



Evaluación de la exposición al riesgo climático físico y supervisión de las instituciones financieras: Caso Brasil

III Jornada Anual de Riesgos del CGRRD
18 Sep 2025

Fernando Linardi

Financial System Monitoring Department
Banco Central do Brasil

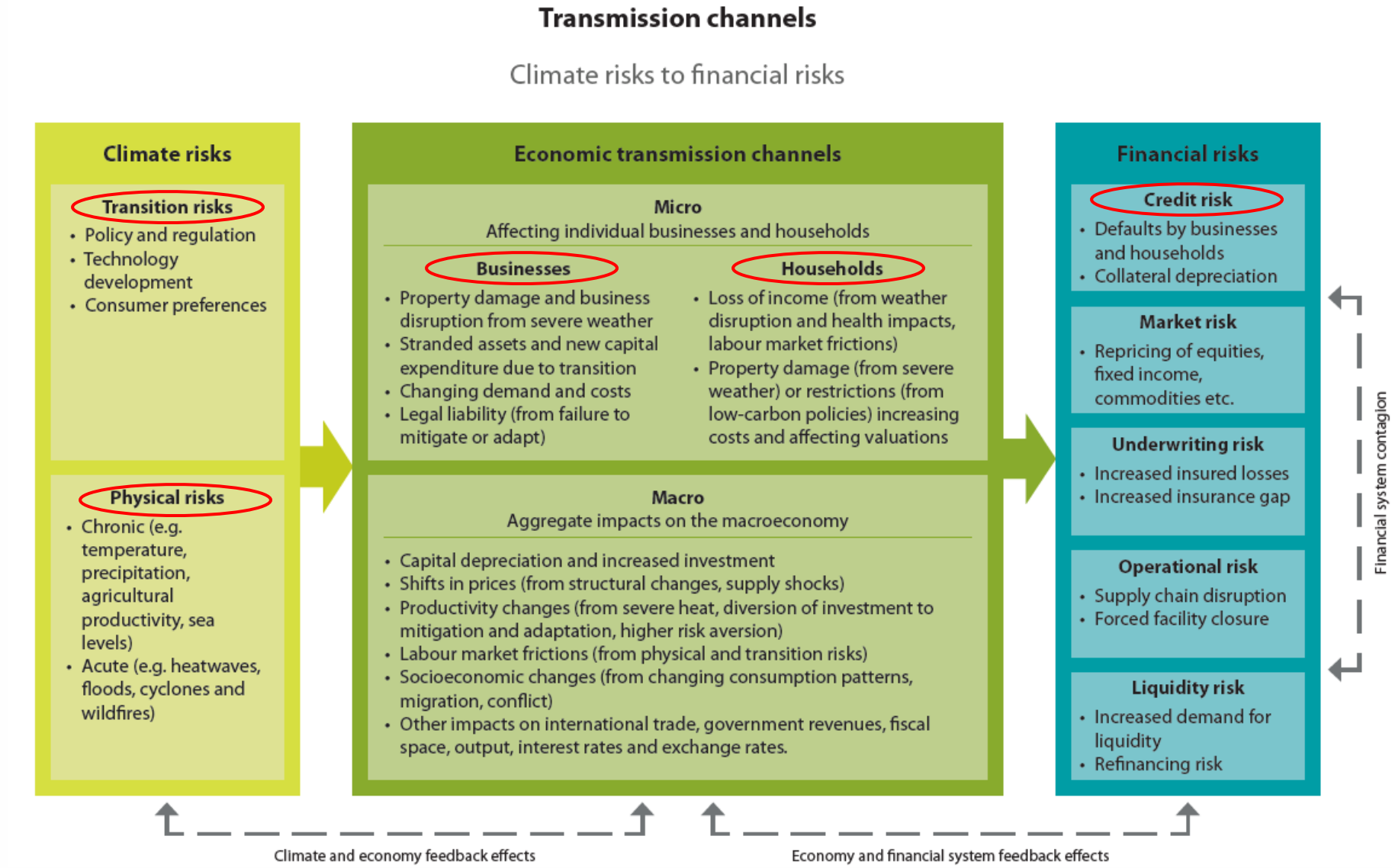
Regulation and Supervision of Social, Environment and Climate Risk

- Banco Central do Brasil (BCB) is responsible for the regulation and supervision of financial institutions.
- Insurance companies, pension funds and investment funds are outside the BCB scope.
- Financial institutions according to their size and complexity need to monitor and manage the social, environmental and climate risks.
- The regulation of defines each of these risks:
 - ✓ Social risk: possibility of losses caused by events associated with the violation of fundamental rights and guarantees (eg. harassment, discrimination, or prejudice, modern slavery, child labor, human trafficking, etc.)
 - ✓ Environmental risk: possibility of losses caused by events associated with environmental degradation, including the excessive use of natural resources (eg. irregular, illegal or criminal exploitation of natural resources, environmental disaster, etc.)

Regulation and Supervision of Social, Environment and Climate Risk

- ✓ Climate risk:
 - Transition risk: the possibility of losses caused by events associated with the transition to a low-carbon economy (regulation, technology or supply and demand of goods and services); and
 - Physical risk: the possibility of losses caused by events associated with frequent and severe weather events (drought, flooding, storms, cyclones and wildfires) or long-term environmental deviations of climate patterns (rising sea levels, desertification, and changes in rainfall or temperature patterns).
- Financial institutions need to assess the climate risk and its impact on credit and market risk.
- FIs should carry out climate scenario analysis and establish a responsibility policy that sets guidelines and principles in managing socio, environmental and climate risks and adopting more sustainable practices in their operations.

Central Bank’s Climate Risk Assessment



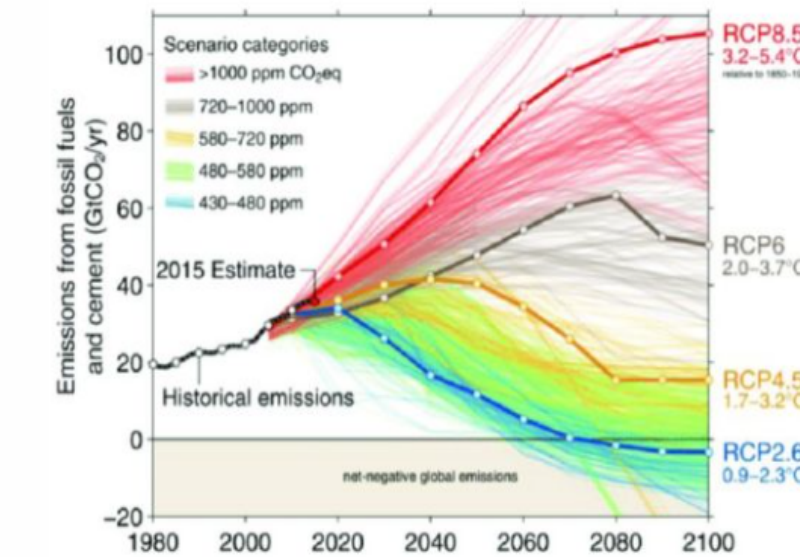
Source: NGFS

Physical Risk Exposure: Risk metric

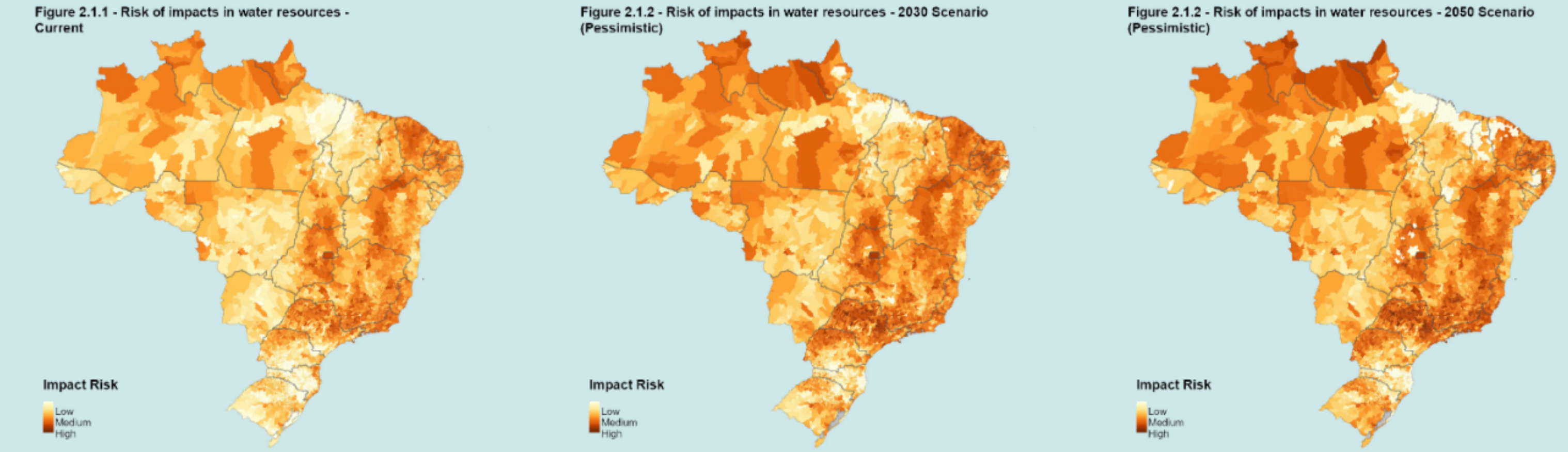
- Objective: assessment of the exposure of financial institutions to physical risks.
- All financial institutions regulated by the BCB (top-down).
- Static balance sheet
- First results:
 - physical risk: exposure assessment in 2030/2050 (current and future scenarios)
 - Results published in the Financial Stability Report (November 2022 and March 2023) (<https://www.bcb.gov.br/en/publications/financialstabilityreport>)

Physical Risk Exposure: Data Sources

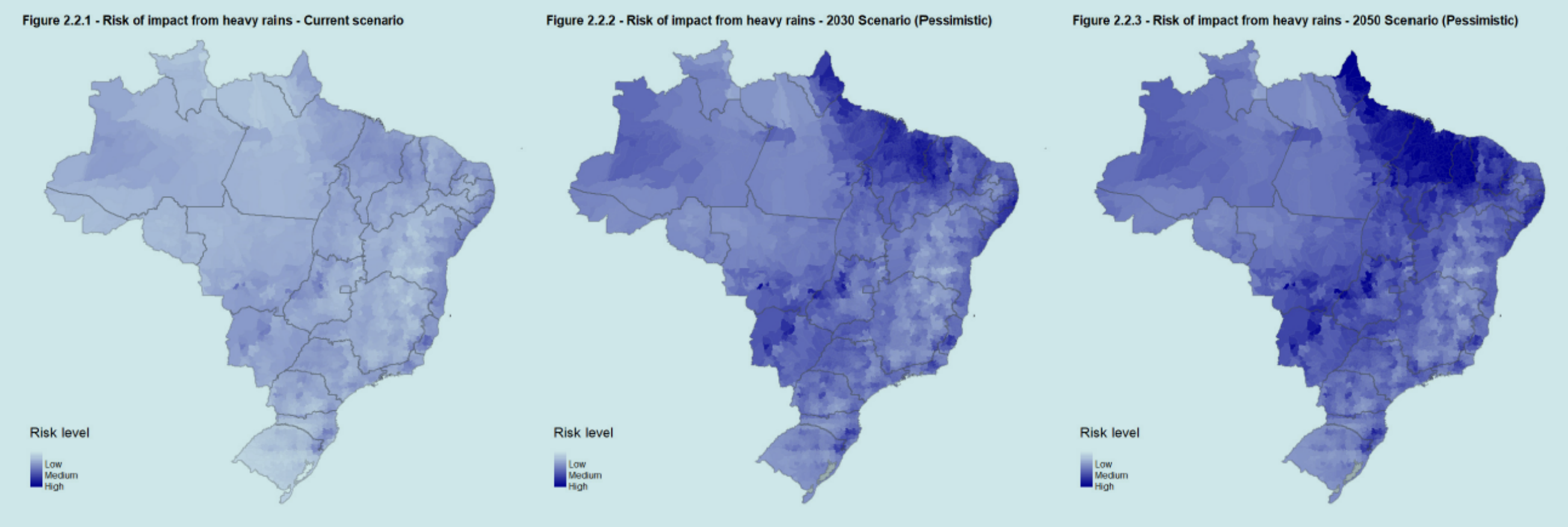
- Scenario developed by the Brazilian National Institute for Space Research (INPE).
 - Scenario for **drought** and **heavy rainfall** (RCP4.5/8.5) for current conditions and future scenarios (2030 and 2050).
 - Scores assigned (disaster risk) to municipalities based on:
 - the vulnerability (e.g., quality of infrastructure and disaster preparedness)
 - exposure to climate hazard (population, pop. density)
 - hazard event (standardized precipitation and evapotranspiration index and one-day intensity of rainfall)
- Loan data collected by BCB from its Central Credit Register.



Physical Risk: Drought by municipality

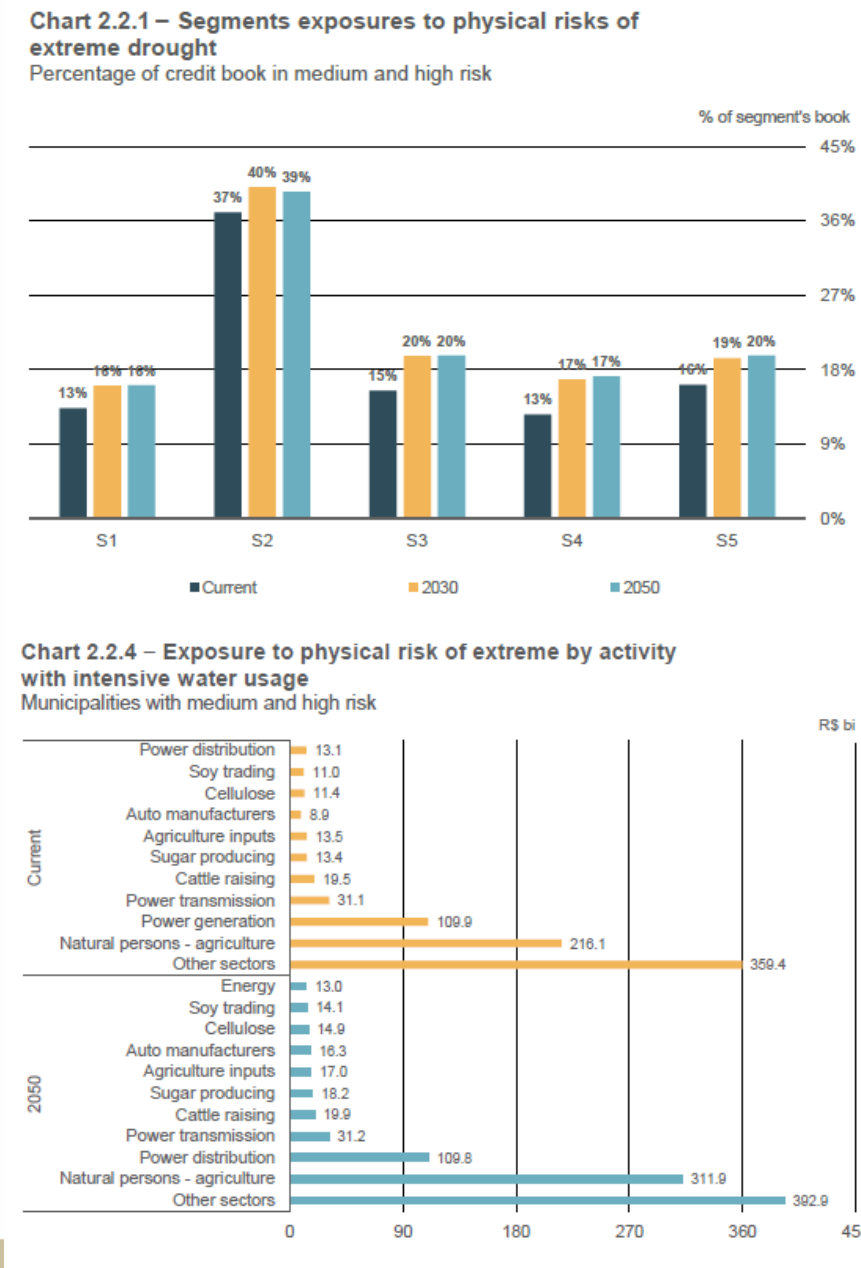


Physical Risk: Heavy rainfall by municipality



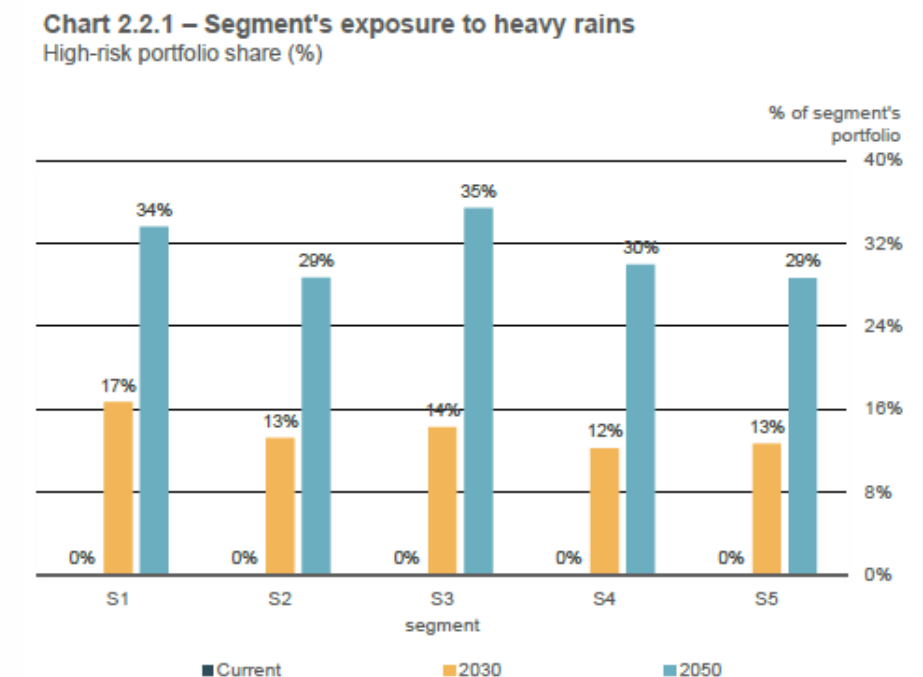
Physical Risk: Results

- **Drought risk:** loans of sectors more dependent on water such as Agriculture, Forestry, Power Generation/ Transmission.
- The results so far indicate that banks have relatively low exposures to firms and individuals in municipalities with a medium/high risk of droughts.
- Few financial institutions (small credit unions) are highly exposed to droughts (> 50% loan portfolio).



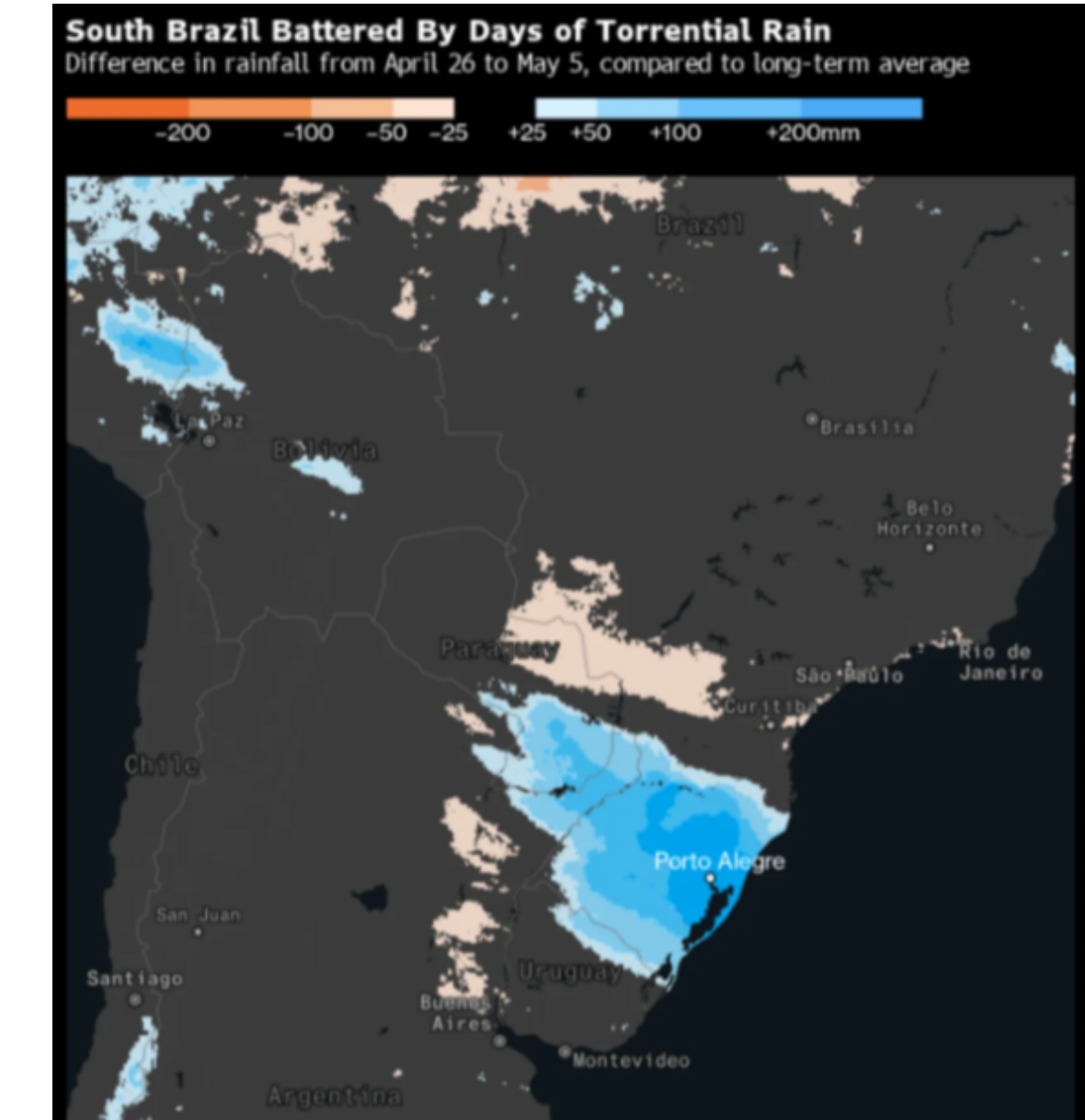
Physical Risk: Results

- **Heavy rainfall:** All loans are considered. Exposures depend on the geographical location of the borrower.
- The share of the credit portfolio exposed to municipalities with high-risk of heavy rainfall would increase in future scenarios, from 16% (2030) to 33% (2050).



Floodings in the South of Brazil (FSR November 2024)

- The state of Rio Grande do Sul was affected by heavy rainfall and record-breaking floods in May 2024.
- More than 300 municipalities and 1.5 million people were affected, 209 dead or missing. BRL\$112 billion in federal government aid.



Floodings in the South of Brazil

- Due to the floods in RS in May 2024, the BCB assessed the exposures and possible losses for financial institutions in the region.
- The flooded areas were defined using satellite images from NASA.
- The exposure of the FIs was obtained by merging data on the geo-coordinates of the credit borrowers' address and the areas identified as flooded.

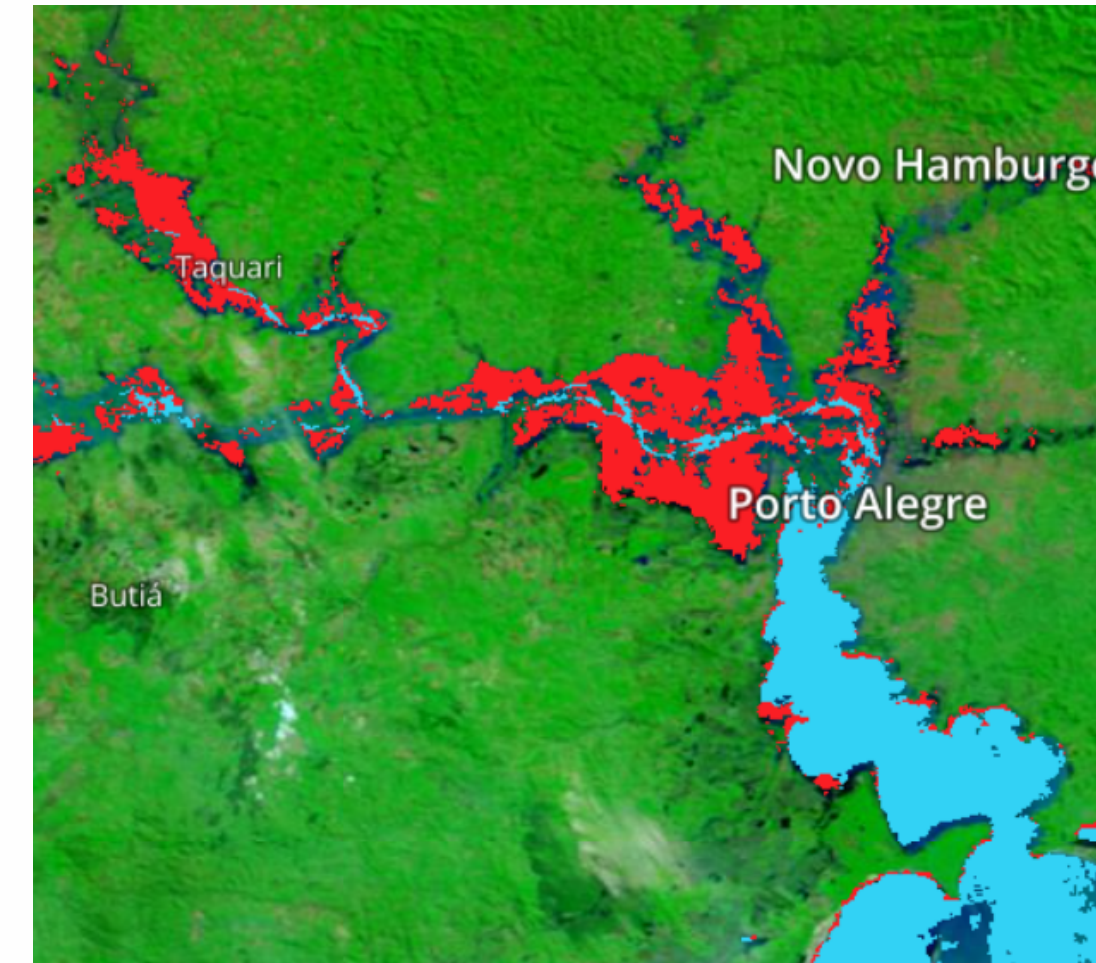
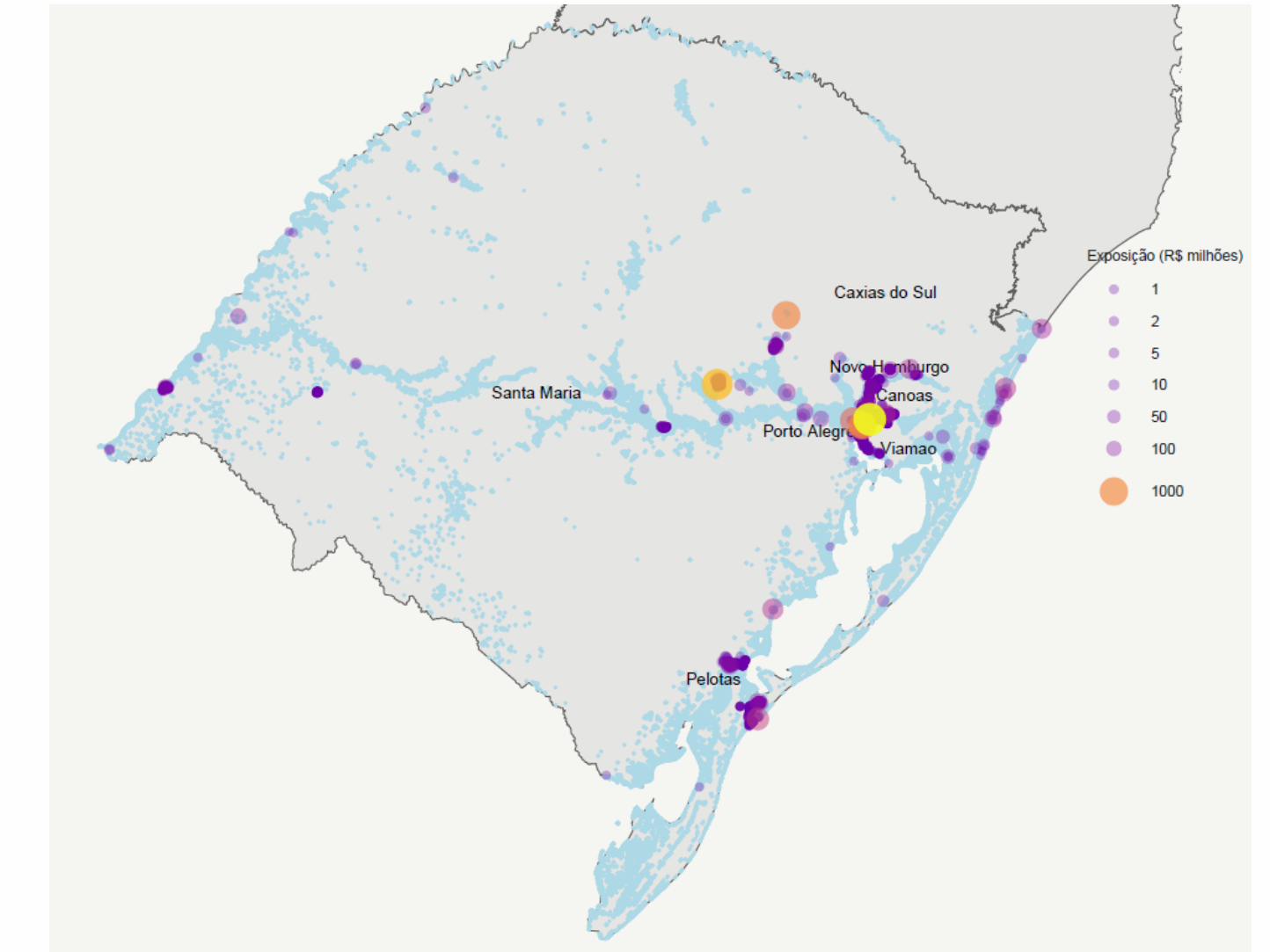


Figura 1: Floods near Porto Alegre/RS in red, May 7 2024. Source: MODIS Near Real-Time (NRT) Global Flood Product.

Floodings in the South of Brazil

- The direct impact on FI from the default of firms and borrowers located in flooded areas.
- The indirect impact is estimated by building a network of suppliers to firms located in areas affected by floods using payment data.



Map 1: Financial institutions' exposures. Floods from May 1st to 16th: dots in light blue.

Floodings in the South of Brazil

- The results show that exposures and possible impact on FIs' capital are limited, despite the serious social and economic consequences of the floods.
- Large banks operate in different municipalities and economic sectors across the country.
- Losses remain contained even in the extreme case observed in RS state.
- Proportionally, the biggest losses would occur in small FIs with operations restricted to the municipalities most affected by floodings.

Estimation of impact	
Floodings in RS state	
Number of firms (thousand)	54
Number of employees (thousand)	663
Exposure to firms (BRL billion)	22,9
Exposure to individuals (BRL billion)	29,6
Interfinancial contagion (BRL billion)	1,8
Capital ratio impact (p.p.)	-0,8
Capital shortfall (BRL billion)	8,1
Capital shortfall (%RC)	0,6

Source: BCB (as of March/2024)

Next steps

- Impact of climate variables (temperature and precipitation, SPI, El Niño) on loans to individuals of the agriculture sector.
- Research project to develop an indicator of climate-related physical risk and to establish a framework for monitoring financial institutions.



III Jornada Anual de Riesgos del CGRRD

17 – 19 Sep 2025

Gracias!

Q&A