition risk;	Very flexible	Challenging calibration, complex classification system, currently applicable for domestic exposures only
<span style="color: green;">■</span> <b>Concentration threshold</b>	Limit concentration	Limit exposure to a certain geographical area for physical risk and to a certain carbon critical "sector" for transition risk	No additional capital; Targeted measures	Challenging calibration: complex classification system of sectors/geographical areas exposed to climate risk
<span style="color: orange;">■</span> <b>Concentration charge</b>	Increase resilience; limit concentration	A risk-weight capital add-on that applies once exposures to a certain sector or region particularly exposed to climate risk exceed a certain threshold.	Targeted measures	Challenging calibration; complex classification system of sectors/geographical areas exposed to climate risk
<span style="color: orange;">■</span> <b>Sectoral requirements (Risk weights or minimum LGDs)</b>	Increasing resilience	Higher risk weights or minimum LGDs could be required on exposures to high physical and/or transition risk.	mandatory reciprocity (limits arbitrage)	New complex tool; Challenging calibration; impact on microprudential requirements
<span style="color: red;">■</span> <b>Sectoral leverage ratio</b>	Increase resilience	Avoid over-leveraging of sectors or regions that are highly exposed to transitional or physical risks	Sectoral approach could allow for targeted increase in resilience	Would make the tool more complex and risk-sensitive, would deviate from its general function as non-risk-based backstop
<span style="color: red;">■</span> <b>Capital Conservation buffer (CCoB)</b>	Increase resilience; Prevent build-up of risks	Buffer add-on during periods of excessive carbon-intensive credit growth	Capital already (partially) at the disposal of the banking system	Non-targeted measure, adaptations challenging
<span style="color: red;">■</span> <b>Countercyclical Capital buffer (CCyB)</b>	Increase resilience; Prevent build-up of risks	Buffer add-on during periods of excessive carbon-intensive credit growth	--	Cyclical nature of climate risk unclear, design changes needed, overlap with sectoral SyRB
<span style="color: green;">■</span> <b>Borrower based (BBMs)</b>	Prevent build-up of risks	Could decrease vulnerability of households towards aspects of climate risks and change the pattern of demand towards more energy efficient houses or houses located in region less prone to physical risks	Very flexible, no additional capital	Gradual effect in resilience; targeting only specific portfolios, politically more sensitive
<span style="color: red;">■</span> <b>NSFR-LCR</b>	Prevent market illiquidity	Could cover risks related to sudden repricing in financial markets	--	Need for distinct climate features unclear
<span style="color: red;">■</span> <b>Systemic bank buffers (G/O-SII)</b>	Misaligned incentive	Could cover bank-specific risks, for systemic institutions	--	Climate risks are not specifically related to systemic importance of individual institutions.

## Stylised change in financial loss profile given climate shocks

Figure 7 - Higher Mean and Higher Variance

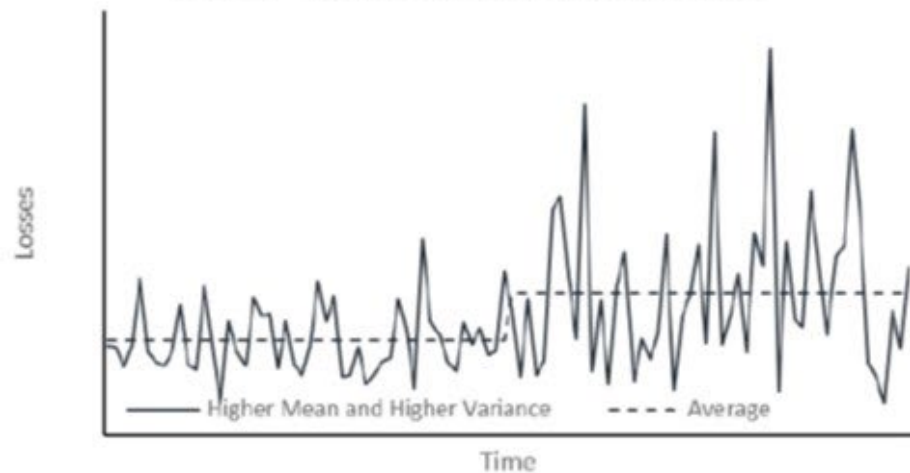
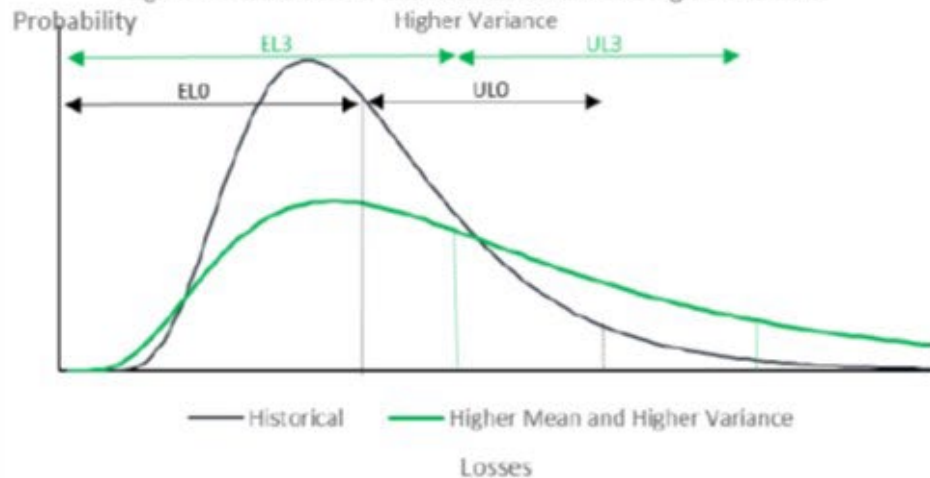


Figure 8 - Distribution of Historical Losses and with Higher Mean and Higher Variance

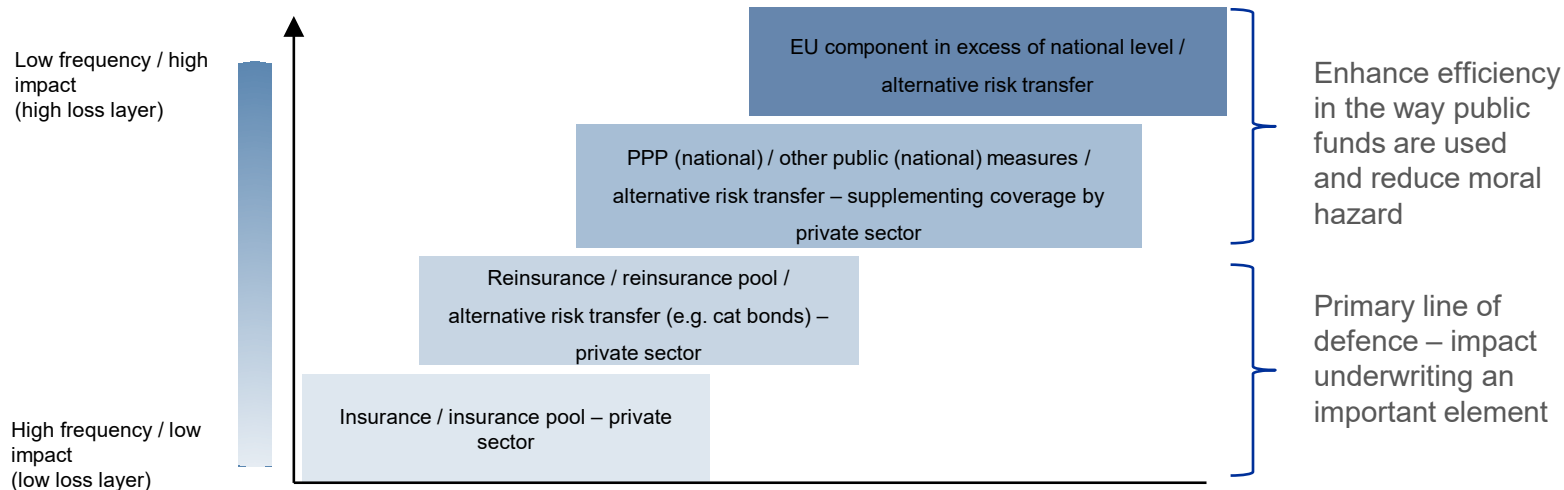


# Macprudential considerations for the non-bank financial sector

## Nonbank financial intermediation (*general*)

- **Enhanced disclosure** to foster market discipline (standardised and comparable forward-looking metrics/targets) and measures to tackle **greenwashing** (classification of investment strategies and mandatory standard for green bonds)
- Measures to address **risk concentrations** could be investigated, consistent with considerations for banks

## Insurance sector (*specific*): Address private insurance protection gap



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### **The evidence: Uneven distribution of exposures, amid strong path dependence**

- Climate shocks not only likely, but inevitable (physical risk, transition risk, or both)
- Concentrated financial exposures to climate change at regional, sectoral, and firm level
- Risk materialisation from the interplay of climate-related exposure with financial vulnerability
- Impact analyses illustrate how the path to reduced climate risk may be bumpy, with tradeoffs as net benefits from climate action only accrue with time, with strong distributional forces at play

### **Evidence-based policies: Macroprudential considerations**

- *Rationale*: Is climate risk “special” from a financial risk perspective?
- *Setting the strategy*: Should absolute or relative objectives predominate – and how to allocate between banks (looking at lenders & borrowers) versus broader parts of the financial system?
- *Operationalising the strategy*: What macroprudential tools (and how to ensure complementarity with its microprudential counterpart)?