

# SIZING THE RISKS AND RAISING AWARENESS: THE BANQUE DE FRANCE / ACPR EXPERIENCE IN DESIGNING CLIMATE STRESS-TESTING EXERCISES

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STÉPHANE DEES  
BANQUE DE FRANCE



# **STRUCTURE**

- 1. Objectives and main features**
- 2. Scenario design**
- 3. The ACPR Pilot exercise**



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# BACKGROUND AND OBJECTIVES

- **Background:**

- 2015: French Act on Energy Transition and Green Growth includes an innovative extra-financial reporting framework and requires the implementation of a regular stress test scenario representative of climate change-related risks
- 2018: ACPR survey aiming at monitoring climate-related exposures and gauging the progresses accomplished by firms

- **Objectives:**

- **For the Banque de France/ACPR:**

- Sizing the vulnerabilities and the risks, including possible mispricing
    - Raising awareness: assessing and making sure firms are equipped with or will adopt or develop appropriate methodologies and data to manage climate-change risks

- **For the financial industry:**

- Developing a better understanding of the transmission channels
    - Relying on a common set of assumptions and scenarios for comparability



# SPECIFICITIES OF CLIMATE SCENARIOS

	Standard scenarios	Climate change scenarios	
		Transition risks	Physical risks
Horizon	Short to medium run	Short, medium and <b>long run</b>	Short, medium and <b>long run</b>
Scenario drivers	Economic and financial	<b>Climate policy and technological change</b>	Conditional on outcomes of transition scenarios and/or <b>environmental dynamics</b>
Shock values	Guidance from historical data	Little to no guidance from history	Little to no guidance from history
Aggregation	National	<b>Sectoral</b>	Sectoral and <b>geographical</b>
Feedback loops	Work in progress (e.g. macro models with financial frictions)	Work in progress (e.g. interaction between policy and economy)	<b>Interaction climate - economy</b>



## MAIN FEATURES

- Time period: **2020 – 2050**
- A **bottom-up** approach
- Both **banks and insurance companies**
- International: France + EU + US + Rest of the World (material exposures)
  - 80-85% of exposures for banks and insurances
- A **granular sectoral approach** with 55 sectors
- Transition risks and physical risks
- Combines **static** (2020-2025) and **dynamic balance-sheet** assumptions (2025-2050)
- Consistency checks and second round effects
- Voluntary « pilot » exercise : not a capital exercise



# **STRUCTURE**

1. Objectives and main features

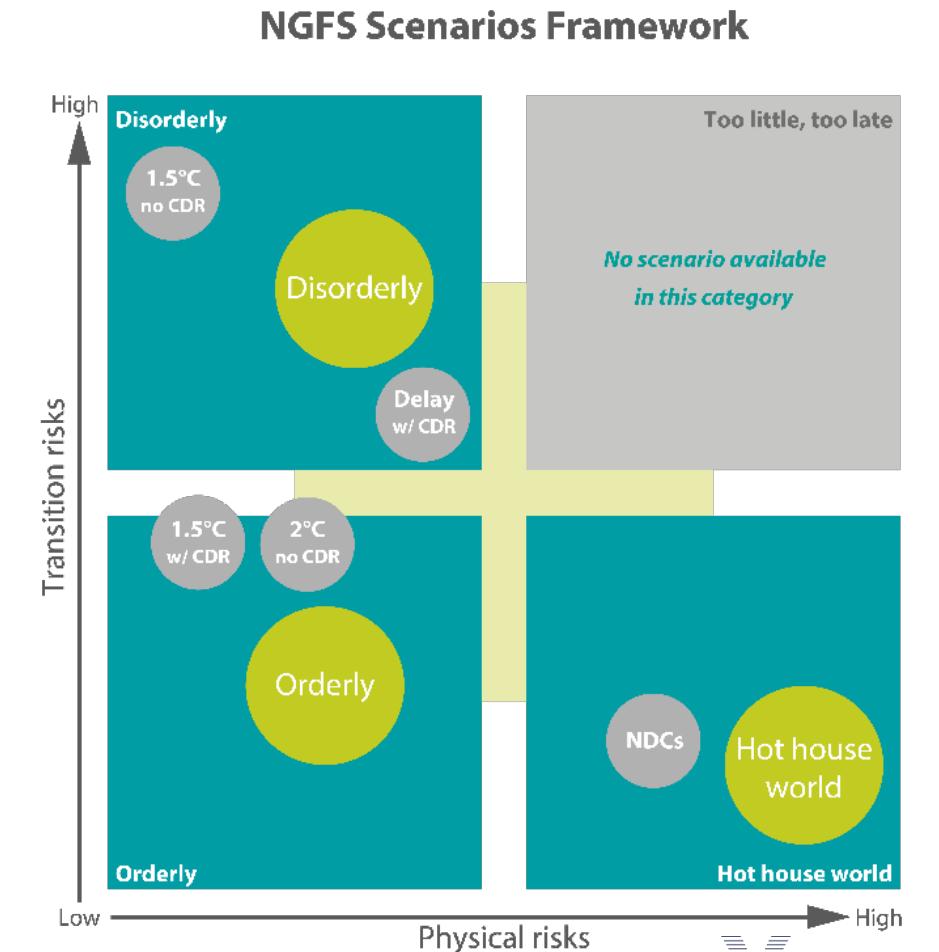
2. Scenario design

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# NGFS SCENARIOS

- NGFS released a set of high-level reference scenarios in June 2020, produced jointly with an academic consortium
- The first phase explores 8 scenarios consistent with the NGFS framework
- They explore futures in which:
  - Different **temperature outcomes** are reached (e.g. 1.5°C, > 2°C, 3°C+)
  - **Emissions reductions** commence soon or are delayed (to 2030)
- All **technologies** are available or not

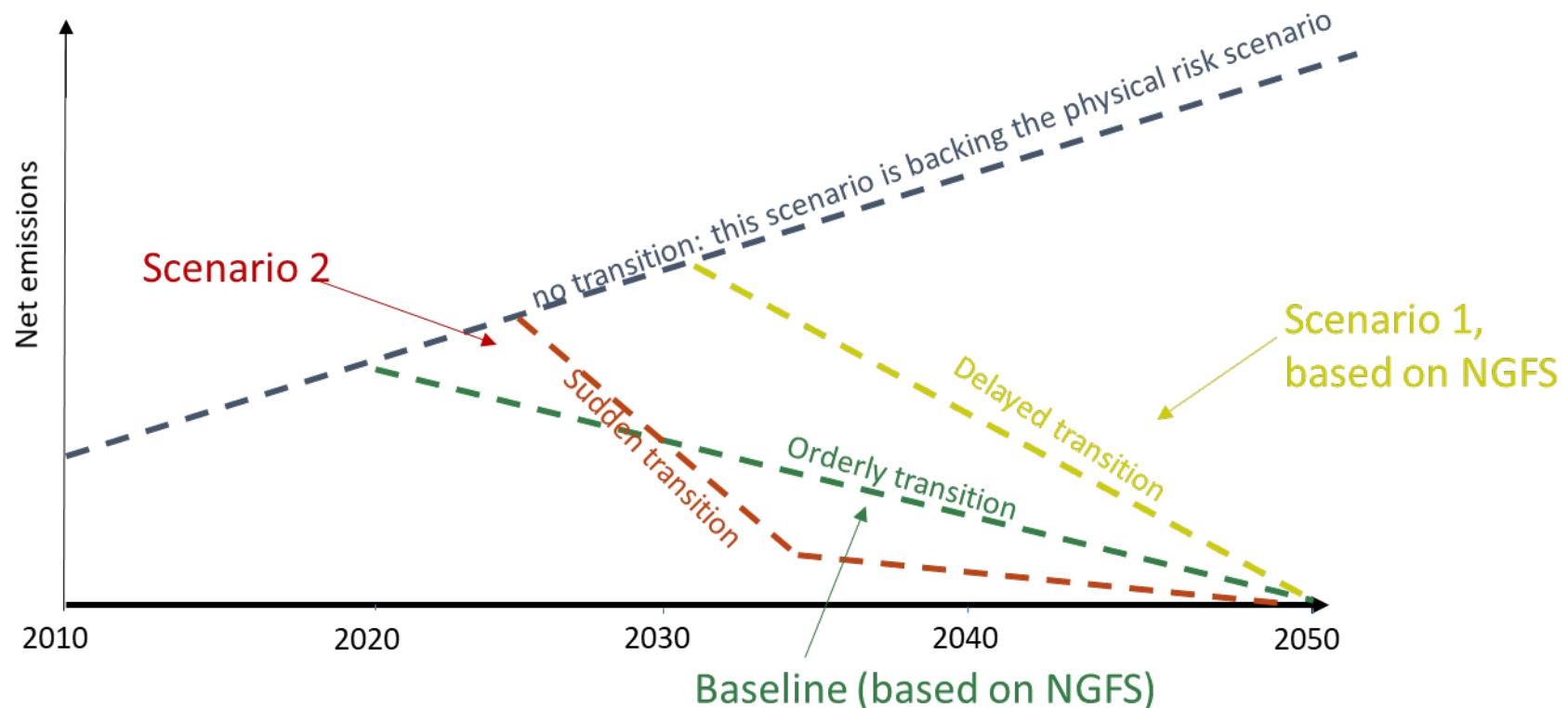




## BUILDING ON THE NGFS

What type of transition to reach zero net emissions by 2050?

Orderly (**baseline**) and disorderly scenarios (**2 adverse variants**) + **physical risk scenario** based on the “business as usual assumption”



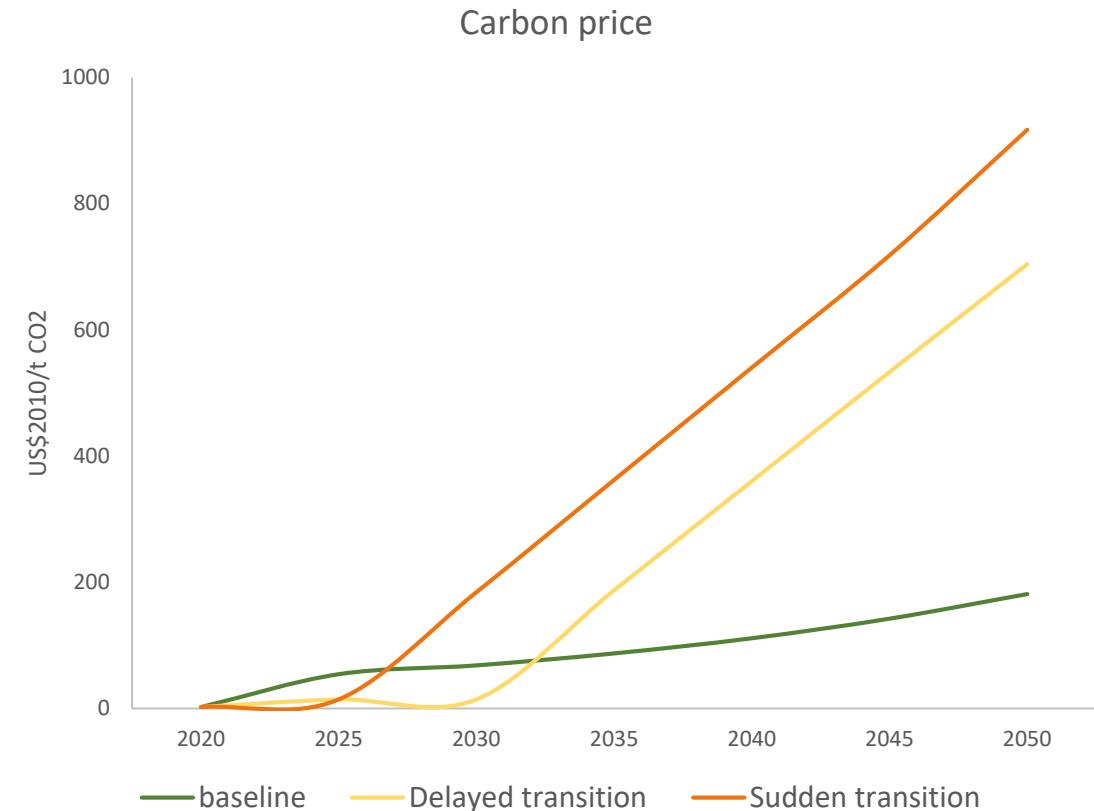


# SHOCKS

- **Carbon prices:**

3 trajectories aligned with the NGFS *high-level* reference scenarios

- Variant 1: from \$14 in 2030 to \$704 in 2050 (/t CO<sub>2</sub>)
- Variant 2: from \$14 in 2025 to \$917 in 2050 (/t CO<sub>2</sub>)

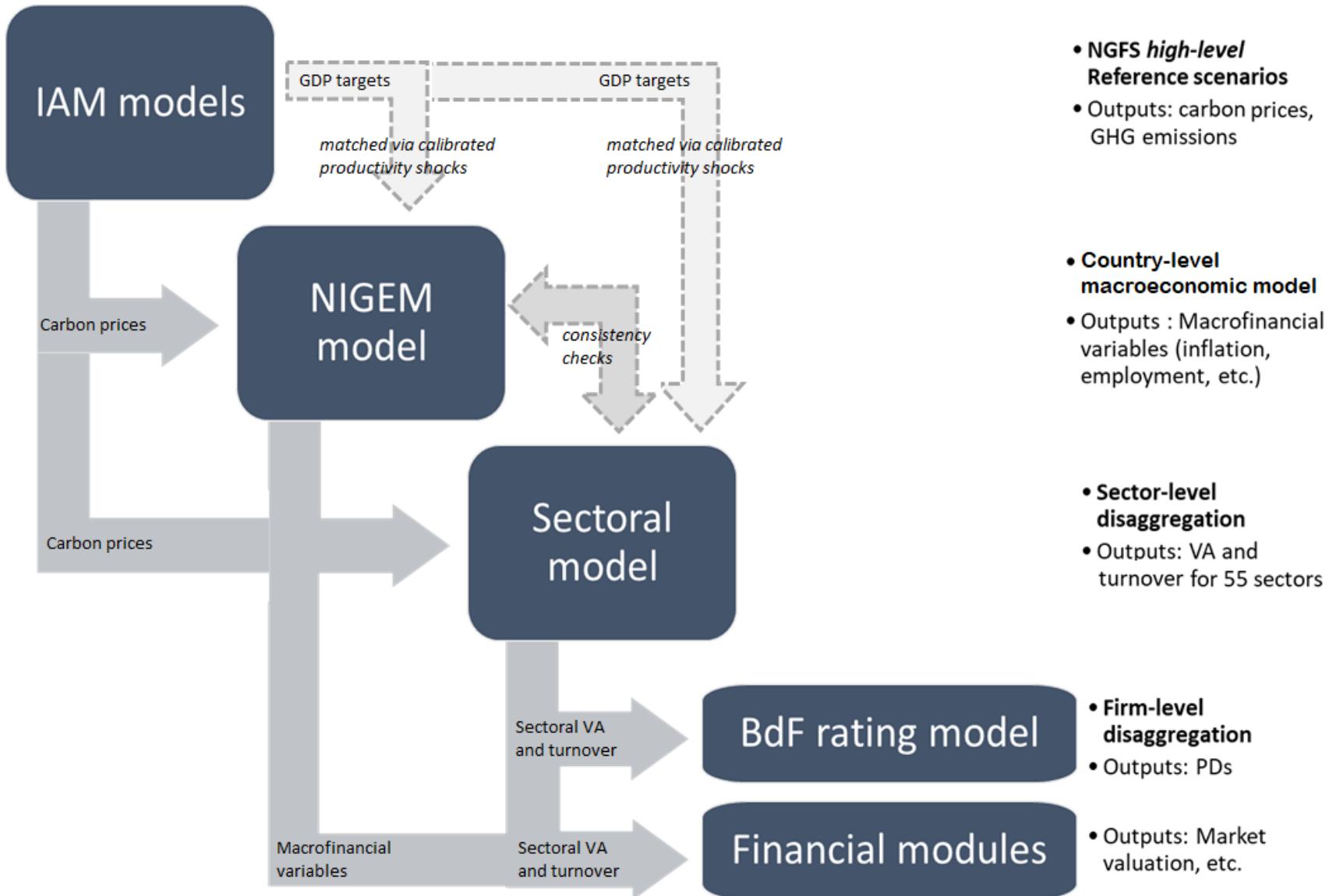


- **Calibration:**

- *Delayed transition*: Calibrated on the NGFS GDP outcomes, assuming positive productivity gains (and postponed increases in carbon prices)
- *Sudden transition*: Constant productivity – no calibration on the NGFS GDP outcomes



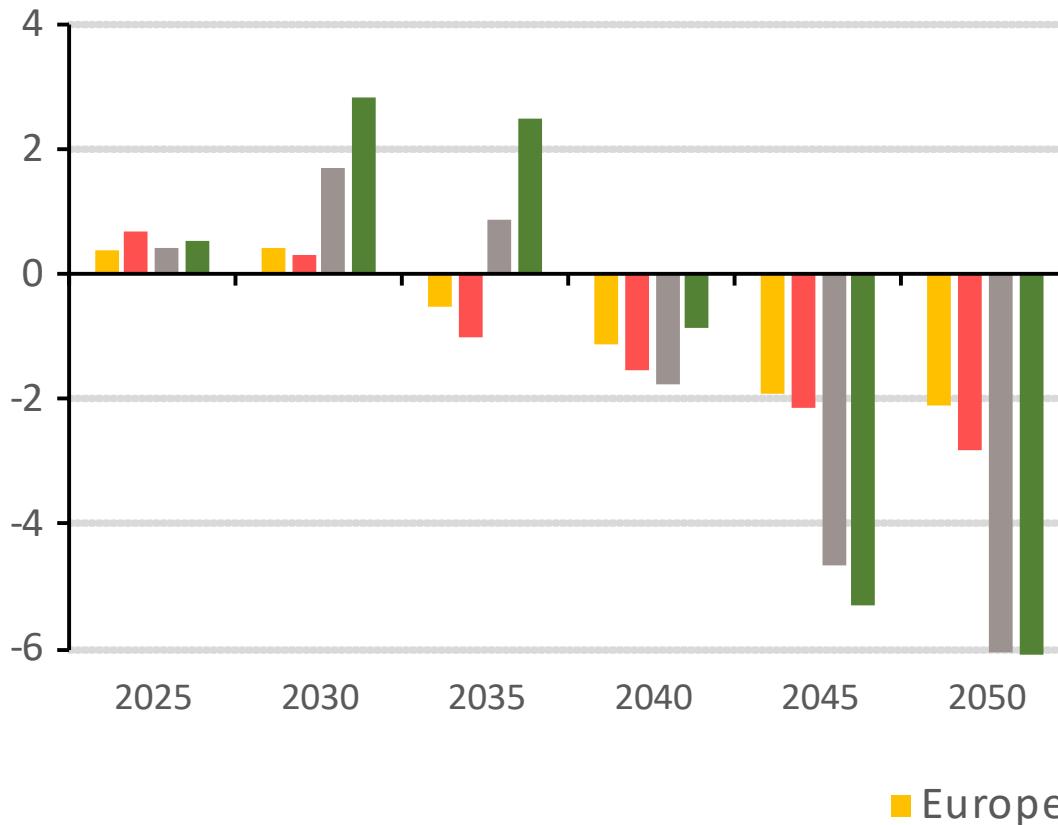
# MODELING ARCHITECTURE



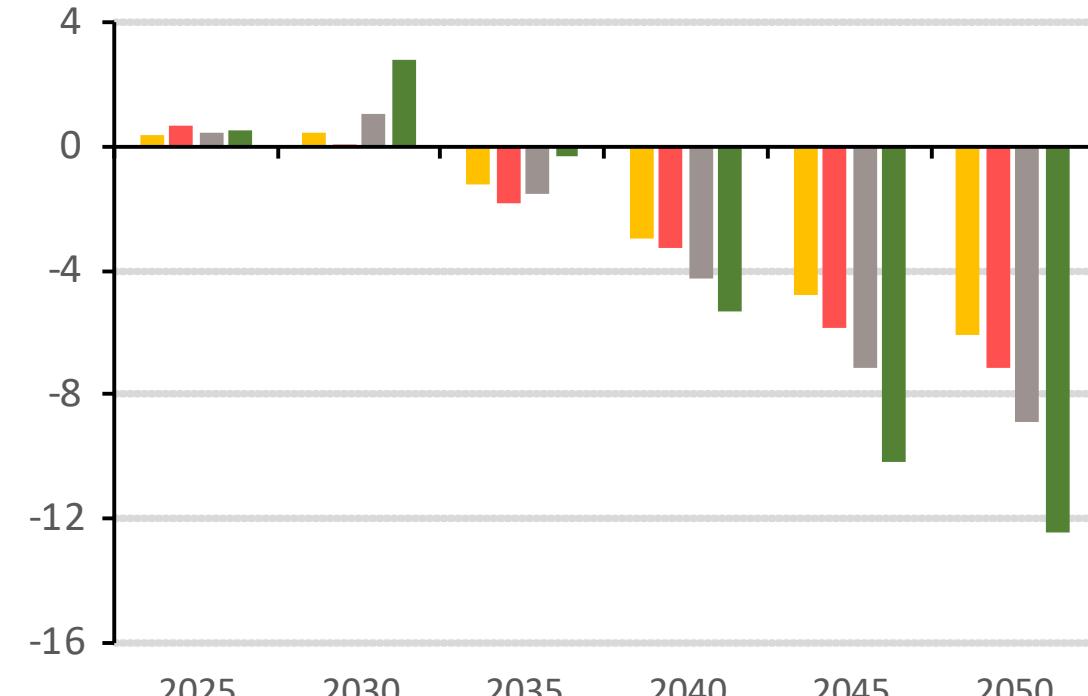


# MACROECONOMIC IMPACTS

Scenario 1- Delayed transition



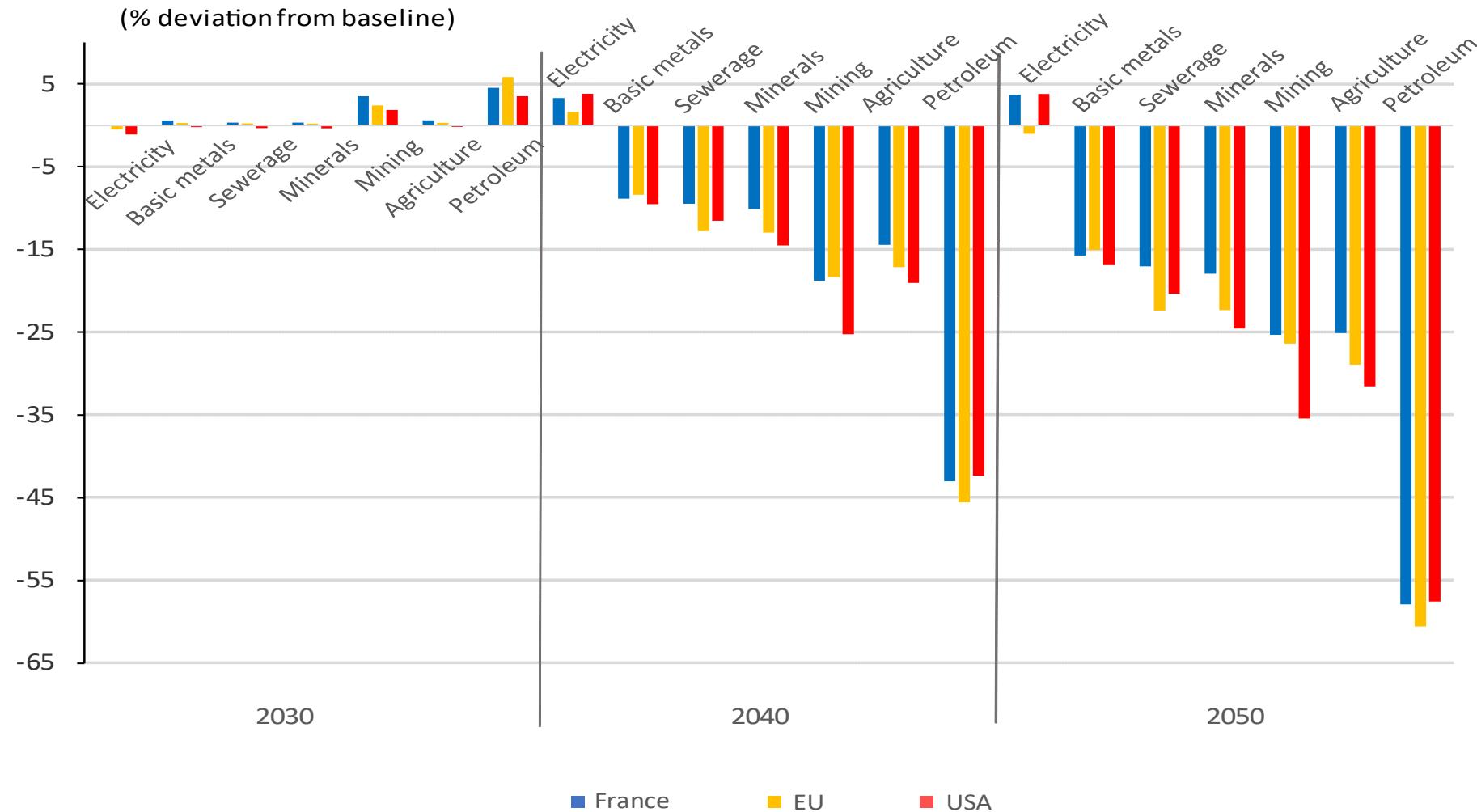
Scenario 2- Sudden transition



Real GDP levels (% deviation from baseline)



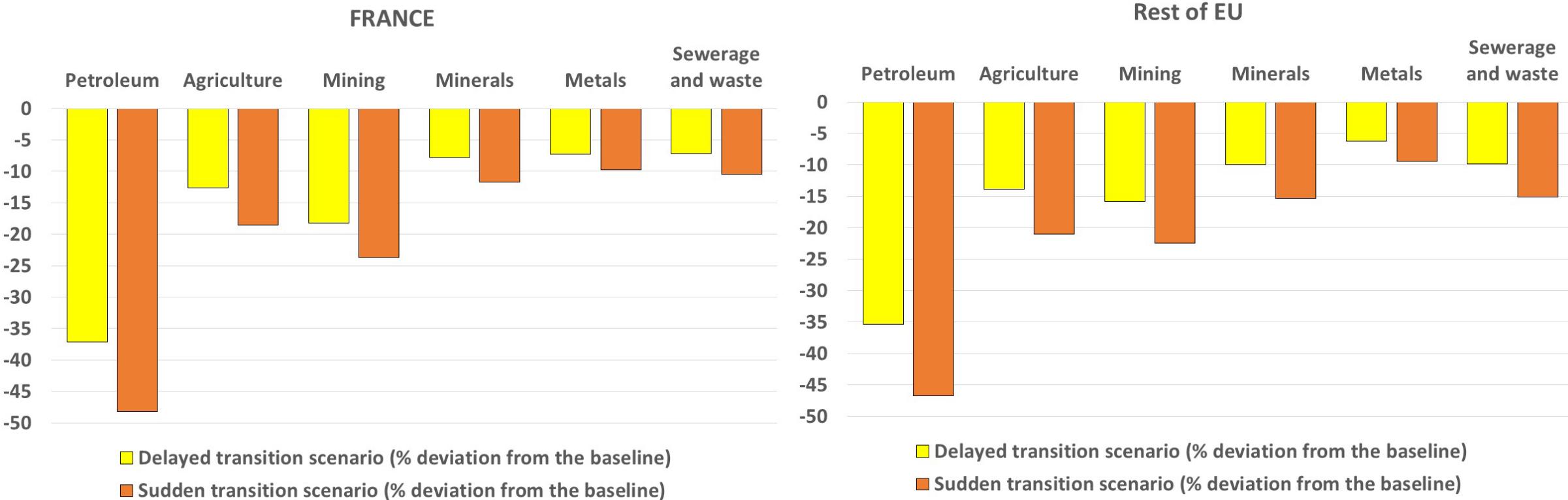
# SECTORAL IMPACTS



*Impacts on sectoral real value added (sudden transition)*



# ASSET PRICE SHOCKS



*Stock price shocks by sector (% deviation from baseline)*



# PHYSICAL RISK SCENARIO

- Scenario consistent with IPCC Representative Concentration Pathway (RCP) 8.5
  - Projected increase in global surface temperatures of 4.3°C by 2100
  - High emissions “business as usual” scenario: increasingly plausible?
- Four NATCAT perils studied: floods, drought, marine submersion and windstorms
- Simulations carried out by public French re-insurer *Caisse Centrale de la Réassurance (CCR)*
  - *Météo France* “ARPEGE” model used to project incidence of perils
  - 23% increase in drought, 38% increase in flooding, 82% increase in submersions
  - 35% increase in all physical perils within projections consistent with RCP 8.5
  - CCR processes exposures (at 20 km<sup>2</sup> granularity), provides losses by *département*
- Rest-of-world exposures to be modeled using NGFS physical risk data (ISIMIP)
  - Undertakings adopt internal mapping of climate variables to financial impacts
  - ACPR asks for coverage of 80-85% of exposures in exercise (representative of business)



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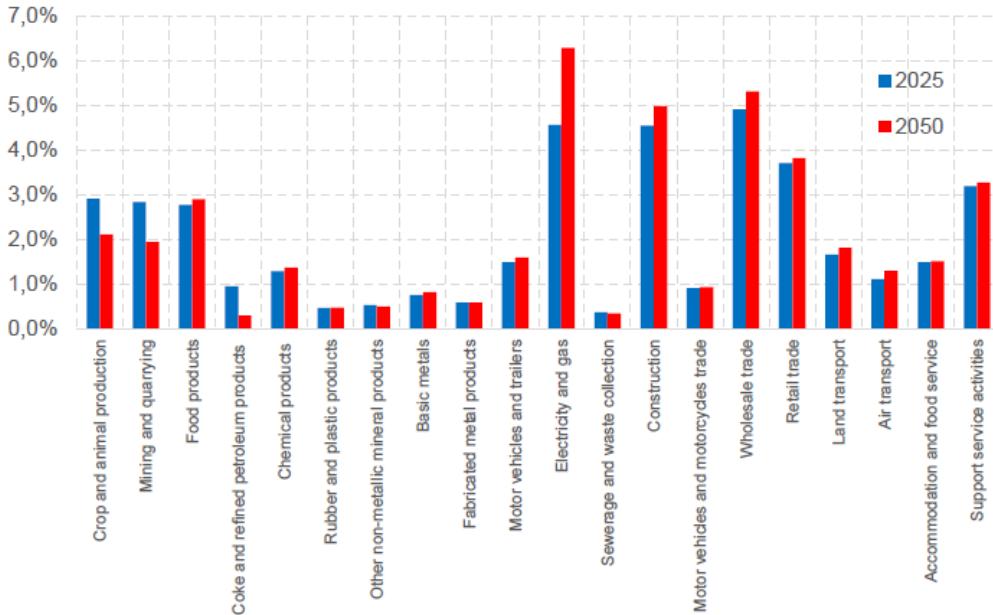


## MAIN TAKEAWAYS

- A very **strong participation**: 9 banking groups (accounting for 85% of total banking assets) and 14 groups of insurers (20 insurance companies - covering 76% of the sector's technical provisions);
- The methodological notices provided by the financial institutions show **in-depth analyses of the climate-change risks** developed in the context of this exercise; include qualitative assessments.
- Banking institutions appreciated the provision of **granular sectoral and geographical data**. They also recognized the usefulness of climate-related variables.

# INSIGHTS FROM THE DYNAMIC BALANCE SHEET ASSUMPTION

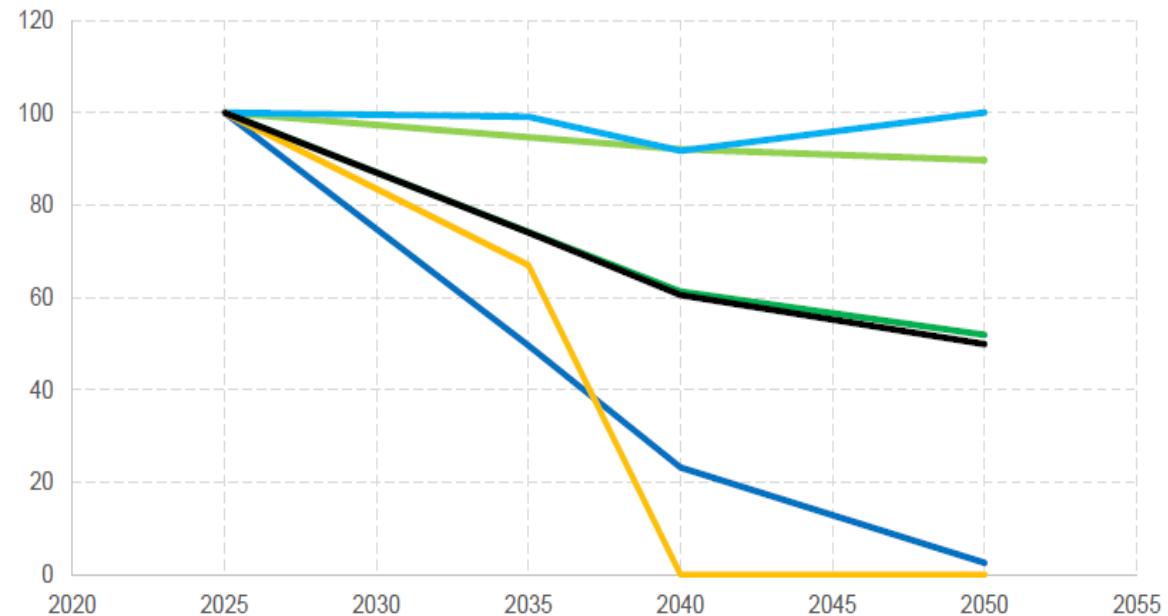
Chart 2 - Sectoral structure of credit exposures



Note: across geographical areas for all banks participating in the exercise under the sudden transition scenario

Source: ACPR

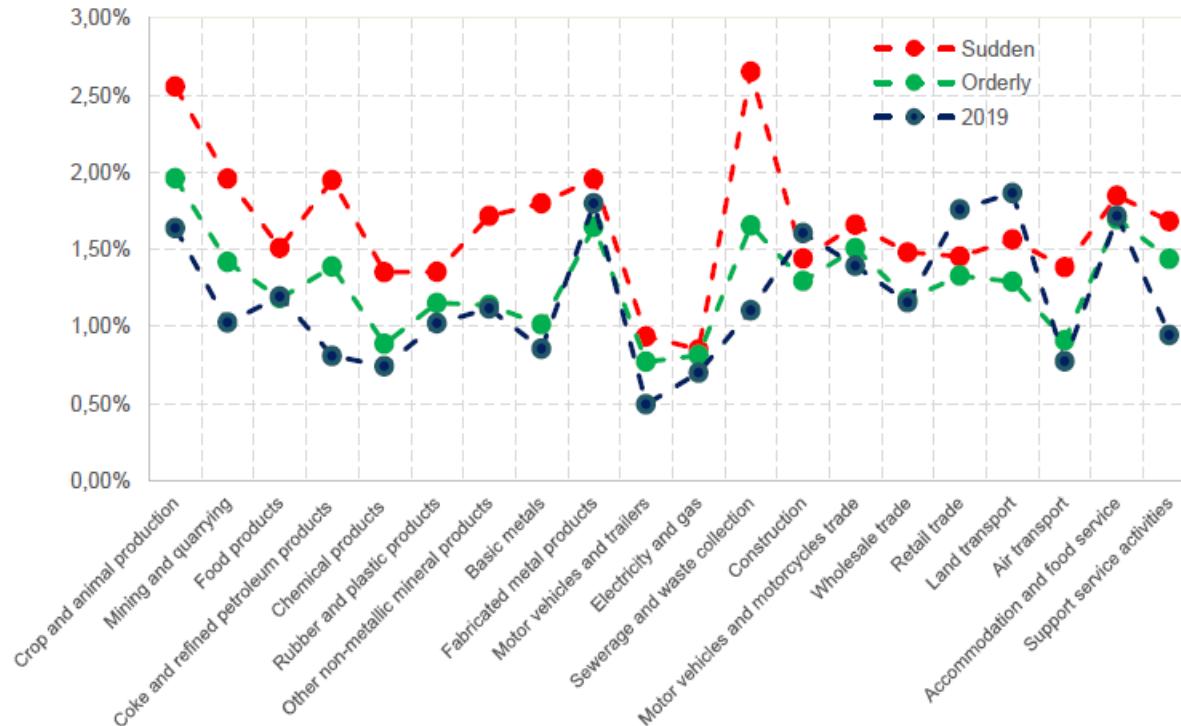
Chart 3 - Evolution of credit exposures in the sector of manufacture of coke and refined petroleum products





# IMPACT ON CREDIT RISK

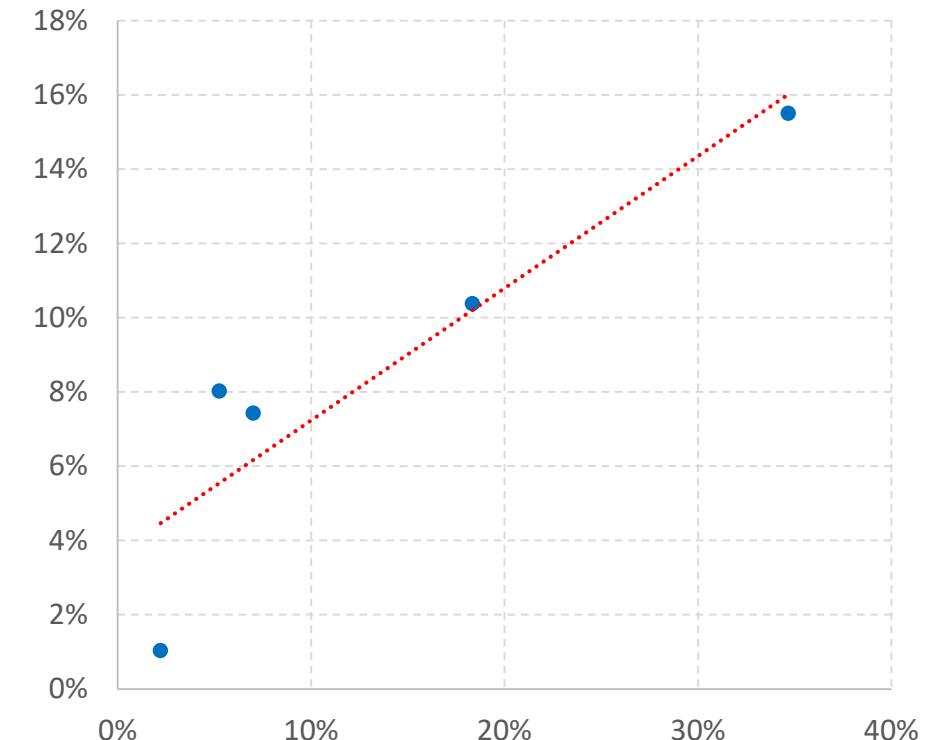
Chart 7 - Evolution of the probability of default broken down by sector



**Note:** the graph below represents the weighted average (weighted using total corporate exposures) of the one-year probabilities of default by sector of the 6 main French banking groups. The levels shown for the orderly and sudden transition scenarios correspond to those observed in 2050.

Source: ACPR

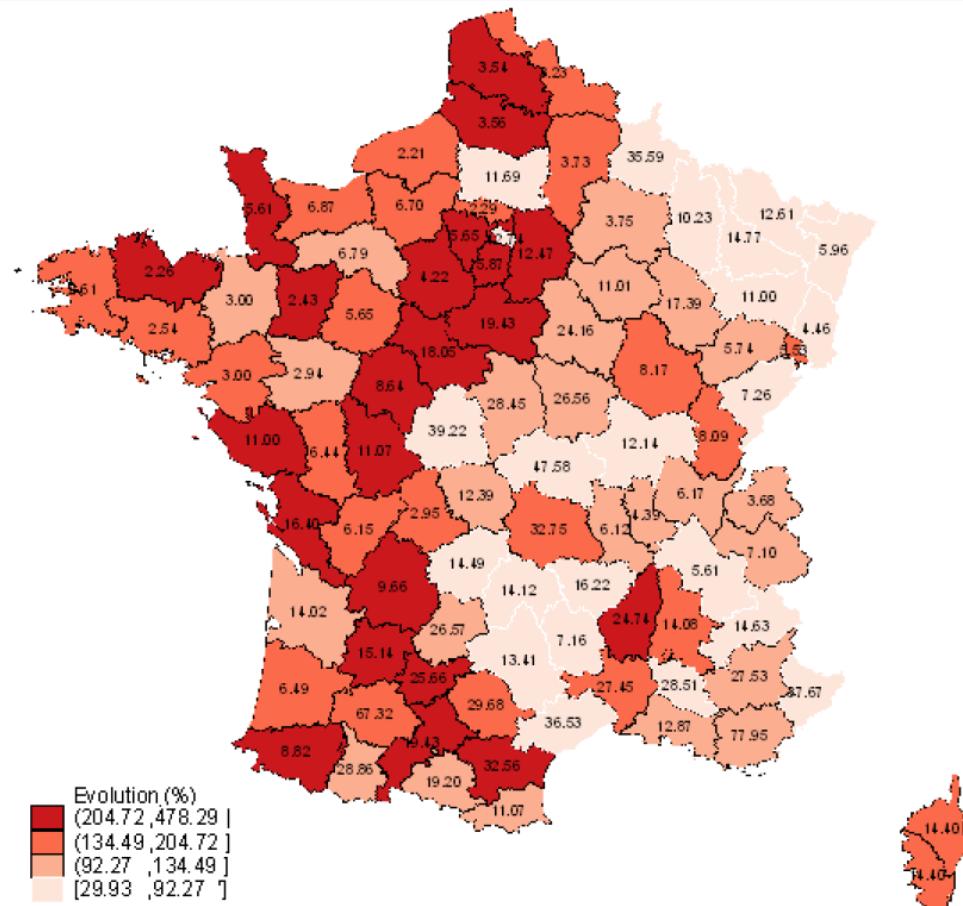
Correlation of the rate of change of the CoR corporate between baseline and adverse and share of corporate exposures to sensitive sectors



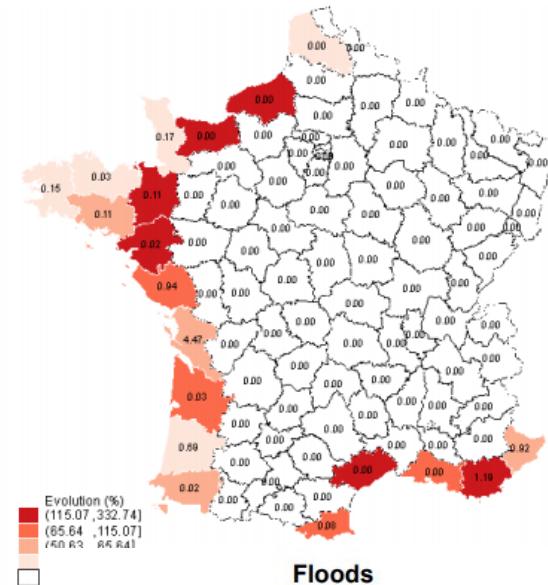


# PHYSICAL RISKS: 3 PERILS IN MAINLAND FRANCE & CYCLONES OVERSEAS

Chart 17 – Claims for all perils (2019 - 2050)



Marine Submersions





# CONCLUSIONS

- Strong engagement from participants and significant methodological developments despite challenges; this exercise was considered as a catalyst
- Identified challenges:
  - Scenarios: not enough variability across NGFS scenarios; issue of the identification of sensitive sectors and granularity
  - Methodological issues: handling long-term horizons, sectoral differentiation and integration into internal models...
- Basis for future work :
  - Identifying best practices regarding the different methodological approaches
  - Improving the analysis on certain segments (market risk, households...)
  - Physical risk remains a challenge: inability to precisely locate exposures for banks; sizing insurance protection gap

# Thank you

# Annexes



## BACKGROUND

- In 2018, the ACPR conducted a survey to update the first Government report with the aim of monitoring exposures and gauging the progresses accomplished by firms.
- The outcome was mixed with some notable progresses on transition risks, but heterogeneous across firms, less on physical risks (due to low perceived exposures and data gaps); liability risk was largely overlooked.
- The ACPR set up working groups with the industry:
  - One on the governance of climate change risks with banks;
  - Two others on scenario analysis (one with banks, the other with insurance companies). The Pilot exercise was designed in the context of these working groups. It took about a year to prepare this exercise



# PROCESS

- **2 working groups with the industry** (banks and insurers) set up by the ACPR to discuss scenario selection and pilot exercise
- Workshops and exchange with the **academic community** to discuss available transition scenarios for France, available models and variables, and assumptions
- Reference to **France's commitments and strategy** and alignment with/calibration on the **NGFS scenarios**



# SCENARIO NARRATIVES

The exercise analyses 4 scenarios

## 3 Transition risk scenarios:

- 1 **baseline** scenario and 2 **adverse variants**
- 2 shock variables related to transition risks:
  - **carbon price**
  - **productivity**
- Adverse variants depending on:
  - **Timing** of the shocks
  - **Size** of the shocks
  - Assumptions about technology – **productivity**

## 1 Physical risk scenario: based on “RCP 8.5”



# HEALTH INSURANCE SCENARIOS

- **AON models evolution of health claims due to:**
  - Spread of vector-borne diseases
    - Climate-driven migration of mosquitos or other insects
    - Impacts given by *région* (13 in France)
    - Scenario based on report Drif, Roche & Valade (2020)
  - Increase in air pollution in major metropolitan areas (concentration + peak)
    - Ozone (O<sub>3</sub>), Dioxide nitrogen (N<sub>O</sub><sub>2</sub>), fine particles PM 2.5 + PM 10
    - Impacts given for 10 largest French metropolitan areas
    - Scenario based on report Drif, Messina & Valade (2020)
- **Mortality and sinistrality tables are projected (from 2020 to 2050) for:**
  - Death benefit guarantees
  - Healthcare coverage (hospitalizations and consultations)
  - Work stoppage guarantees



# TIMELINE

**May 2020:**  
publication of the  
provisional scenarios  
and hypotheses for  
the financial year by  
the ACPR for  
consultation;

publication of the  
analytical framework  
by the Banque de  
France

**October to  
December  
2020**  
submission of  
results by  
institutions

**April 2021**  
Publication  
of results



**19 June 2020:**  
end of the  
consultation  
period and  
additional work  
on physical risk. /  
**16 July 2020:**  
update and  
publication of the  
final assumptions  
of the pilot  
exercise

**January - March  
2021:** phase of  
alignment with  
institutions and  
second-round  
effects

**End of 2020/2021:**  
Methodological  
work in particular  
within the  
framework of the  
Finance ClimAct  
project

# References

- [Scenarios and main assumptions](#)
- [Modelling framework and scenario details](#)
- [Guidance and scenario data](#)
- [Governance and climate-related risk management](#)
- [French insurers facing climate change risks](#)
- [French banking groups facing climate change-related risks](#)