



**EUROPEAN CENTRAL BANK**

BANKING SUPERVISION

# 2022 climate risk stress test

---

**Final Results**

**8 July 2022**

ECB-CONFIDENTIAL until publication,  
thereafter ECB-PUBLIC



# The 2022 climate stress test is the ECB Banking Supervision's biennial thematic stress test exercise

## Questionnaire and peer benchmarks (Modules 1&2)

- **104 significant institutions**
- **Rationale:** All significant institutions (SIs) are being assessed as part of the regular climate risk assessments and will be subject to the **new EBA Pillar 3 requirements** (including requirements close to metrics in Module 2)

## Bottom-up projections (Module 3)

- **41 significant institutions**
- **Rationale:** Proportionality principle being applied to factor in **different levels of preparedness** of the banks

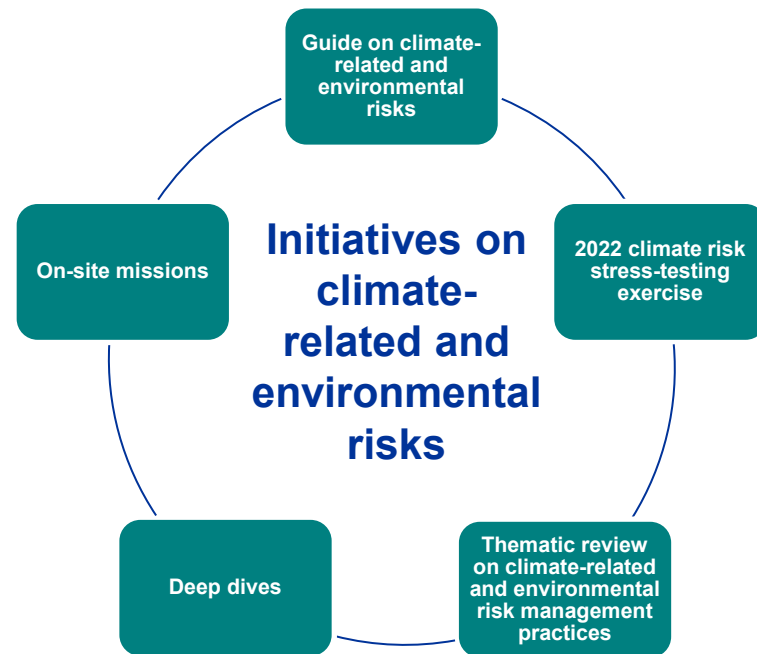
### Objectives

- **Contribute to the overall Supervisory Review and Evaluation Process (SREP)** in a qualitative way. It is not a capital adequacy exercise
- **Joint learning exercise** to enhance banks' and supervisors' ability to assess climate-related risk
- **Make more information available** on climate risk stress-testing
- **Prepare banks** for the upcoming regulatory changes<sup>1)</sup>
- **Leverage** on ECB's stress-testing approach
- **Support other ECB/SSM Banking supervision initiatives**, e.g. thematic review

1) EBA's report on Environmental Social Governance (ESG) risk management and supervision, i.e. inclusion of ESG in SREP and stress-testing.

# Climate stress test within a broader supervisory perspective

- 2022 climate stress test exercise is **part of a broader set of activities** by the ECB to assess supervised institutions' level of preparedness for properly managing climate risk.
- It is complemented by the **thematic review** of banks' climate-related and environmental risk management practices.
- It will seek to comprehensively assess how banks have incorporated these risks into their **strategy, governance and risk management frameworks and processes**.
- Climate risk stress test and thematic review are complemented by **deep dives** (e.g. commercial real estate) and **on-site missions**.



# Recommendations to banks



**Banks need to integrate climate risk stress tests into their ICAAPs (if not the case so far)**



**Banks need to enhance their climate risk stress-testing frameworks to account for various transmission channels and asset classes; they should cover both physical and transition risks**



**Banks need to establish a robust governance structure for their climate risk stress-testing frameworks and integrate climate risk stress test outputs into their banking activities/planning**



**Banks need to incorporate climate risk scenarios into their stress-testing models, reflecting both physical and transition risks, as well as long- and short-term horizons**



**Banks should enhance climate risk management, understand their client's transition plans and strengthen their strategic plans to exploit the opportunities of the green transition**



**Banks need to invest much more in climate-relevant data collection by engaging with customers and improving their proxy assumptions**

# Lessons learnt

## *By banks*

- Banks have **provided comprehensive and innovative information**, giving insight into their climate risk stress-testing capabilities.
- For some areas, **information** is **pioneering** (e.g. climate risk stress-testing parameters)
- **but they:**
  - a) face **significant challenges** in terms of data availability and modelling techniques, affecting quantitative measurements;
  - b) **have not integrated climate risk (59% of their sample)** into their stress-testing framework;
  - c) are **sensitive to credit loss** arising from transition and physical risks;
  - d) are not able to **properly reflect transition paths** in their long-term strategies.

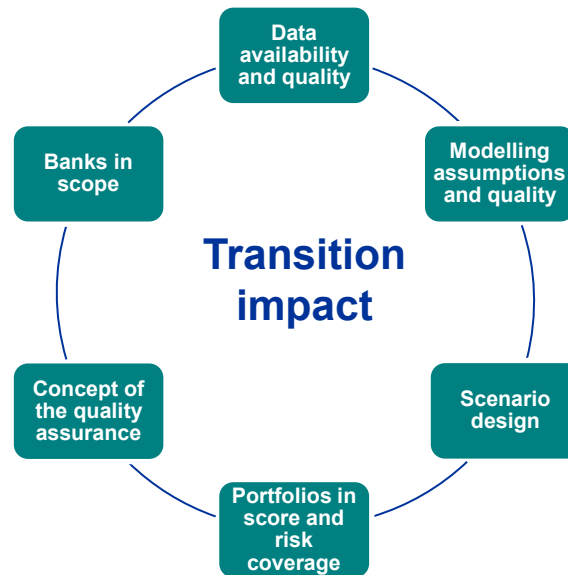
## *By supervisors*

- Supervisors have gained valuable insight into banks' **climate risk stress-testing frameworks and capabilities**.
- Supervisors have a good overview of **data availability and use of proxy information**.
- Supervisors have gained **insight into vulnerabilities** of banks' business models to climate risk
- **but they need to:**
  - a) reflect further on developing **bottom-up stress scenarios**;
  - b) enhance **methodological approaches** (e.g. market risk, holdings);
  - c) help banks overcome challenge of **data availability**;
  - d) provide **guidance on “best practices” (2022H2)**.

## Conclusions

# Quantitative findings should be interpreted with caution

- Projecting<sup>1)</sup> banks reported **€70bn of aggregate losses** under the 3 short-term exercises (3-year disorderly transition and the two physical risk scenarios)
  - €53bn losses reported under the short-term disorderly transition scenario
  - €17bn losses reported under the short-term physical risk scenarios (drought & heat risk and flood risk)
- This **may significantly understate** the actual transition risk:
  - benign scenarios** where climate shocks are not accompanied by an **overall economic downturn**
  - narrow risk coverage and reported exposures** targeting specific portfolios<sup>2)</sup>
  - banks data and modelling capacity** is at preliminary stage with still limited sensitivity to climate factors
- no supervisory overlays** applied in the bottom-up projections reflecting the learning nature of the exercise



1) 41 banks were requested to provide projections.

2) The exposures in scope of this exercise only account for around one third of total exposures of the 41 banks.

# “Good practices”

- **Despite challenges, some banks have shown that these can be overcome:** the following “good practices” were identified for certain elements of banks’ climate risk stress-testing capabilities:
  - **Climate risk stress-testing framework:** Some banks established robust stress-testing frameworks by the cut-off date, some of which were also included in the ICAAP. They also integrated various transmission channels and asset classes.
  - **Sectoral Income:** Some banks used counterparty/transaction-level internal data sources for at least 90% of their reported income (both for interest income and fees and commission income).
  - **Greenhouse gas (GHG) proxies (Scope 1-2):** Some banks incorporated actual emissions data (i.e. reported by firms) in at least 50% of the cases, based on internal collection efforts and purchase of datasets. Also reported using adequate waterfall approaches to proxy the rest of the data.
  - **GHG proxies (Scope 3):** A few banks reported 1/3 of scope 3 emissions based on actual data; controlling whether obtained S3 emissions include all relevant GHG protocol categories.
  - **Credit risk modelling:** A few banks considered both direct and indirect transmission channels in line with the scenarios. Also acknowledged the long-term scenario narratives in projections and business strategies. Integrated both physical and transition risks. Performed counterparty level analysis using actual data for a single portfolio; adequate extrapolation techniques using proxies.

# The 2022 climate risk stress test in a nutshell



Scope & methodology

- **Module 1:** Qualitative assessment of **climate risk stress-testing framework**
- **Module 2:** Stock-take on: (i) **sustainability** of banks' **income** and; (ii) **financed GHG emissions**
- **Module 3: Bottom-up** stress test loss **projections** (subset of sample)



Climate risk scenarios

**Transition risks** based on NGFS<sup>1)</sup> scenarios:

- identify short-term tail risks (3 years)
- analyse long-term transition paths (30 years)

**Physical risks** for Europe:

- flood risk (1 year)
- drought and heat risk (1 year)



Output report

- **Climate risk stress-testing capabilities**
- **Peer benchmark** of profitability-vulnerability and GHG emissions
- Impact from **credit risk, market risk, operational / reputational risk** based on qualitative assessment
- **Benchmark vulnerabilities** to transitional and physical risks

**SREP integration**

1) Network for Greening the Financial System



# Long-term climate change scenarios capture different implications in terms of transition and physical risk

	Orderly transition	Disorderly transition	Hot house world (HHW)
Average increase in global temperature	1.5°C	Below 2°C	By more than 3°C
Amount of CO2 emissions	Global net zero CO2 emissions reached around 2050	Global net zero CO2 emissions achieved around 2050	Global CO2 emissions remain relatively constant until 2050
Level of transition risk	Relatively low	High	Relatively low
Level of physical risk	Relatively low	Relatively low	Increase until the end of the century

**The three long-term scenarios are largely based on the NGFS net zero 2050 (orderly), delayed transition (disorderly) and current policies (HHW) scenarios.**

# Short-term scenarios focus on significant increase in energy costs and impact of extreme weather events

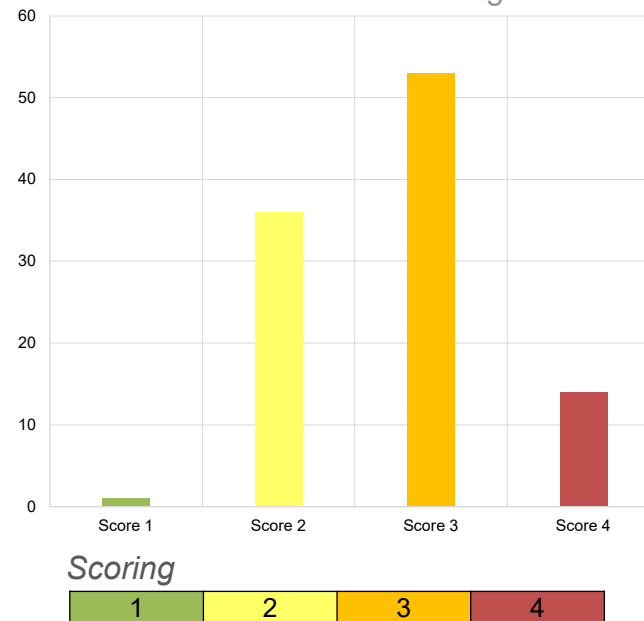
	Disorderly transition	Flood risk	Drought and heat risk
Risk type	Transition	Physical	Physical
Main channel	Immediate and substantial increase in carbon prices	Extreme floods in EU in the first quarter of 2022	Long heatwaves in EU in the summer of 2022
Design	An increase in carbon prices corresponding to the five most adverse years of the NGFS disorderly transition scenario	Total losses due to floods' impact on asset and properties in 2022 of €100 billion. The JRC Flood Risk Index allows to differentiate losses across regions and countries	Adverse country-level productivity shocks for EU countries

**The short-term scenarios reflect the risks of an immediate disorderly transition, with sharp increases in carbon prices and the materialisation of acute physical risks.**

# Despite making progress, banks have considerable climate risk stress-testing challenges

- Banks' climate risk stress-testing capabilities and vulnerabilities to the materialisation of climate risk were assessed on the basis of both **qualitative** and **quantitative** information collected in the exercise.
- Overall, **despite notable progress** and banks' ability to provide meaningful input to the exercise, and even considering the **“learning”** nature of the exercise, **the large majority of banks** revealed **considerable deficiencies**.
- **Going forward**, banks need to improve their climate stress-testing frameworks and be **mindful of the overall associated impacts**.

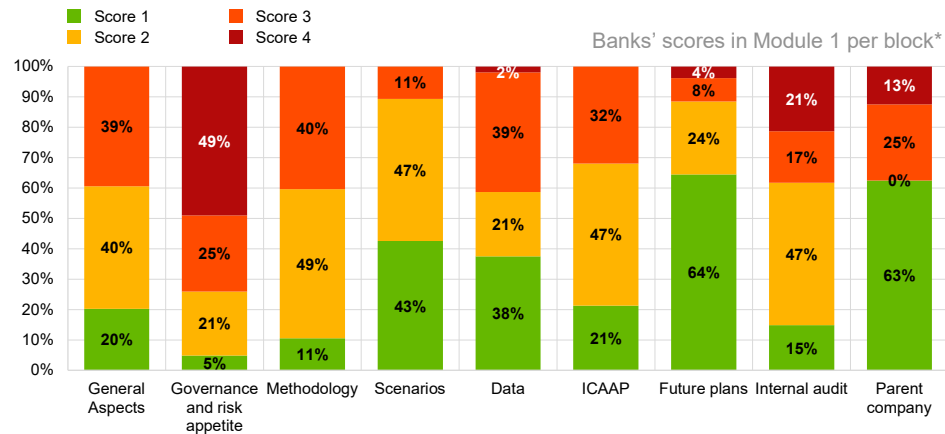
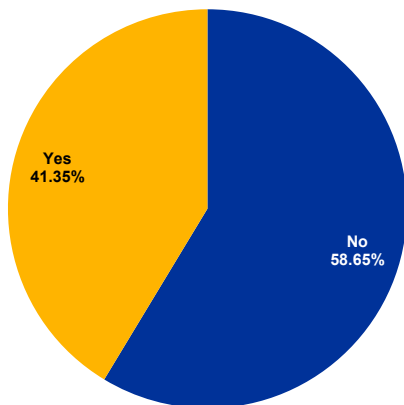
Banks' global score



Notes: The coloured scoring combines qualitative and quantitative assessments of banks' submissions across the three modules of the exercise. Scoring grades from 1 to 4 (with 4 being the worst score).

# Banks' climate risk stress-testing capabilities

Is climate risk currently included in the institution's stress test framework? (%)

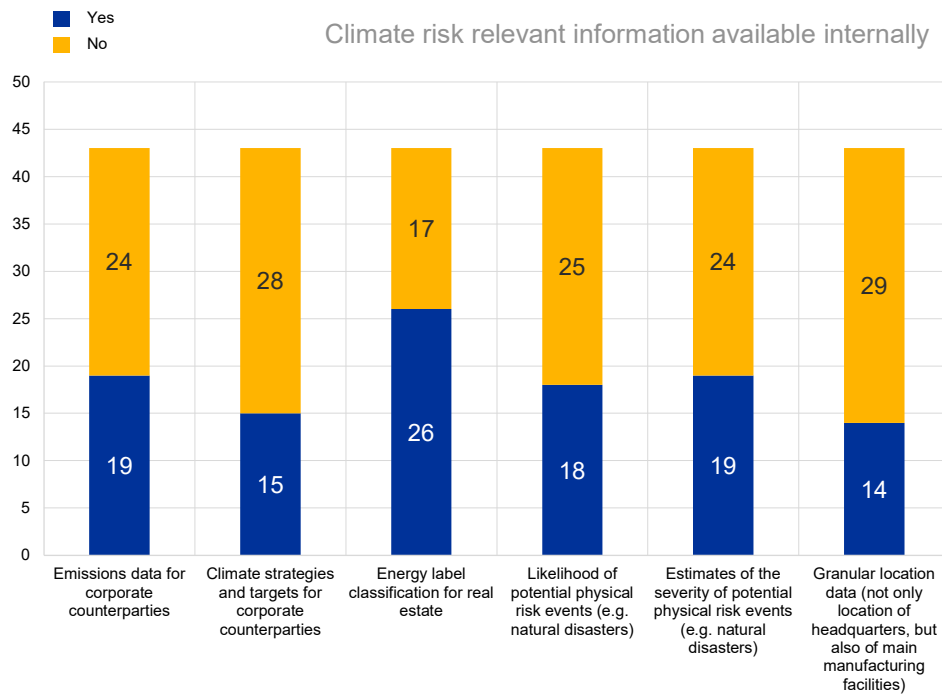


- **59% of banks have not integrated climate risk** into their stress-testing framework
- **Climate risk coverage** (e.g. transition and/or physical risks) requires further enhancements
- **Governance remains an issue for most of the banks with a framework**, there is a lack of independence between development and validation
- A large share of banks do not use climate risk stress test outcomes to inform their **business strategies**

\* Banks without a climate risk stress-testing framework reply to specific questions of blocks 1, 2, 4, 6 and 8

# Availability of climate risk-relevant counterparty data

- Relevant climate related information is not (or only partially) available for many banks.
- For five of the six requested information categories, **half of the 43 banks<sup>1)</sup> indicated no internal availability.**
- For most of the 43 banks, **energy label classification information<sup>2)</sup> for real estate** is internally available.
- While **data on counterparties' transition strategies** and **locations** are not.

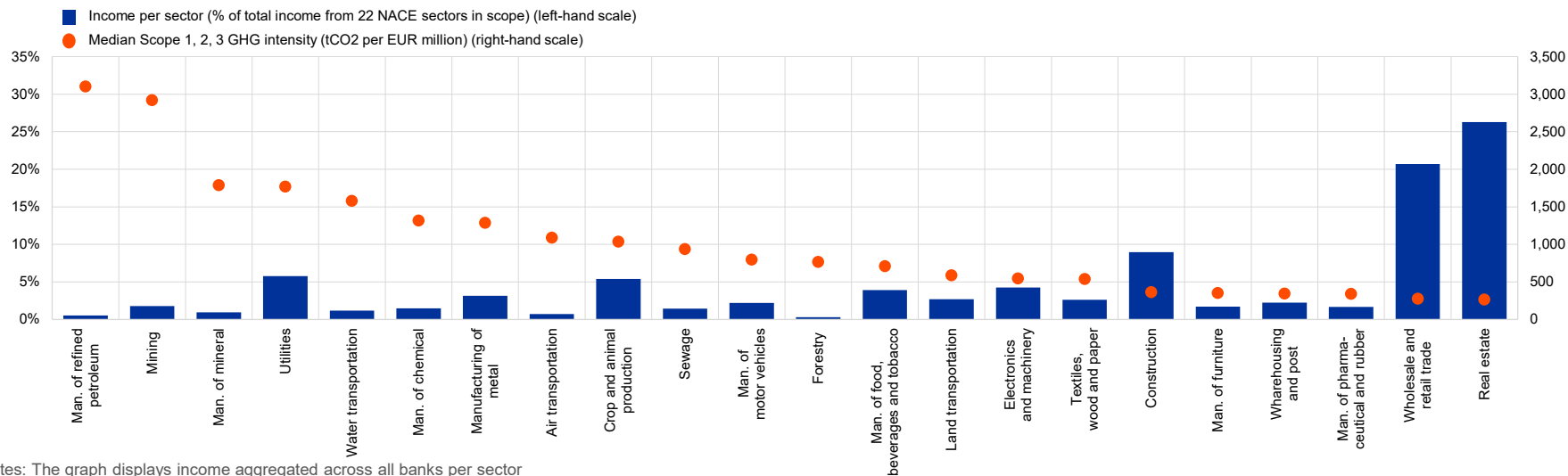


1) Question applied only to those banks that have a climate risk stress-testing framework in place.

2) Information refers to both actual and proxied data with the latter constituting a major part (see also slide 16).

# Income from financing of carbon-intensive industries

- Banks generate **considerable share of their income from the 22 climate-relevant GHG-intensive sectors**, amounting to 65.2% (full sample median) of total interest income from non-financial corporations<sup>1)</sup>
- Among these sectors, most income is generated from relatively lower carbon intensive sectors (e.g. real estate), while **higher-emitting sectors (>1,000 tCO<sub>2</sub>/mln€) still account for 21% of reported income**



Notes: The graph displays income aggregated across all banks per sector (Metric 1). Median scope 1, 2, 3 intensity per sector relates to Metric 2 information.

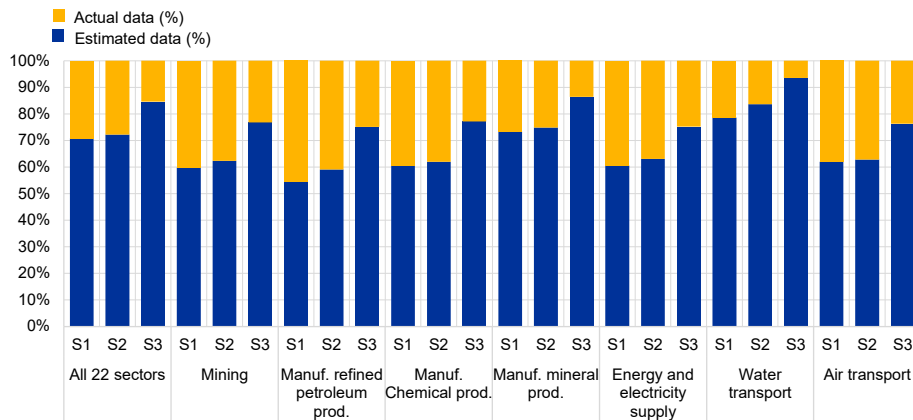
1) Total balance sheet income as provided by banks in their supervisory reporting

## Horizontal analysis of aggregate results

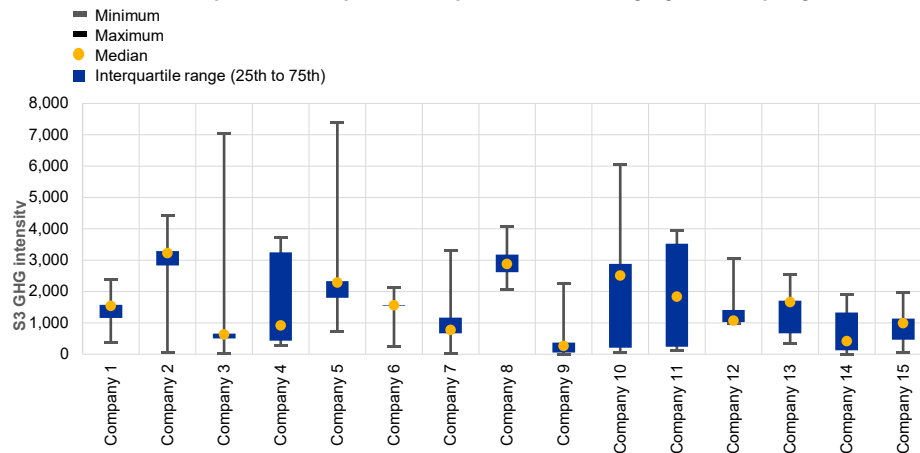
# Deficiencies in emissions data

- Banks **strongly rely on estimated data** and the use of proxies to report **Scope 1,2,3** emissions.<sup>1)</sup>
- Proxies are a first step towards **closing the data availability gap**,
- **but various proxy techniques or data sources greatly influence the reported data**, leading to deviations in reported scope emissions for the same counterparty across banks.
- ECB Banking Supervision to **analyse further** the underlying assumptions of the proxies (H2 2022).

Relative use of actual data vs proxies for reporting of Scope 1-3 emission data



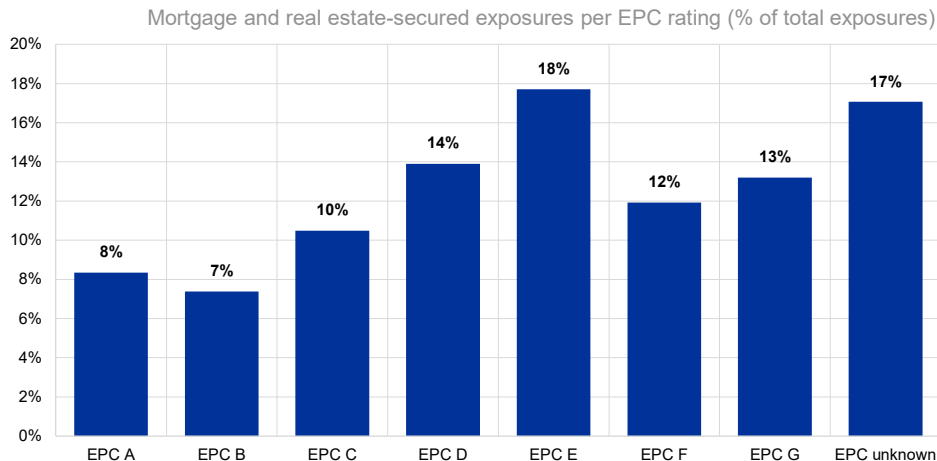
Dispersion of reported Scope 3 GHG intensity by counterparty



1) Scope 1: direct emissions from activities under control of the company; Scope 2: indirect emissions from purchase and use of electricity, steam, heating and cooling; Scope 3: other indirect emissions from sources not under control of company.

# Deficiencies in energy performance certificate data

- While energy performance certificates (EPCs) are mandatory in the EU for real estate transactions, **banks were unable to allocate 17%** of the reported collateral to an **EPC bucket**.
- **Around 65% of the banks** predominantly **rely on proxies**.
- **For proxies**, most banks use the **construction year** or **energy costs of the collateral** as the main input factors.

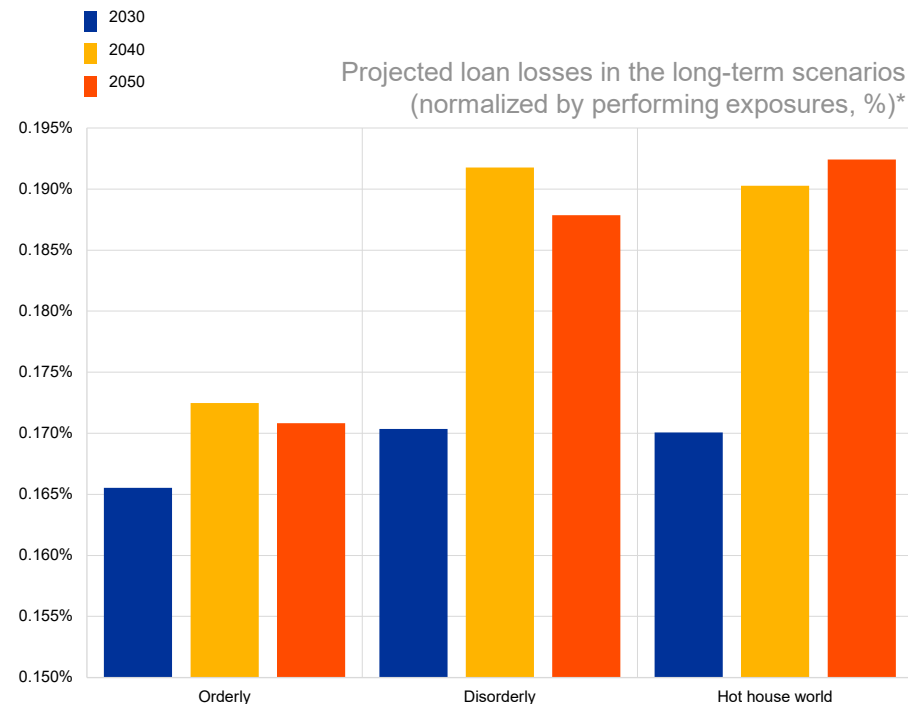


**Banks are to reflect on the robustness of proxies' assumptions.**  
**Heterogeneity across EPC frameworks across country is a drawback**



# Long-term transition scenario impact

- Results show that **an orderly green transition will lead to lower loan losses** than a disorderly one or no policy actions at all.
- This is in line with the ECB's [top-down 2021 Economy-wide climate ST](#).
- The combination of overall **mild scenarios** and banks' **projected reductions in exposures** to highest-polluting sectors lead to relatively modest projected loan losses.
- Weaknesses in banks' climate stress-testing capabilities **affect the accuracy of quantitative results since**:
  - the dynamics of the sector-specific shocks are not fully captured;
  - the differentiation of the long-term scenario narratives is not sufficiently considered.

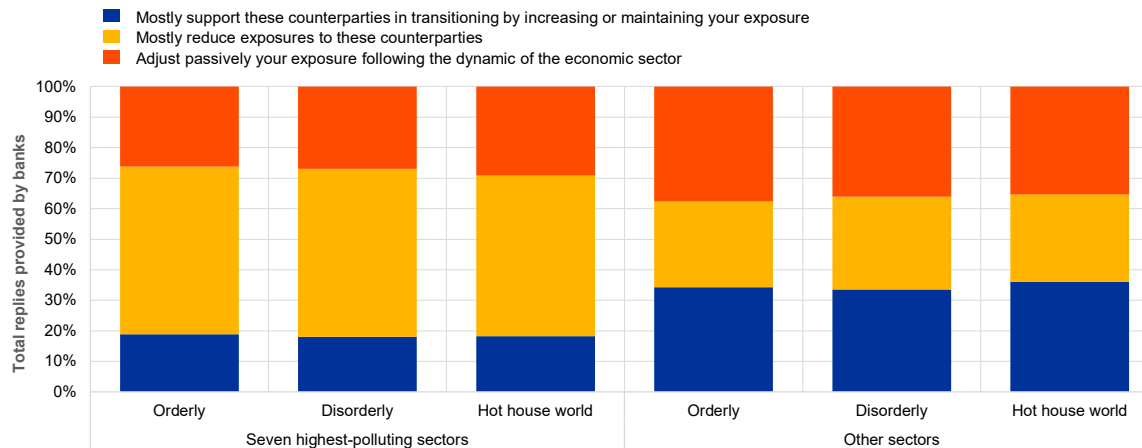


\* Data refer to banks that have provided projections.

# Banks' long-term projections of credit allocation policies

- **Long-term strategies to adapt to different climate risk scenarios are not clearly defined by banks**, showing little differentiation between different scenarios.
- Banks show some tendency towards **reducing exposures** to the highest-polluting counterparties, while indicating **transition support** for lower carbon-emitting sectors.

## Reported responses by bank for long-term transition scenarios \*

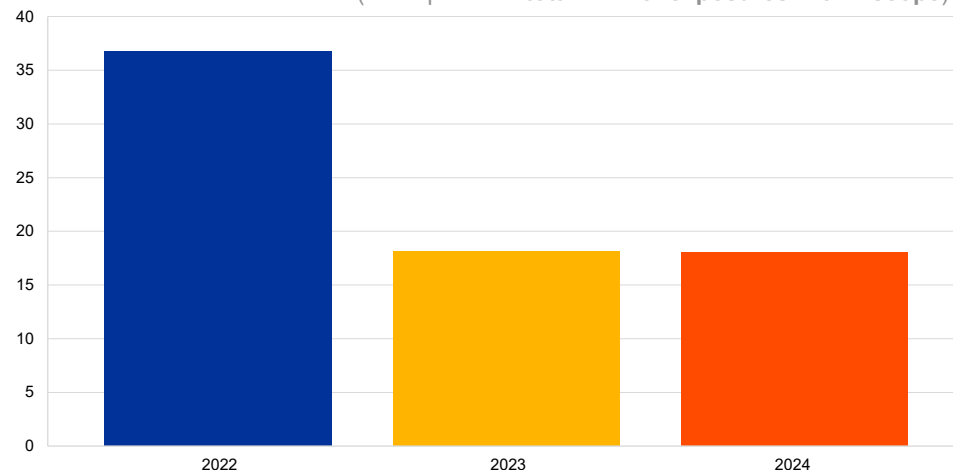


\* Data refer to banks that have provided projections.

# Earlier materialisation of transition risk projected to increase credit impairments

- Banks in better position to model short-term climate losses<sup>1)</sup>, but **shortcomings were identified.**
- Cumulative impairments under the short-term disorderly transition scenario **projected to be more than 70 basis points higher** than under the baseline scenario, though absolute impact should be considered in conjunction with the benign scenario structure.
- The increase is mainly driven by **highest-polluting sectors** such as refined petroleum and mineral products, mining and land transportation.
- The **main drivers of losses are:**
  - steep **increase in carbon prices** to reach a net zero emitting economy
  - **sectoral output losses in carbon-intensive sectors**

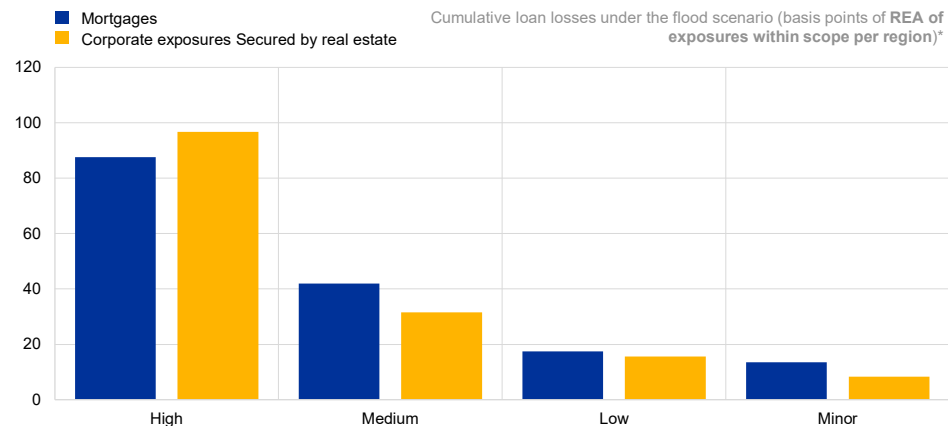
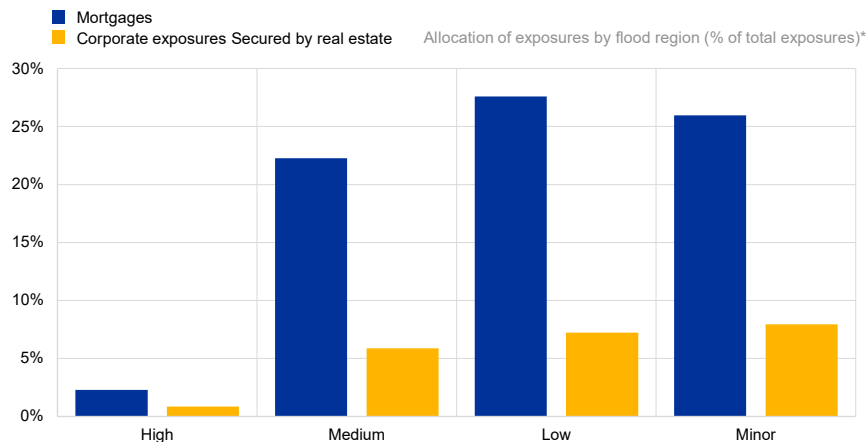
Loan losses in the short-term disorderly scenario vs baseline scenario  
(basis points of **total REA of exposures within scope**)\*



\* Data refer to banks that have provided projections. Only the credit-risk exposure amount (REA) for the portfolios and sectors within the scope of the climate risk stress test are considered here. Does not directly translate into capital depletion.  
1) When compared to their long-term projections.

# Most banks have low exposures to flood-risk areas

- Most banks report **low allocation of exposures to high flood-risk areas**.
- **Exposures to high and medium flood risk regions** account for half of the losses with an exposure share of just 31%.
- Less than 25% of banks included **private insurance coverage** in their projections. For half of those banks, it covers a large amount of the collateral loss (>50%)



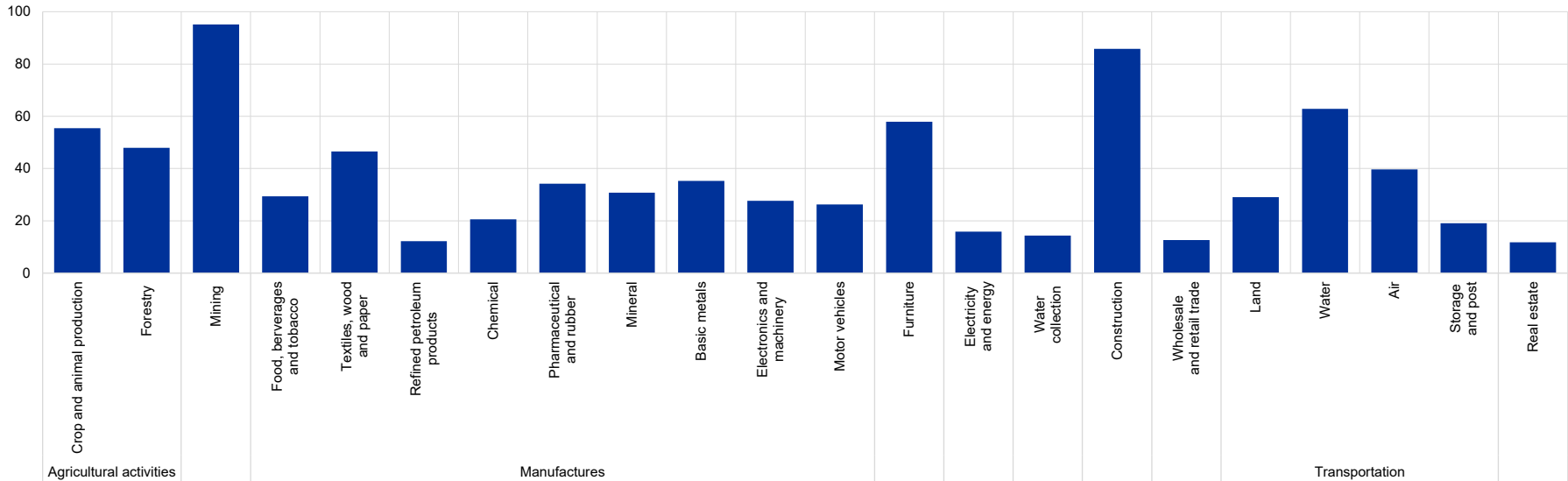
\* Data refer to banks that have provided projections. Only the credit-risk exposure amount (REA) for the portfolios and sectors within the scope of the climate risk stress test are considered here. **Does not directly translate into capital depletion.**

Horizontal analysis of aggregate results

# Credit losses in some sectors are strongly impacted by a drought and heat scenario

- Severe drought and heat events lead to higher credit losses, especially on exposures to **mining**, **construction** and **agricultural activities**, particularly in regions more vulnerable to high temperatures

Loan losses in the drought and heat vs baseline scenario  
(basis points of the REA of exposures within scope per sector\*)



\* Data refer to banks that have provided projections. Only the credit-risk exposure amount (REA) for the portfolios and sectors within the scope of the climate risk stress test are considered here. **Does not directly translate into capital depletion.**

# Integration of stress test results into the SREP

Two main climate risk-related exercises are considered in the **2022 SREP cycle**:

1. **2022 climate risk stress test**; and
2. **thematic review of expectations in the ECB Guide on climate-related and environmental risks**

Joint Supervisory Teams (JSTs) are currently assessing the outcomes of these two exercises as part of the 2022 SREP based on dedicated guidance. This guidance focuses on integrating the input from the two exercises into the SREP assessments in a qualitative manner, focusing mainly on the areas of business model and internal governance and risk management.

**These exercises will not have any direct quantitative impact**, although it was agreed that an **indirect impact** might arise **through** the potential impacts on the **SREP scores**.

# Integration of stress test results into two SREP elements

## Element 1 - business model assessment

JSTs to consider the impacts from two perspectives:

- **Materiality** – JSTs are asked to assess the impact on the business model from **two perspectives**, both the materiality of the risk and the preparedness of the institution. **Information from both the climate risk stress test and the thematic review have facilitated this assessment.**
- **Preparedness** – JSTs to **assess** the institutions' **alignment with ECB's expectations** in terms of their capacity to adequately manage the specificities of climate risk on their business models.

## Element 2 - internal governance and risk management

Climate risk stress test – together with thematic review – will be relevant from several governance perspectives.

- Supervisors are **assessing the responsibility for the management of ESG risks within the organisation**, e.g. management body and internal controls, in accordance with the **three lines of defence model**.
- Supervisors are also assessing the **embedment of ESG risks within the risk management framework**, along with the **adequacy of data reporting facilities** to ensure **effective oversight** and **enable informed decisions**.

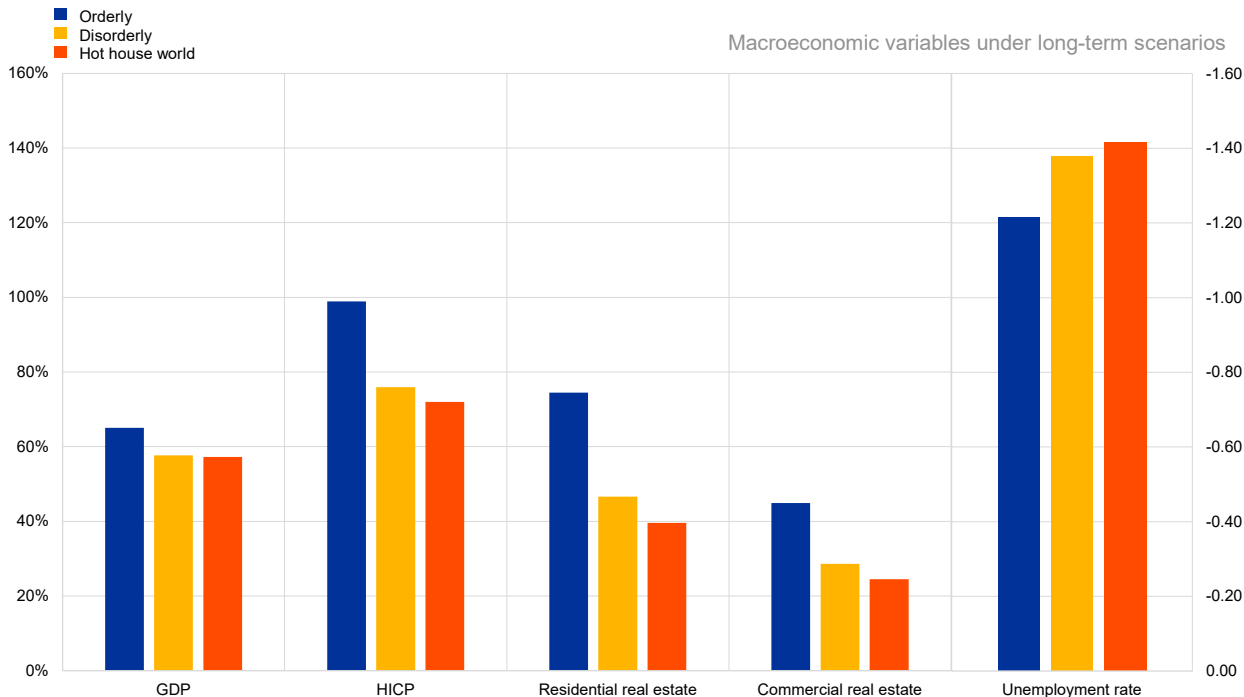
# ECB will follow up with guidance on “best practices”

- Following the completion of the exercise, more in-depth analyses of banks' stress test submissions are being planned to **identify best practices and recommendations** for banks on how to overcome key obstacles to developing sound climate risk stress-testing frameworks.
- **Guidance on “best practices”** is envisaged towards the end of 2022 and will complement other follow-up work (e.g. from the thematic review).
- Best practices and lessons learnt from this exercise will also feed into discussions about **future supervisory climate risk stress tests**.



# Annex

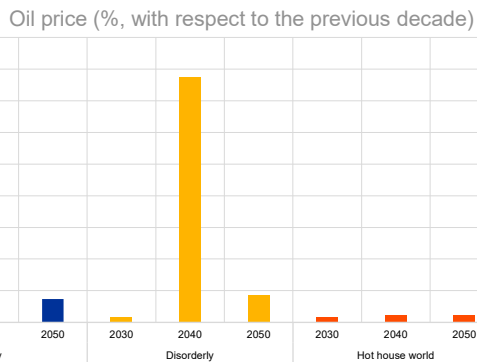
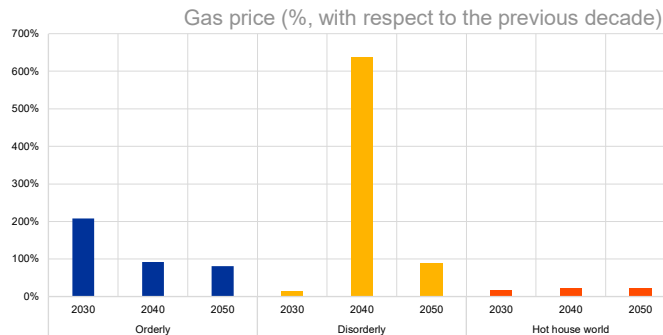
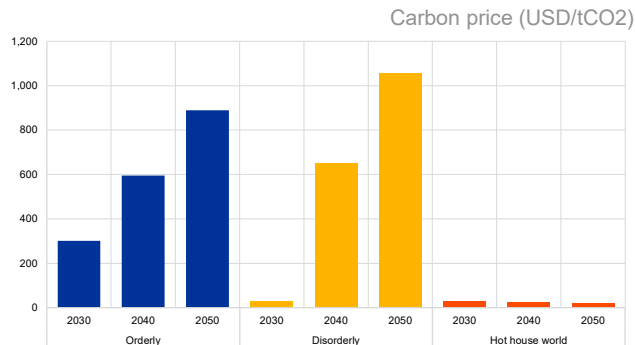
# Long-term scenarios project favourable economic outlook – but more so in an “orderly” transition



- The long-term scenarios forecast **benign macroeconomic outlooks**, with all the countries growing (at different rates depending on how abruptly transition policies are implemented).
- **Unemployment levels improve** for the majority of the considered countries.
- Cumulative HICP remains positive each year under the scenario, **ruling out deflationary periods**.

Note: Unemployment figures show to cumulative percentage point changes, with respect to starting point.

# Impact under the long-term transition scenarios stems from carbon prices channeling policy decisions

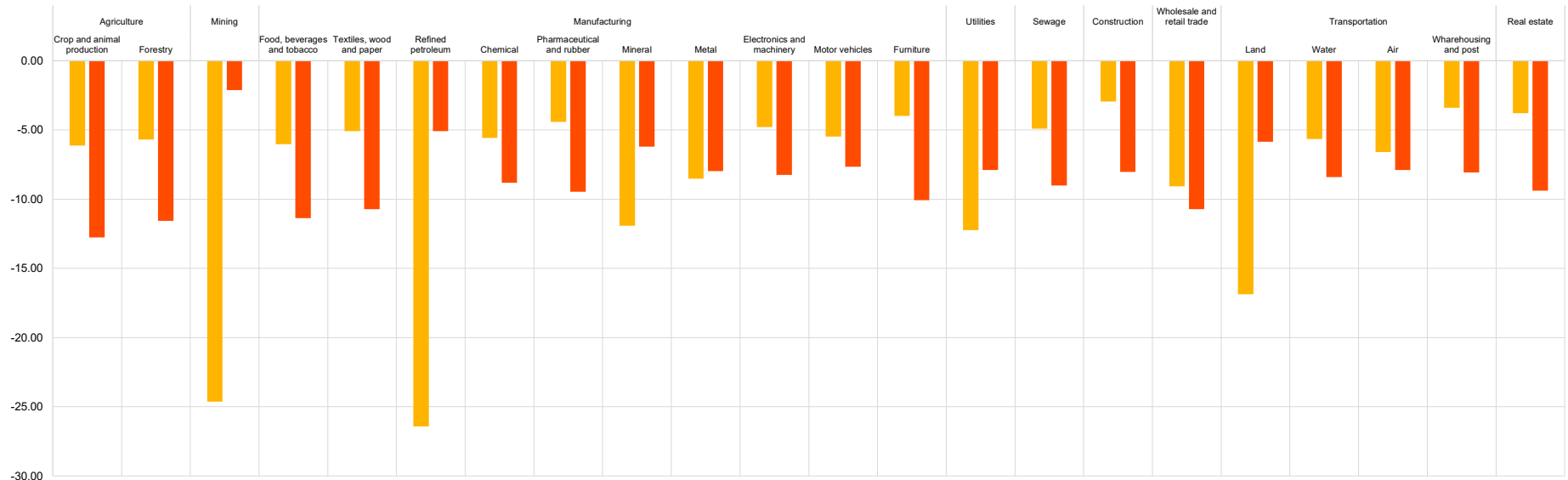


- **Carbon prices are the main driver of the transition.**
- This has implications for prices of other non-renewable energy sources and subsequently for sectors dependent on using these resources.

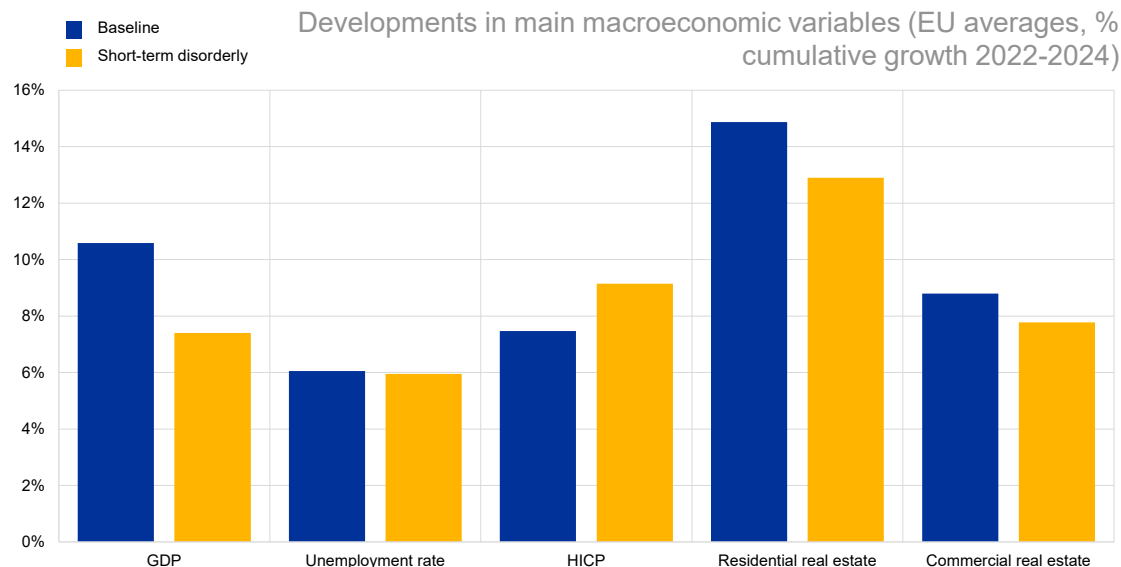
# Shock to carbon prices affects sectors differently, depending on carbon intensity of sector

■  $\Delta$  disorderly vs orderly  
■  $\Delta$  hot house world vs orderly

Gross value added deviation from the long-term orderly scenario (percentage points)



# Short-term scenario projects a favorable economic outlook – but worsening against baseline scenario

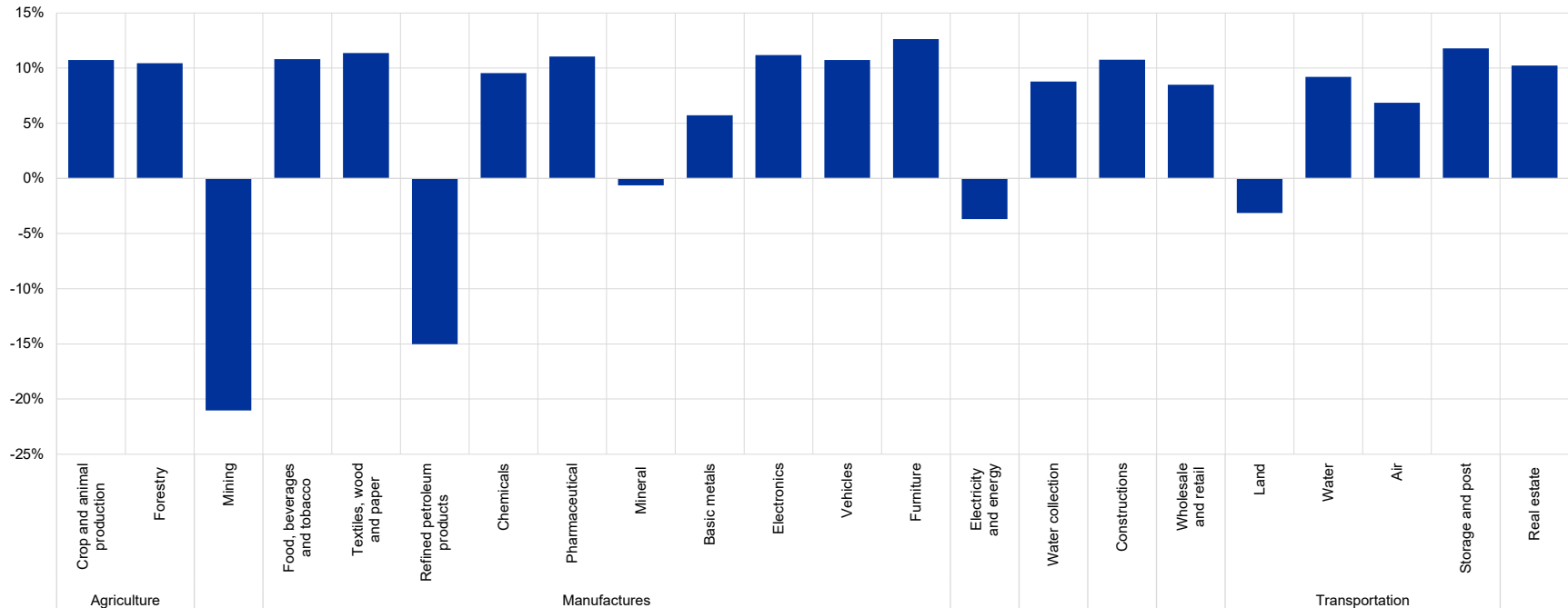


- Short-term scenario forecasts a **benign macroeconomic outlook**, with a positive GDP for 2021-2024.
- **Unemployment levels improve** for majority of the considered countries.
- Cumulative HICP remains positive each year under the scenario, **ruling out deflationary periods.**

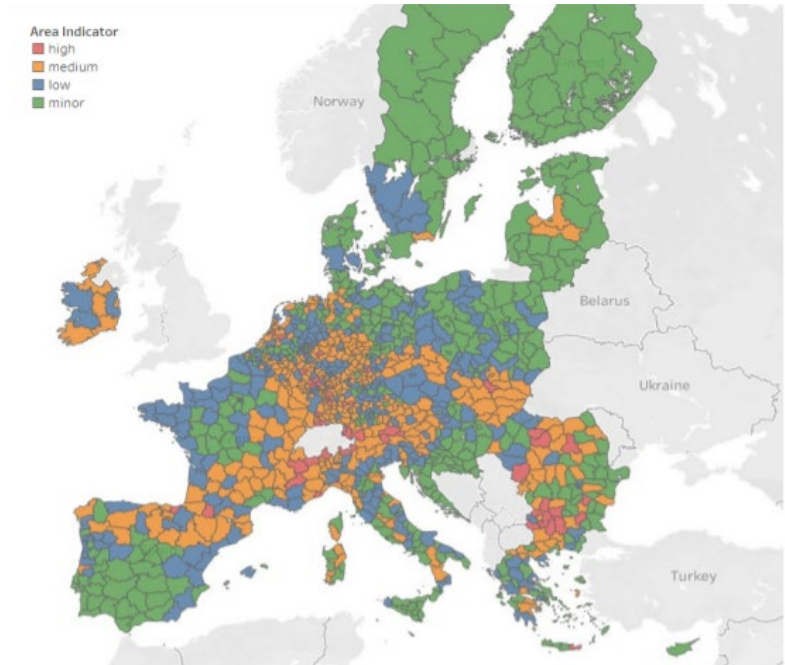
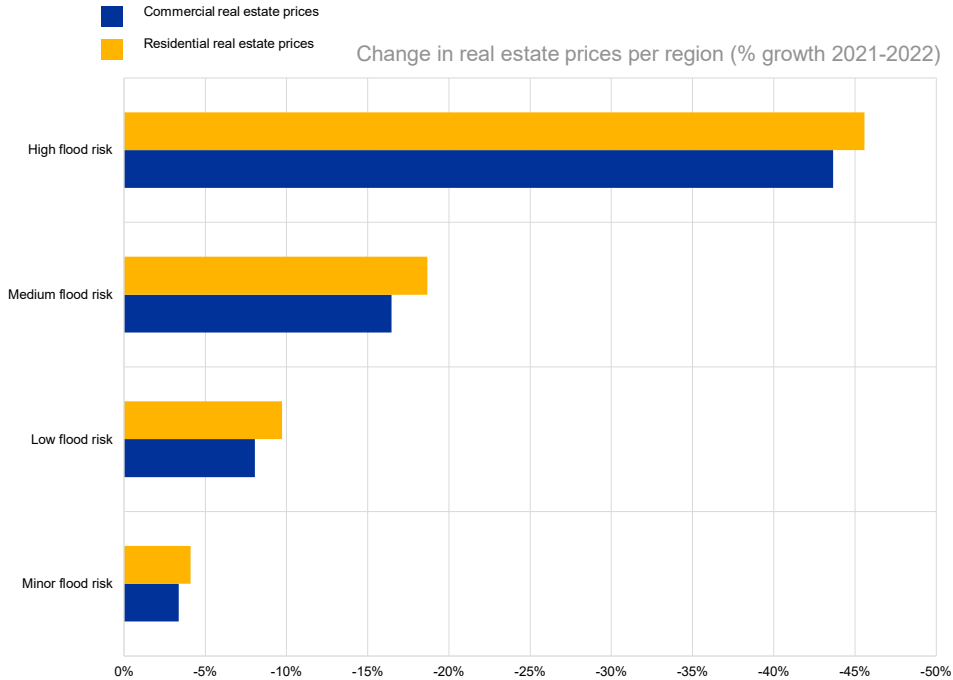
Note: Unemployment figures show to unemployment rate (as % of labor force) at the end of the scenario.

# Shock to carbon prices affects sectors differently, depending on their carbon intensity

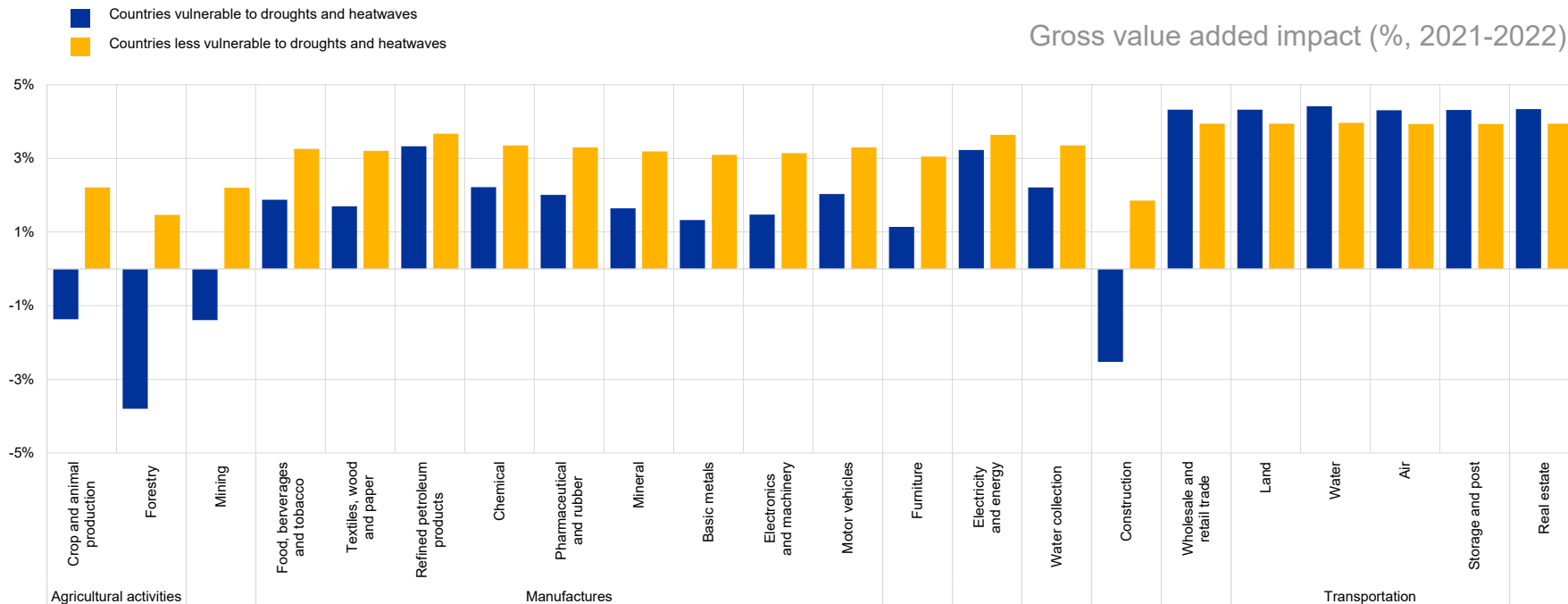
Gross value added under short-term disorderly scenario (EU average, %, 2022-2024)



# Flood risk scenario map: regions and shocks



# Under drought and heat scenario, sectors and countries are affected differently by extreme temperatures

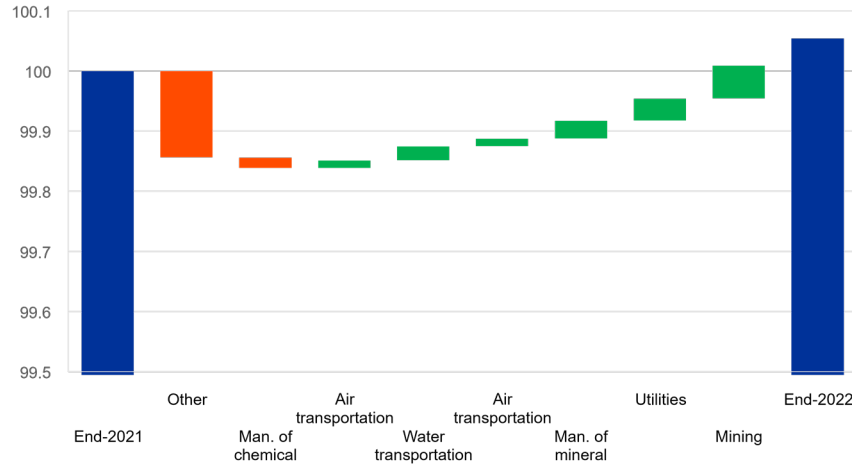




# Banks' net fair value positions affected by corporate bonds portfolio; positive impact from equity

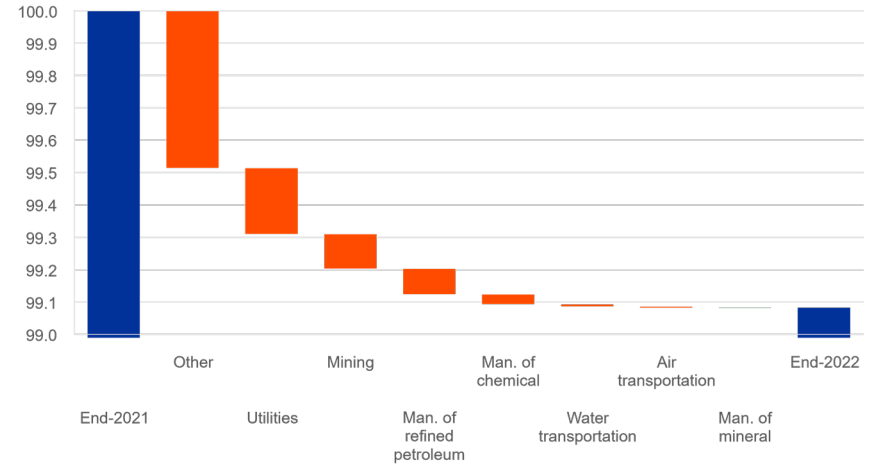
Net equity positions

Sectoral change in fair value (index: fair value of net positions in 2021 =100)



Net corporate bonds positions

Sectoral change in fair value (index: fair value of net positions in 2021 =100)



- **One-year materialisation of transition risk** leads to a small decline in the net fair value positions of banks' corporate bond portfolios. <sup>1)</sup>
- Marginal positive impact is shown for the equity portfolio, where banks “benefit” from their hedges.

<sup>1)</sup> Market risk applies to 27 banks in the climate risk stress test sample.

# Banks consider climate-related effects more in operational risk than in reputational risk

- Of the 40% of banks that have a climate risk stress-testing framework in place, 74% include climate-related and environmental events in their **operational risk stress-testing or scenario analysis framework**.
- This is true for only 38 % of banks which include them in their respective **reputational risk framework**.

Inclusion of operational and reputational risk in stress-testing/scenario analysis framework

