Grant Thornton

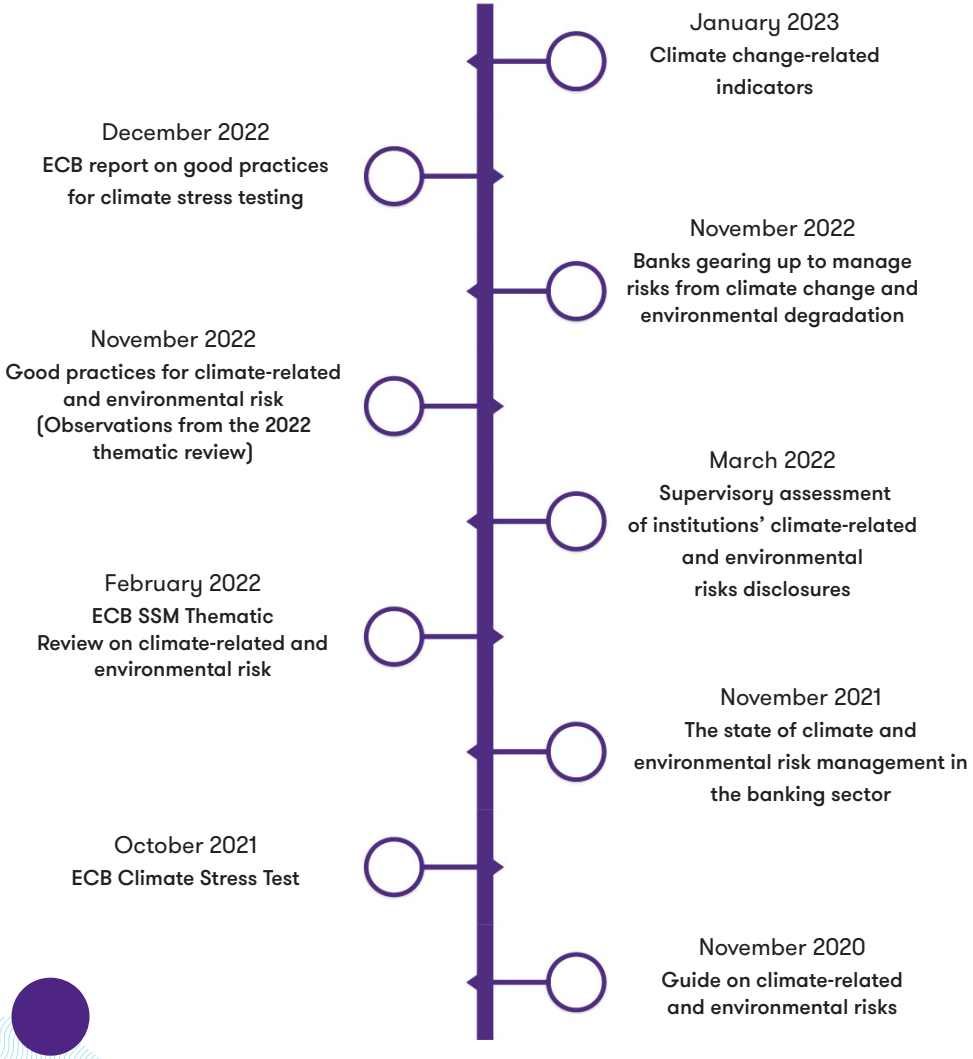
Fast Read Summary of ECB Publications on Climate-related and Environmental (C&E) Risk from 2020 to present

April 2023

Executive Summary

Path to the Next Climate Stress Test

Over the last few years the ECB have published a series of guidance and best practice publications in the Climate and Environmental (C&E) risk area. These publications and best industry practices indicate that while banks have made progress in incorporating climate-related risk, there is a high level of inconsistency in certain practices and also areas for improvement. The ECB's supervisory reports aim to provide banks with examples and suggestions to improve their internal methodologies and processes.



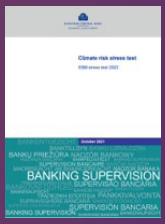
The purpose of this publication is to provide an executive summary of all the key ECB publications that provide guidance or discuss the best practices observed within the industry.

Nov 2020

Guide on Climate-related and Environmental Risks

In November of 2020, the ECB introduced 13 expectations for banking institutions outlining the requirements of how banks should approach C&E Risk Management. These expectations put emphasis on the strategic approach for C&E risk management including risk assessment, quantification and stress testing across Credit, Market, Operational and Liquidity Risk.

Read the full publication



Oct 21 & Jul 22

ECB Climate Stress Test Methodology and Results

On July 8th, 2022, the European Central Bank (ECB) published the results of the Climate Stress Test 2022 related to climate change. The exercise was defined in October 2021 and focused on climate-related risks, both transitional and physical. The aim was to make a comprehensive assessment relevant to the way banks incorporated climate risks into their strategy, governance, and risk management frameworks and processes.

Read the full publication

Feb 2022

ECB SSM Thematic Review on Climate-related and Environmental risk

The report, published in February 2022, reviews climate-related and environmental risks, considering them as priority for the ECB for 2022-2024. Not only does it describe the supervisory requirements to be met by banks, but it also presents the methodology to be followed by the Joint Supervisory Teams (JST) and how future assessments will take place.

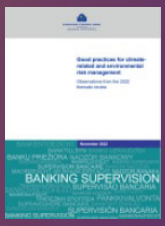
Read the full publication

Mar 2022

Supervisory assessment of institutions' Climate-related and Environmental Risks Disclosures

The report shows that while progress has been made in some areas, most institutions still need to make significant efforts to transparently disclose their exposures to climate-related and environmental risks, and improve their disclosure practices. The ECB's objective is to address key gaps in their disclosures and accelerate their preparation for upcoming technical requirements. This is in line with the European Commission's objectives for sustainable finance.

Read the full publication

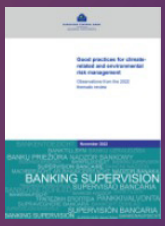


Nov 2022

Good Practices For Climate-related and Environmental Risk

This supervisory publication displays examples of good practices and observations from significant institutions to align their actions with expectations set in the C&E Guide published in November 2021. The ECB intends to meet the industry's demand for practical knowledge through this compilation, and it should be read in conjunction with the ECB's report on good practices in the climate-related stress test.

Read the full publication



Nov 2022

Banks Gearing up to Manage Risks From Climate Change and Environmental Degradation

Banks acknowledge the significance of physical and transitional risks in their current business planning horizon and have developed institutional frameworks to address climate-related risks. However, many institutions still need to improve their coverage of risk drivers. The ECB requires them to fully align with expectations by the end of 2024. The ECB has also observed good practices in addressing broader environmental risks.

Read the full publication

Dec 2022

ECB Report on Good Practices for Climate Stress Testing

The 2022 ECB climate stress test has helped banks to develop their climate-related risk stress testing capabilities, but the ECB acknowledges the challenges in sourcing relevant data for analyzing climate-related risks. The report highlights inconsistencies and diversity across banks' practices and scope for improvement, based on information collected during the exercise. Good practices have been identified, but the ECB expects banks to further develop their frameworks, data, and analytical capabilities to progress beyond these examples.

Read the full publication

Jan 2023

Climate Change-Related Indicators

The European Central Bank (ECB) recognizes the dangers that climate change presents to both the economy and the financial sector. As part of its responsibilities, the ECB is dedicated to addressing these issues by managing the impact of climate change on monetary policy and the financial system, promoting the shift to a net-zero economy, and improving transparency regarding climate-related matters. To achieve this effectively, there is a need for accurate data and comprehensive indicators.

Read the full publication

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Publication Details

ECB Guidance on the Integration of Climate-related and Environmental Risks

November 2020

Read the full publication

The 13 expectations, and 43 sub-expectations impact all parts of a financial institution's operating model. Over the course of the last two years, the ECB have made clear the importance they attach to climate-related and environmental risk, and their intention to increase their supervisory activities in this area.

ECB Guidance on the Integration of Climate-related and Environmental Risks

Institutions are expected to:

- **Understand the impact of C&E risks on the business environment** in which they operate, in the short, medium and long term, in order to be able to make an informed strategic decision.
- **Determine** which C&E **risks impact** their business strategy in the **short, medium, and long term**, for example by using (stress) scenario analyses.

- **Explicitly allocate roles and responsibilities** to management body members and/or its sub-committees for C&E risks.

- Explicitly include climate-related and environmental risks in their **risk appetite framework**.

- Assign climate-related and environmental risks within the organisational structure in accordance with the **three lines of defense model.**

- Report aggregated risk data that reflects their exposures to climate-related and environmental risks with a view to enabling the management body and relevant sub-committees to make informed decisions.

- Identify and **quantify** climate-related and environmental risks within their overall process of ensuring capital adequacy **and include them into ICAAP.**

- Climate-related and environmental risks are expected to be **included in** all relevant stages of the **credit-granting process** and credit processing. Specifically, institutions are expected to form an opinion on how climate-related and environmental risks affect the borrower's **default risk and collateral valuations.**

- Material climate-related and environmental risks should be included in **stress testing** - baseline and adverse scenarios.

- **Publish meaningful information and key metrics** on climate-related and environmental risks that they deem to be material, with due regard to the European Commission's Guidelines on non-financial reporting.

Good Practices for Climate-related and Environmental Risk

November 2022

Read the full publication

This supervisory publication displays examples of good practices and observations from significant institutions to align their actions with expectations set in the C&E Guide published in November 2021. The ECB intends to meet the industry's demand for practical knowledge through this compilation, and it should be read in conjunction with the ECB's report on good practices in the climate-related stress test.

Key Areas of Focus

Materiality
- Identifying Risk Drivers
- Identifying Exposures

Governance & Risk Appetite
- Data Collection
- Client Questionnaires
- Third Party Providers

Business Strategy
- Strategic targets and Risk appetite
- Risk Management Tools
- Product Offering

Risk Management
- Stand-alone Scorecard
- Integration into PD-rating systems

"Good Practices" Highlights

1

Bottom-up risk identification process to identify relevant risk drivers.

2

Qualitative and quantitative approaches are used to assess materiality of risk drivers.

3

Institutions have developed tools to track the status of the data gaps.

4

Institutions have started to develop granular and forward-looking key risk indicators (KRIs).

5

Scorecard usually consists of two weighted components:
Client awareness metric.
Carbon transition metric.

Assessment of Materiality

- **Identification of Risk Drivers**: To determine the **materiality** of C&E risks, institutions have developed a **bottom-up** risk identification process to identify relevant **risk drivers.** This procedure relies on internal and external sources of knowledge.
- **Identification of Exposures:** Depending on the type of **exposure,** different **qualitative** and **quantitative** approaches are used to **assess** the **materiality** of the risks.
- **Determination of Materiality**: To determine materiality, institutions have developed **thresholds** regarding **Capital Impact, Liquidity Impact, Qualitative** assessment, and **Concentrations.**

Business Strategy - Good Practice for Transition Planning

- **Materiality Assessment:** institutions typically **assess the materiality** of their exposure to transition risks.
- **Strategic Targets and Risk Appetite:** Institutions **strengthen their goals** through the use of **monitoring systems** and taking actions that **affect the allocation** of assets in their portfolio.
- **Risk Management Tools:** Institutions **incorporate targets** and attention limits into their monitoring and **escalation processes,** which require **corrective measures** in case of violations. One institution specifically takes actions **specific to its counterparties** for clients that do not align with the institution's portfolio direction.
- **Product Offering:** Institutions also adjust the **product offering** for clients subject to elevated **transition risks.**

Governance and Risk Appetite

Good Practice Data Governance:

- **Data Collection**: To **overcome data gaps**, as a first step, institutions develop **tools** to track the status of the data gaps.
- **Client Questionnaires:** Institutions typically use dedicated **climate-related and environmenta risk questionnaires** to collect client or **asset-level** data.
- **Third Party Providers:** Institutions tend to rely on a **combination of internal and external data.** External data is often procured from third-party providers.

Governance and Risk Appetite

Good Practice Risk Appetite:

- **KRIs** - Institutions have started to develop **granular and forward-looking** key risk indicators **(KRIs)**. These KRI´s **continuously monitor** whether the institution's **exposures are inconsistent** with the transition path depicted by the scenario the institution has adopted. Moreover, Institutions determine whether Key Risk Indicators **only include on-balance-sheet** or also include **off-balance-sheet** exposures.

Risk Management

Institutions are developing a variety of ways to reflect C&E risks in the risk classification of clients. The most common ways are stand-alone client scorecards on C&E risks or dedicated questionnaires to gather C&E related risks.

Credit Risk

The ECB is mentioning two main approaches for climate risk quantification, either classifying debtors via a stand-alone scorecard and/or integration of C&E into PD-rating systems.

A - Stand Alone Scorecard - Two Weighted Components:

1. Client Awareness Metric:

To what extent is the client aware of C&E Risks?

2. Carbon Transition Metric:

The threat of climate change to clients' business model & profit-generating capacity. Converted into 10-point scale bundles in 4 categories.

Predefined follow-up actions.

B – Integration in PD Rating Systems:

- Assessment of any reputational risks, liability risks, and negative environmental impacts on the client.
- Environmental risk questionnaire on clients' risks. Also on external providers, where possible.
- Classified into low, medium, high, or very high risk of financial loss.
- Formalised guidelines based on results.

Market Risk

Within market risk, ECB observations are mainly around the classification of exposures to transition risk in the trading portfolio by applying the following principles;

1. Develop **risk classification** of **C&E risks** at the sector level.

2. **Aggregate activities & positions** at the sector level.

3. **Quantify transition risk** in terms of mark-to-market exposure for each position, based on its **sector classification.**

The main sources of risk are:

- The institution calibrates the above by **leveraging C&E risk scores** and **information from external data providers.**
- Based on **each sector's sensitivity,** the institution derives the sensitivity to **transition risk** for each position/activity, and quantifies mark-to-market exposure.
- Results of the **classification** are used to **set a transition risk indicator,** which is employed as a tool to make portfolio decisions.

Operational Risk

The ECB is primarily focusing on assessing the impact of physical risks to the business continuity of operations.

- Using **forward-looking scenario** analysis to quantify the risks from **weather hazards.**
- Used to build a tool for the identification and classification of **high-risk exposure** to business continuity.

1. Hazard

- Identifies the **main material physical risk** events affecting its operations.

2. Exposure

- Assesses what **buildings may be exposed** to those risk events and map these onto hazard maps.

3. Vulnerability

- **Classification system:** low, moderate, or high risk. Identifies **medium/high risks** and may then decide to **relocate** or implement actions to mitigate the risks.

Climate Stress Test Methodology and Results

October 2021/July 2022

Read the full publication

On July 8th, 2022, the European Central Bank (ECB) published the results of the Climate Stress Test 2022 related to climate change. The exercise was defined in October 2021 and focused on climate-related risks, both transitional and physical. The aim was to make a comprehensive assessment relevant to the way banks incorporated climate risks into their strategy, governance, and risk management frameworks and processes.

The Climate Stress Test Methodology

Scope & Methodology

- Module 1: Qualitative assessment of the climate risk Stress Testing Framework
- Module 2: Sustainability of banks' income and financed greenhouse gas emissions (GHG)
- Module 3: Bottom-up stress test loss projection

Climate Risk Scenarios

- Transition Risks: Based on Network for Greening the Financial System (NGFS) scenarios (short-term tail risks, long-term transition paths)
- Physical Risks: flood, drought, and heat risk

Output Report

- Climate risk stress test capabilities
- Peer Benchmark
- Impact on Credit, Market, and Operational/Reputational Risks
- Benchmark Vulnerabilities

ECB Recommendations to Banks

- Integration of climate risk stress tests into **ICAAP.**
- Enhancement of **climate risk stress-testing frameworks** to account for **various transmission channels** and **asset classes** covering both **physical** and **transition risks.**
- Establishment of a **robust governance structure** for climate risk stress-testing frameworks and **integrate climate risk stress test outputs into banking activities/ planning.**
- **Incorporation of climate risk scenarios** into stress-testing models, reflecting both physical and transition risks, as well as **long-and short-term horizons.**
- Enhancement of climate **risk management,** understanding of **client transition plans** and the **strengthening of strategic plans** to exploit the opportunities of the green transition.
- **Investment in more climate-relevant data** collection by engaging with customers and improving proxy assumptions.

"Good Practices" Highlights

1

Incorporation of various transmission channels and asset classes using robust Stress Testing framework included in ICAAP.

2

Significant amount of reported income based on internal counterparty/ transactional level data.

3

Incorporation of actual emissions data in significant proportion of the cases and adequate waterfall approaches for proxy methodologies for the remaining part.

4

Significant level of actual data for Scope 3 emissions, controlling for consideration of relevant GHG protocols.

5

Development of climate - sensitive credit risk models (e.g., relevant sensitivity to risk parameters at sectoral level)

Good Practices for Climate Stress Testing (CST)

December 2022

Read the full publication

The 2022 ECB climate stress test has helped banks to develop their climate risk-related stress testing capabilities, but the ECB acknowledges the challenges in sourcing relevant data for analyzing climate-related risks. The report highlights inconsistencies and diversity across banks' practices and scope for improvement, based on information collected during the exercise. Good practices have been identified, but the ECB expects banks to further develop their frameworks, data, and analytical capabilities to progress beyond these examples.

Key Areas of Focus

Integration of climate-related risks into stress test credit risk models

- Climate-related risk transmission to credit risk parameter
- Modelling approaches identified
- Modelling risk mitigation

Data Requirements for CST

- Internal Data Needs
- Emissions DataModelling approaches identified
- Energy Performance Certificates (EPC)

CST Frameworks

- Scope of CST Frameworks
- Climate Risk Scenarios
- Balance Sheet Approaches

"Good Practices" Highlights

1

Use of IPCC-aligned scenarios for Climate Stress Testing.

2

Obtaining emissions data from external providers as it can be time-consuming to obtain it directly from clients.

3

ECB expected banks to use private insurance and national compensation schemes as ways to reduce climate-related risks.

4

Consider more climate-specific variables in order to measure the impact of climate-related risk.

5

Assess climate-related risks in their materiality assessment and use the results to define the scope of their CST framework.

Climate Risk Stress Testing Frameworks

Scope of CTS frameworks:

Banks are required to **assess climate-related** risks in their materiality assessment and use the results to define the scope of their Climate Stress Testing (CST) framework. The CST framework **should consider** the **bank's business model, operating environment,** and **risk profile.** The **good practices** report from the 2022 thematic review provides **guidance** on the assessment of materiality for climate-related risks.

Climate Risk Scenarios:

The ECB recommends using **IPCC-aligned scenarios** for Climate Stress Testing. The most common source for **these scenarios is the NGFS**, but others include the IPCC, Banque de France, the Bank of England, and private providers. Institutions may also use a **combination of publicly available scenarios** and internally developed ones that are tailored to their specific vulnerabilities and focus on sectors or areas where their clients operate.

Balance Sheet Approaches:

Banks with advanced approaches may use **both static and dynamic balance** sheet approaches in their CST framework, depending on their objective. The **static** approach evaluates **short to medium-term** resilience to shocks, while the **dynamic** approach assesses the impact of **strategic choices on vulnerabilities** over longer horizons. The **quality** of the dynamic results **depends on the integration** of climate risk factors, counterparties' transition plans, and the approach to dynamic exposure allocation.

Data Requirements for Climate Stress Testing

Internal Data Needs:

Most banks gather information on the main activities of each **counterparty** at the local level with the involvement of staff who have **direct contact** with clients. **Codes** are assigned by the **front office**, risk management, or relationship managers, or retrieved during onboarding.

Emissions Data:

Many institutions obtain **emissions data** from **external providers** as it can be time-consuming to obtain it directly from clients. The **availability and accuracy** of emissions data varies between countries and sectors, making it difficult to access. Future **regulatory developments**, such as European Sustainability Reporting Standards (ESRS), will provide transparency and set minimum requirements.

Data Requirements For Climate Stress Testing

Energy Performance Certificates (EPC) Data:

Energy Performance Certificates (EPCs) are used to **help improve the energy efficiency** of buildings and can be obtained by banks in a variety of ways, such as directly from **customers,** public **EPC registers,** collateral valuations, or from external data providers. Although actual EPC data is preferred, banks often rely on **estimated data.** However, the amount of actual EPC data collected by banks is **limited**, with one in four banks not having any real EPC data in their systems.

Integration of Climate-related Risks Into Stress Test Credit Risk Models

Climate-related Risk Transmission To Credit Risk Parameter:

Banks need to consider more **climate-specific variables** in addition to sectoral **GVA** and traditional **stress testing variables** in order to accurately **measure the impact of climate-related** risk. Banks should include the **carbon price** in order to assess the **impact of climate risks** in credit risk parameters.

Modelling Approaches Identified:

The ECB has observed that banks tend to use a combination of **existing stress test models** and newly developed **climate risk models** to measure the impact of climate-related risks. Some banks already had **advanced models** in place, while others used a **combination of internal models and tools from external providers.**

Long-Term Modelling Approaches:

The ECB found that there is a **difference in the level of sophistication** of **good practices** observed in climate stress testing. Some banks are **still developing models** while others **have integrated physical and transition risk** into their **long-term models,** or use a combination of internal models and external tools.

Modelling Risk Mitigation:

The ECB expected banks to use **private insurance** and **national compensation** schemes as ways to reduce climate-related risks, as stated in the **ECB guide for good practices.** However, most banks did not include these measures in their **projections**, mostly due to a lack of data, particularly for the drought and **heat scenario.** Banks should clearly state their assumptions about the role of private insurance and national compensation schemes and **link the insurance coverage** to the specific hazard outlined in the scenario.

ECB Report on Climate-Related Indicators

January 2023

Read the full publication

The European Central Bank (ECB) recognizes the dangers that climate change presents to both the economy and financial sector. As part of its responsibilities, the ECB has released a set of indicators through a report, in which a short description of the indicators is provided with the methodology used. Furthermore, highlights of existing caveats are presented, and possible limitations and areas for further development are brought into scene.

Key Areas of Focus

Sustainable Finance Indicators

1. Issuances of sustainable debt securities
2. Holdings of sustainable debt securities

- Indicators only cover debt classified as sustainable in the Centralised Securities Database (CSDB)

Carbon Emission Indicators of Financial Institutions

1. Indicators on financing carbon-intensive activities:

- Financed emissions (FE)
- Carbon intensity (CI)

2. Indicators on exposures to transition risks:

- Weighted average carbon intensity (WACI)
- Carbon footprint (CFP)

Analytical Indicators on Physical Risk

1. Normalised exposure at risk (NEAR)
2. Potential exposure at risk (PEAR)
3. Risk scores

Challenges:

- Potential overestimation of risk
- Potential underestimation of risk

ECB Report on Climate-Related Indicators

January 2023

According to the ECB, The purpose of these indicators is to aid the examination of climate-related topics in the financial sector. As they are still being developed, this release also aims to stimulate public discussion and encourage an open dialogue (including discussions on methodology) with researchers, stakeholders, and others in order to advance the creation of statistical indicators.

"Good Practices" Highlights

1

Indicators measure how the financial sector contributes to the financing of high-emitting economic activities.

2

The proportion of financial support for economic activities that could be impacted by the shift towards a net-zero emissions.

3

ECB presents a diverse set of hazards, from flooding and landslides, to wildfires.

4

Financial dealings connected to the issuance and ownership of sustainable debt securities.

5

ECB presents further guidelines on consolidated corporate emissions data and balance sheet information.

Sustainable Finance Indicators

Indicators of sustainable finance offer time-based data on the amount outstanding and financial dealings connected to the **issuance** and **ownership** of **sustainable debt securities.**

By merging the **ESG aspects** with **traditional macroeconomic** dimensions, it becomes easier to incorporate these indicators into **forecasting** models and other analytical tools, thus allowing for their use along with existing macroeconomic data sources.

1. Issuances Of Sustainable Debt Securities:

Information about the issuance of sustainable debt securities is made public by the issuer at **face value, nominal value, and market value.** The distribution by sustainability categorization is only available for the Euro area and the European Union overall. A breakdown by issuer sector and individual countries within the Euro area is **only accessible for green bonds.** A security is considered to meet the sustainable criteria if it is labeled as such by the issuer.

2. Holdings Of Sustainable Debt Securities

The indicators for sustainable debt securities holdings provide a **classification by sustainability** for the overall euro area (at both face and market value), including a breakdown by **issuing region** (euro area, EU, rest of the world). Only **green bonds** have breakdowns by holding sector and euro area country, and the **same** is true for **financial transactions,** which are only available for the euro area. These indicators have a **low level of assurance,** consistent with the indicators for issuances.

As with other sustainable finance initiatives, the indicators provided here only have a **minimal level of assurance** and consider debt securities as sustainable, if they are **self-labeled** as such by the issuer. This approach **covers all sustainable instruments** classified as such in the **CSDB,** regardless of the level of assurance. When sufficient information becomes available, breakdowns of the level of assurance, including those with **second-party** opinions and certifications, will be provided.

Analytical Indicators on Carbon Emissions

Indicators analyzing the **carbon emissions** funded by the financial sector have a dual focus: they assess the **total amount of emissions** financed by the financial sector and the sector's exposure to **counterparties** with high emissions.

1. Indicators on Financing Carbon-Intensive Activities:

The first two indicators on carbon emissions **financed by financial institutions** aim to provide information on how the financial sector contributes to the financing of high-emitting economic activities.

A. Financed emissions (FE): Total **GHG emissions** of a debtor/issuer **weighted by the investment** as a share of the company's total value.

Analytical Indicators on Carbon Emissions

B. Carbon intensity (CI): FE divided by the **production** value of the company **weighted by the investment** in the company's activities as a share of the company's total value.

2. Indicators On Exposures To Transition Risks:

The assessment of exposure is determined by **measuring the proportion of financial support** for **economic activities** that could be impacted by the shift towards a **net-zero emissions** target. Unlike metrics related to funding for activities with high carbon emissions, these indicators use the value of the lender's portfolio as a basis for standardization.

A. Weighted average carbon intensity (WACI): **Total GHG emissions** of a debtor/issuer standardized by a measure of the **company's production value,** weighted by the investment in these activities as **a share of the total investment** portfolio value.

B. Carbon footprint (CFP): FE **standardized by the total investment** portfolio value.

Analytical Indicators on Physical Risk

Physical risk arises from the combination of three factors: **physical dangers**, the **presence of assets, and the susceptibility** of those assets to the **hazards.** Accordingly, the information and evaluation were structured into three tiers.

Normalised Exposure At Risk (NEAR):

The **percentage** of the portfolio at risk where each **debtor/issuer's** exposure is weighted by a **financial risk ratio**. This relates the expected annual losses **(EAL)** to measures of financial **performance** (revenue) or company size (total assets).

2. Potential Exposure At Risk (PEAR):

The **percentage** of the portfolio that is **exposed to physical hazards**, is based on the total financial exposure for all entities that have a risk score **above zero.** PEAR offers a potential ("maximum") value to complement the specific value provided by **NEAR.**

3. Risk Scores (RS):

These complement PEAR by **splitting exposures** into risk level categories and indicate the percentage of the portfolio that is **associated with a specific risk class** from 0 (no risk) to 3 (high risk). The scores at the group head level are calculated using **simple averages.**

Analytical Indicators on Physical Risk

The **European Central Bank** presents a diverse set of **hazards,** from flooding and landslides to wildfires, each of which demands a **specific method** of modeling and the application of various scientific techniques. Consequently, the **dimensions of these hazards** are expressed in different units (e.g. water depth for flooding, soil content for subsidence) often accompanied by a **reassessment of hazard strengths** and frequencies in the form of scores. However, due to their varying nature and origins, these scores are not directly comparable across different hazards.

Analytical indicators are subject to more serious limitations than experimental indicators on sustainable finance. ECB presents some guidelines to follow such as working on consolidated corporate emissions data and balance sheet information, identifying the nature of physical hazards and their intensity, or handling both overestimation of risk and underestimation of risk.

Contacts

Our team would be delighted to discuss your challenges and opportunities in any aspect of climate risk. Our services are flexible and efficient, designed to facilitate and support your business model.

Our highly qualified Quantitative Risk team provides support to financial institutions across the full spectrum of risk measurement and modelling strategies, including the development, deployment, and validation of key models and risk measurement methodologies in regulatory capital, stress testing and IRB, IFRS9, and bank risk modelling. The team has experience in implementing machine learning techniques in the context of credit risk modelling, as well as a keen interest in emerging trends within the machine learning space.

Contact us today to discuss.

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