The macroprudential challenge of climate change
Outline

1 | The evidence
2 | Macroeconomic policy considerations
3 | Summary
Climate shocks on the horizon, one way or another

Projections for carbon emissions & warming
(Emissions in gigatonnes of CO2 per year)

2030 Emissions gap
CAT projections and resulting emissions gap in meeting the 1.5°C Paris Agreement goal

Pledges & Targets

Global GHG emissions GtCO2e/year

2030

60

50

40

30

20

10

5

0


1.5°C Paris Agreement compatible

Nov 2021 update

Source: Climate Action Tracker

Required decarbonisation rates depend on entry point

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

Mapping firm exposures to physical hazards

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

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).
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.
### From exposure to financial risk

#### Exposure dimension

<table>
<thead>
<tr>
<th>Institution-specific</th>
<th>Non-financial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transition</strong>: Emissions (actual &amp; forward-looking)</td>
<td><strong>Physical</strong>: Climate-related hazards (floods, wildfires, heatwaves,…)</td>
</tr>
<tr>
<td><strong>To non-financial sectors</strong></td>
<td></td>
</tr>
<tr>
<td>• credit instruments (loans, debt sec., equity,…)</td>
<td></td>
</tr>
<tr>
<td>• contingent liabilities (insurance, derivatives)</td>
<td></td>
</tr>
</tbody>
</table>

#### Risk dimension

<table>
<thead>
<tr>
<th>System-wide</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Climate</strong>: interdependent hazards</td>
</tr>
<tr>
<td><strong>NFCs</strong>: In-/output interdependencies</td>
</tr>
<tr>
<td><strong>Financial Institutions</strong>: overlapping exposures</td>
</tr>
</tbody>
</table>

| | **Transition**: Impact on profits & costs, technological obsolescence, risk perceptions |
| | **Physical**: Asset damages, insurance costs, production disruption |
| | **Vulnerability of counterparts**: indebtedness, leverage, provisions |
| | *climate-related impact on credit risk (PD, LGD), market risk (asset valuation)* |
| | **Clustered risks, interconnectedness** |
| | *Dynamic risk amplification & propagation* |
| | *(joint defaults, contagion, fire sales)* |

ECB/ESRB (2022), *The Macroprudential Challenge of Climate Change*. 
Importance of scenario analysis, with past not a good guide

Network for Greening the Financial System scenarios

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
Outline

1 | The evidence
2 | Macroprudential policy considerations
3 | Summary
The rationale for a macroprudential approach

**Classic systemic risk channels**
- Spillovers
- Non-linearities
- Interconnections

**Climate-specific characteristics**
- Concentration of risk
- Externalities from entities’ lending to carbon-intensive sectors
- Amplification between physical and transition risk

**Risk underestimation/ risk of acting too late**
- Uncertainty over scale and timing
- Historical and imperfect data
- Endogeneity of climate risk

Climate risk may become systemic, with increased volatility and additional absolute risks at the financial system level

Macroprudential policy can address systemic aspects of climate risk by
1. making the system **less prone to climate-related risks** or **increasing loss-absorbing capacity**, and
2. having a **system-wide perspective, preventing the migration of risks**
3. usefully **complementing supervisory efforts and microprudential regulation**
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

Source: ECB
Macroprudential policy – Looking into the existing toolkit for the banking sector

Range of tools possible, two instruments particularly adaptable:

- **Systemic risk buffer**
- **Concentration thresholds**
### Candidate macroprudential tools for the banking sector

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

Source: ECB/ESRB (2022), *The Macroprudential Challenge of Climate Change*. 
Stylised change in financial loss profile given climate shocks

Source: Holscher et al, 2022, "Climate Change and the Role of Regulatory Capital: A Stylized Framework for Policy Assessment".
Macroprudential 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

Source: ECB-EIOPA Discussion Paper, Policy options to reduce the insurance protection gap (2023).
The macroprudential challenge of climate change: Summary

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)?