S&P Global Sustainable1 Compass Series

Avanzando hacia el Horizonte del Riesgo Climático

Madrid, 29th May, 2024

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Climate Risks Analysis in Bank Credit Ratings

Recent Developments and Hurdles Ahead

Francesca Sacchi

Associate Director & ESG FI Expert

Financial Services Ratings EMEA

S&P Global Ratings

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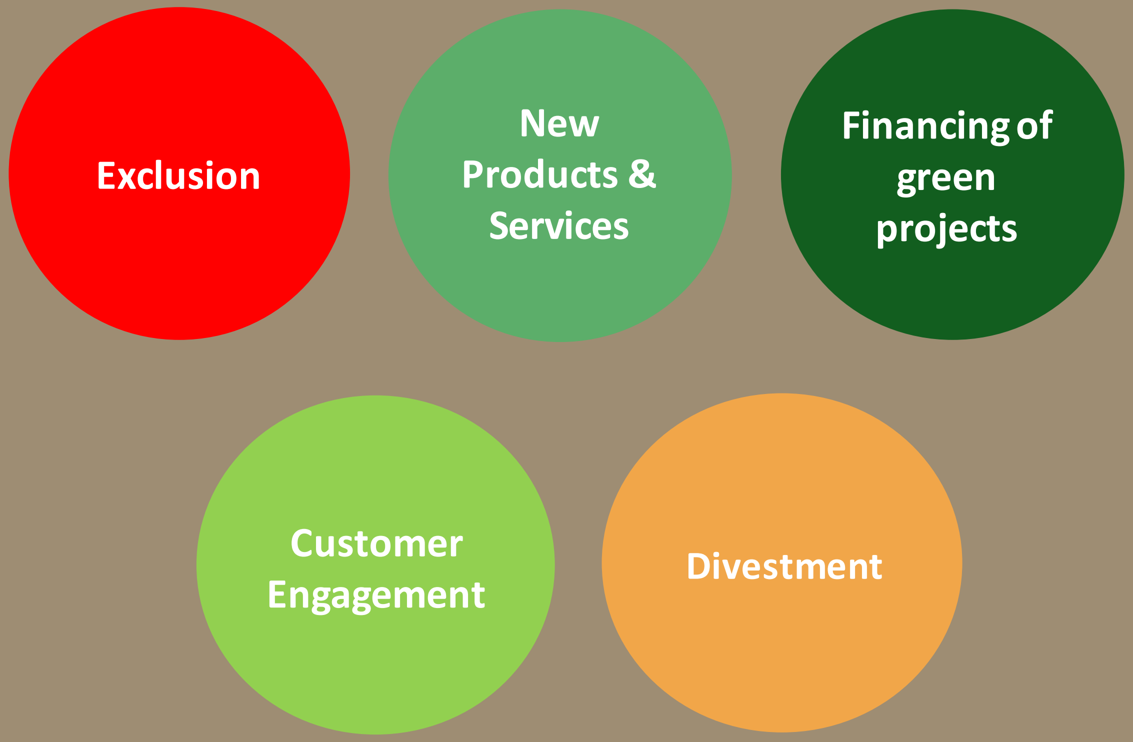
This report does not constitute a rating action

Banks' Strategies To Address Climate Change: Material Progress Observed



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- Reducing climate-related risks is a key priority for an increasing number of banks. Awareness and preparedness is gradually improving.
- More climate-related data is available, and methodologies/models are progressing.
- While exclusion and divestment policies have the potential to rapidly reduce banks' climate risk, customer engagement is gaining traction.
- Banks are also increasingly committing to finance green projects and technologies.
- The energy transition offers large business opportunities. The suite of green products and services offered is broadening (green mortgages, electrical vehicle loans…).

Supervisors are Fostering Banks' Analysis of Climate Risks

- Regulatory climate stress tests are developing rapidly across regions.
- The ECB's Climate Stress Test (CST) is the most comprehensive climate stress test we have observed so far.
- We view ECB CST's estimates as likely understating the climate stress losses banks might face in practice.
- The ECB CST is not used to set capital requirements.
- These foundational regulatory exercises are exploratory in nature and represent a first step of a long journey.
- CSTs typically include climate change and physical risks, using some of the NGFS scenarios. Focus on credit risk with different time horizons.
- CSTs revealed that banks would face lower losses in an orderly climate transition scenario.
- As CSTs confirmed the methodological challenges and data availability issues, we expect regulators will continue to fine-tune their CSTs.

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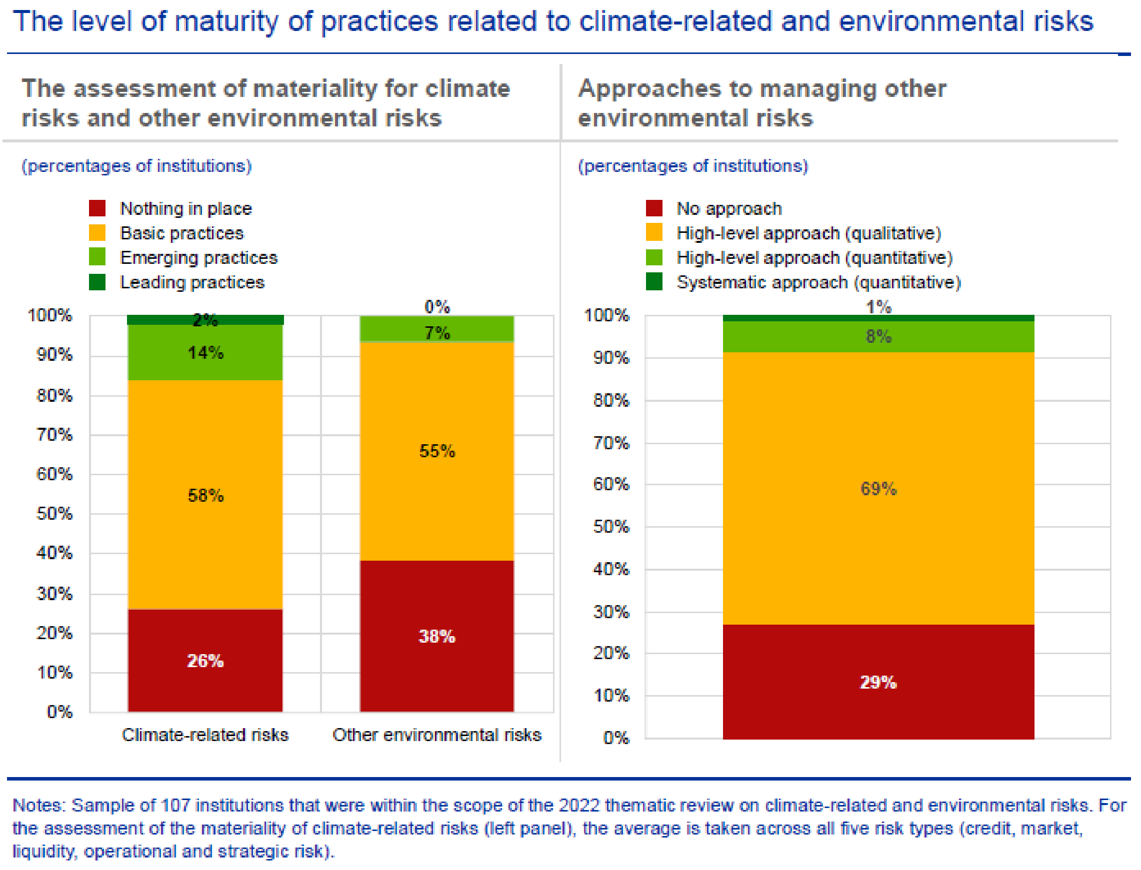
Key Findings From ECB's 2022 Thematic Review on C&E Risks



Source: ECB

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- Over 85% of banks have at least basic practices in place for most of the areas addressed by the ECB's expectations.
- Banks made progress in the materiality assessment, but strategic responses are still at an early stage of development.
- The approaches still lack methodological sophistication and, in most cases, remain a qualitative assessment.
- Less significant institutions better address risks, but dispersion is greater.
- The analysis of other environmental risks is less advanced:
  - ✓ Institutions take a similar approach to that taken for climate-related risks.
  - ✓ The first steps towards managing these risks typically include setting exclusion or inclusion criteria.
  - ✓ Other approaches include preparing heatmaps, considering the risks in client due diligence and conducting client-specific biodiversity impact assessments.

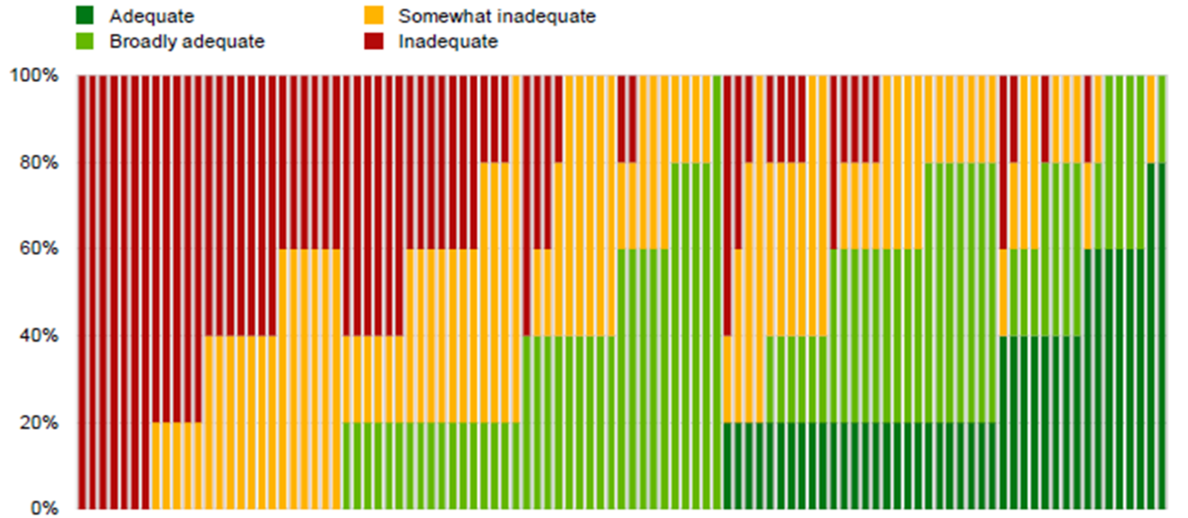
Remediation Timelines

- The ECB expects institutions to be fully aligned with all supervisory expectations by the end of 2024 at the latest, providing details on intermediate steps. In particular, it expects institutions:
  - ✓ by end-March 2023, to have in place a sound and comprehensive materiality assessment;
  - ✓ by end-2023, to manage C&E risks, with an institution-wide approach covering business strategy, governance and risk appetite, and risk management (credit, operational, market and liquidity risk management);
  - ✓ by end-2024, to be fully aligned with all supervisory expectations, including having in place a sound integration of C&E risks in their stress testing framework and ICAAP.

- The not-aligned institutions are required to submit an implementation plan to address the weaknesses identified.

Key Findings From ECB's 2022 Supervisory Assessment on Banks' Disclosure of C&E Risks

(Percentage per bank of alignment of supervisory expectations for the disclosure of 5 categories: materiality assessment, governance, business model, risk management and metrics and targets)



Source: ECB.

- According to the ECB, majority of Significant Institutions disclose at least basic information on C&E risk.
- While significant progress could be observed across the board, for about 75% of the institutions the level of disclosures was considered still insufficient.
- While not yet aligned with supervisory expectations, the disclosures of the largest European banks outperform global peers.
- Most of the Less Significant Institutions were scored by the ECB inadequate or somewhat inadequate in disclosing C&E risks.
- Only 35% of the banks (vs 25% in 2021) disclosed information on their exposure to other environmental risks (most often biodiversity loss).
- Large institutions need also to comply with the binding Pillar 3 disclosure standards, which the ECB will closely scrutinize.

A Focus on EBA's Climate Disclosure Requirements (1/2)

Qualitative information

- Table 1 - Qualitative information on environmental risk
- Table 2 - Qualitative information on social risk
- Table 3 - Qualitative information on governance risk

- Business strategy and processes
- Governance
- Risk management

Quantitative templates

Climate change transition risk				Climate change physical risk	Mitigating actions	
Template 1: Banking book – credit quality of exposures by sector, Scope 3 emissions, maturity bucket	Template 2: Loans collateralised by immovable property – by energy efficiency of collateral	Template 3: Alignment metrics on relative Scope 3 emissions	Template 4: Exposures in the banking book to top carbon-intensive firms	Template 5: Banking book, credit quality of exposures subject to physical risk by sector, geography, maturity buckets	Templates 6 to 9: Investment supporting customers' transition/ adaptation (taxonomy-aligned)	Template 10: Climate change mitigation actions (non-taxonomy-aligned)

Source: EBA Final draft implementing technical standards on prudential disclosures on ESG risks in accordance with Article 449a CRR.

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A Focus on EBA's Climate Disclosure Requirements (2/2)

The quantitative templates on climate transition and physical risks:

- Template 1 requires banks to disclose a breakdown of exposures in the most relevant climate-sensitive sectors. The information on financed emissions is required to be disclosed at the latest with June 2024 reports.
- Template 2 requires banks to disclose information on the energy efficiency of the collateral of loans collateralized by immovable property.
- Template 3 requires banks to disclose alignment metrics for indicators of potential climate change transition risk by sector.
- Template 4 requires banks to disclose their exposure to the top 20 carbon-intensive firms in the world.
- Template 5 requires banks to disclose their exposure to physical risk related to climate change.
- KPIs on banks financing activities that are environmentally sustainable according to the EU taxonomy (GAR- Green Asset Ratio - and BTAR - Banking Book Taxonomy Alignment Ratio).

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Green Asset Ratios of EU Banks: What to Make of Them?

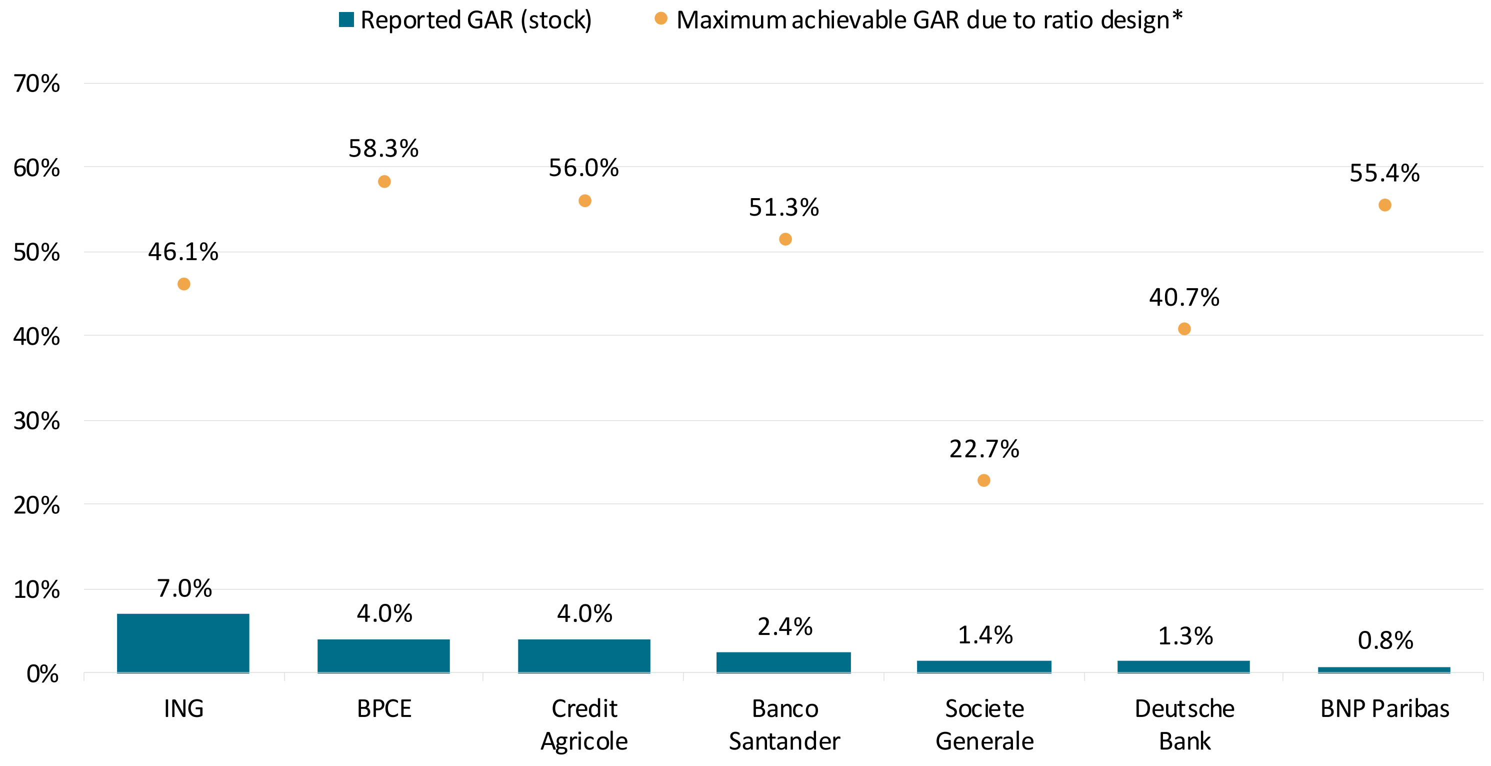
Increased transparency is welcome, but meaningful comparisons will only be possible over time

- **The green asset ratio (GAR) is a positive step toward greater transparency,** may encourage growth of sustainable bank financing, and could enhance banks' standing among certain stakeholders.
- **The design of the GARs appears to particularly penalize certain banks** due to their business models or asset allocation:
  - Banks with significant non-EU nonfinancial corporate (NFC) exposures and/or SME exposures are likely to report relatively lower GARs, given that these assets are excluded from the GAR numerator (but included in the denominator).
  - Beyond that, the lack of harmonization on energy performance certificates (EPC) labeling of mortgages is likely causing significant differences across banks' reported GARs.
- **Over time, several legislative changes should address these challenges and make GARs gradually more comparable**:
  - A broader scope of EU NFCs will be subject to the upcoming Corporate Sustainability Reporting Directive (from 2026), meaning that fewer SMEs should be excluded from the GAR numerator.
  - The proposed revision of the Energy Performance of Buildings Directive (EPBD) could bring more comparability across national EPC labels, and therefore enhance GAR comparability.

EU G-SIBs Have Reported Relatively Low GARs, With Differences

GAR levels are likely impacted by the ratio design and by differences in national EPC labeling

Reported GARs by EU G-SIBs, as of December 2023



*Defined as the share of assets included in the GAR numerator relative to all GAR assets. Source: Bank disclosures, S&P Global Ratings.

- **By design, each bank can only achieve a certain GAR level** due its asset composition – because certain financial assets are excluded from the GAR numerator but not from its denominator.
  - This maximum achievable GAR is particularly low for some G-SIBs (SocGen or DB) due to significant exposures to NFCs not subject to the nonfinancial reporting directive (NFRD), but also other assets (goodwill and commodities).
- **A key driver of differences are household exposures.** A large portion of household exposures are reported as eligible to the EU Taxonomy. However, reported alignment levels in these portfolios vary from 0% to 16%, depending on the availability of EPCs for mortgages and national measurement scales.
  - Banks reporting the highest GARs (ING and BPCE) have large household exposures and relatively high EPC-coverages of 60%-70%.
- **NFC exposures:** A smaller portion is reported as eligible by G-SIBs (16%-42%), but alignment levels are higher than for household exposures (20%-40%) in these portfolios.

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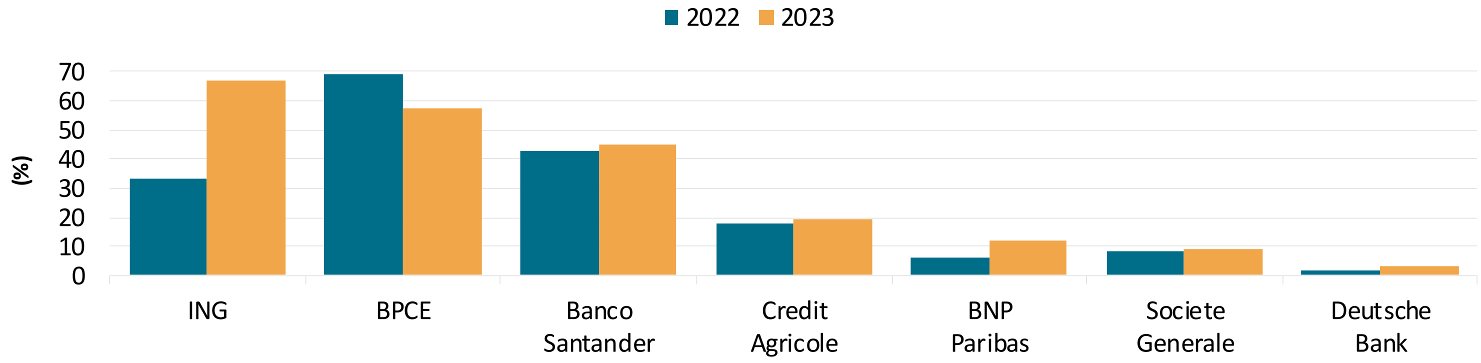
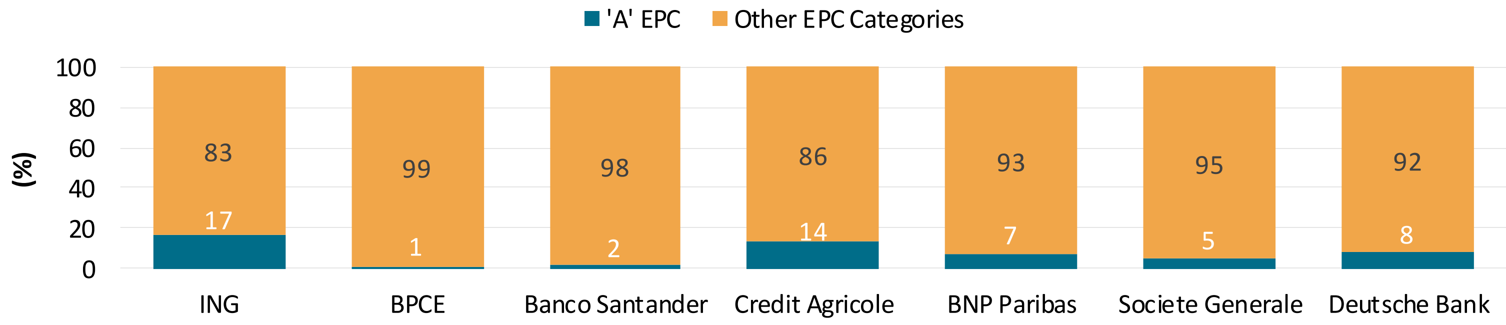
EPC Labeling Of Mortgages As A Key Differentiator In GAR Results

Share of mortgages with an EPC label



Share of ‘A’ EPC labels as of year-end 2023



Source: Banks' disclosures, S&P Global Ratings.

- According to the EU Taxonomy technical screening criteria, a building (built before 2021) is considered as taxonomy-aligned if it has an EPC of at least class ‘A’
  - **For banks, obtaining EPC certificates is key to determine alignment**, and some banks (ING and BPCE) are more advanced than their peers in this regard.
- EPCs are defined in the EPBD but leaves actual implementation to member states. As such, **comparisons between EPC levels are difficult.**
  - For instance, Dutch ‘A’ labels roughly correspond to French ‘C’ labels in terms of primary fossil fuel use. This difference is likely to also explain some of the GAR variations between French and Dutch banks, for instance.

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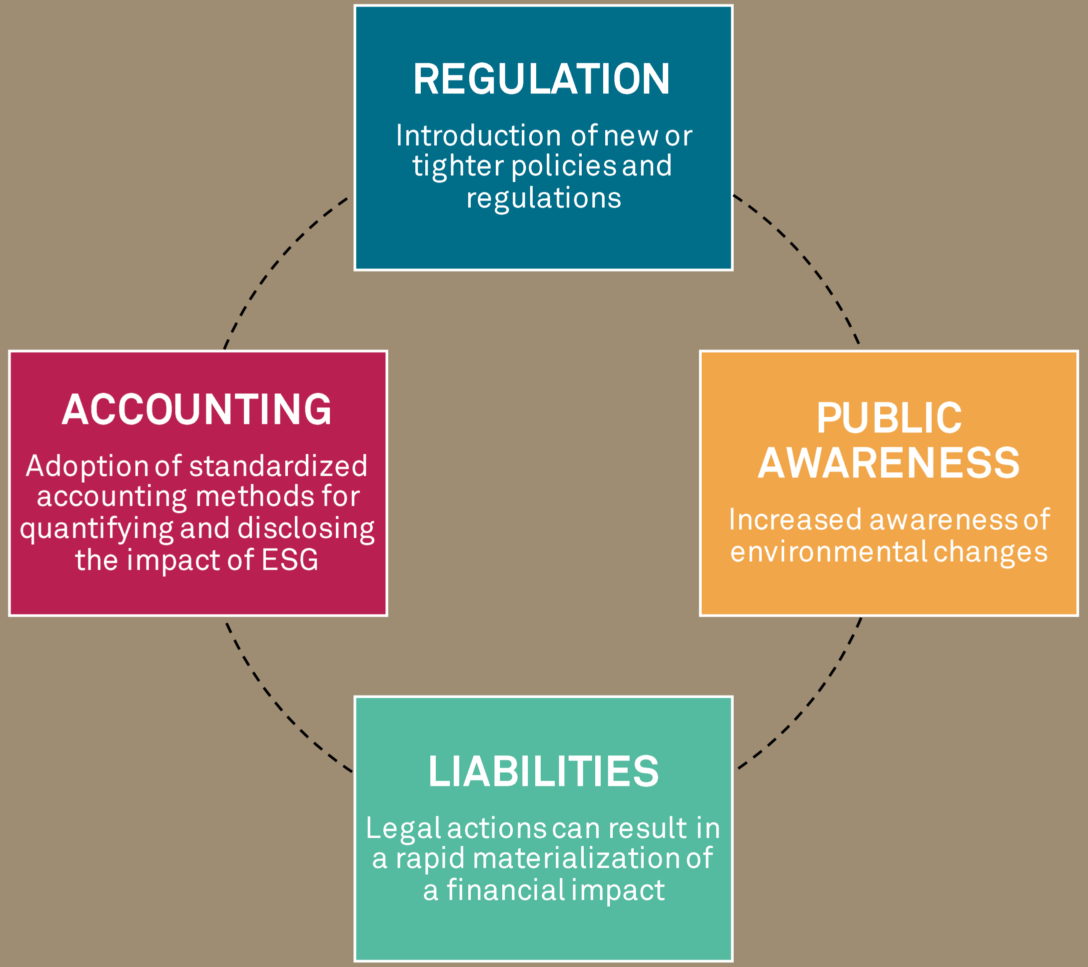
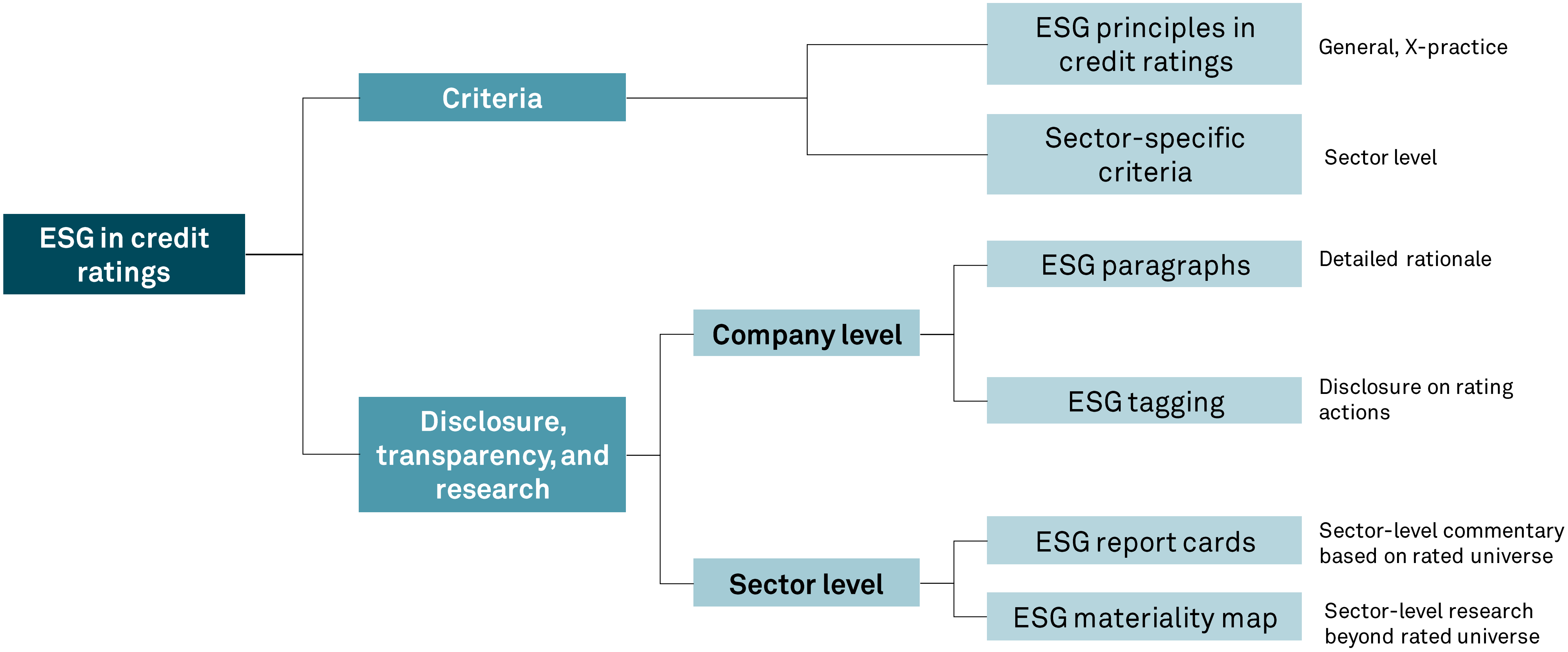
Sizeable Challenges & Hurdles Remain



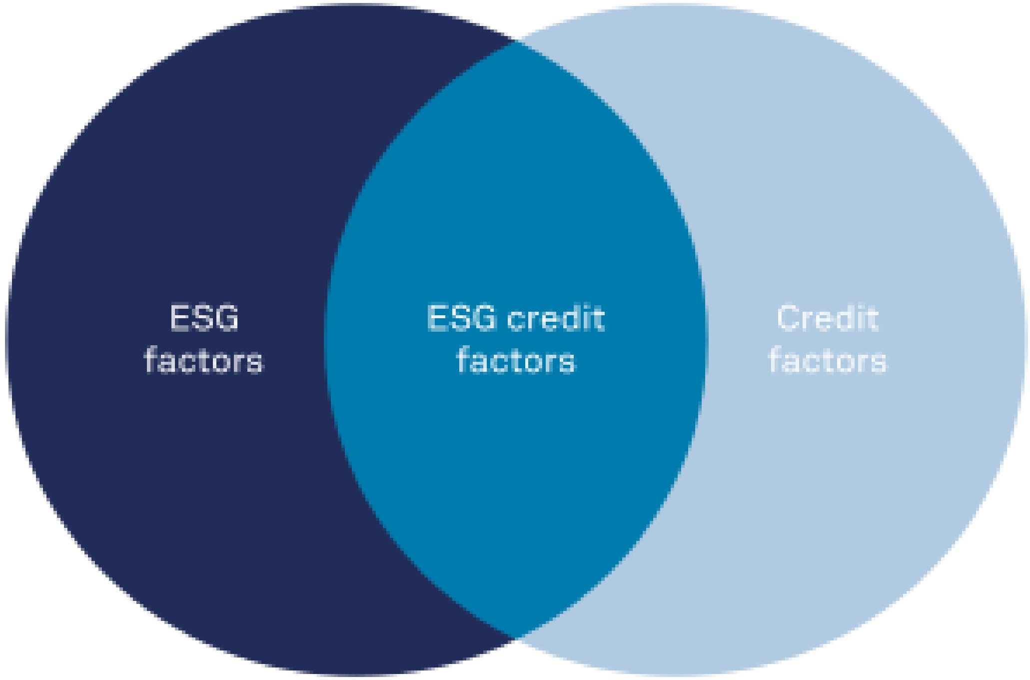
- C&E Risks are complex and non-linear.
- Data availability and comparability remains an issue.
- Focus is on credit risk, but other risks are likely to grow (e.g., legal, reputation, greenwashing).
- Several recommendations and disclosure standards.
- Uncertain prudential treatment of climate risks.
- Banks face pressure in opposite directions from different groups.
- Nature-related risks will increase over time and disclosure standards are evolving.

ESG in Credit Ratings: The How and the Why



ESG Criteria: Materiality Is Key

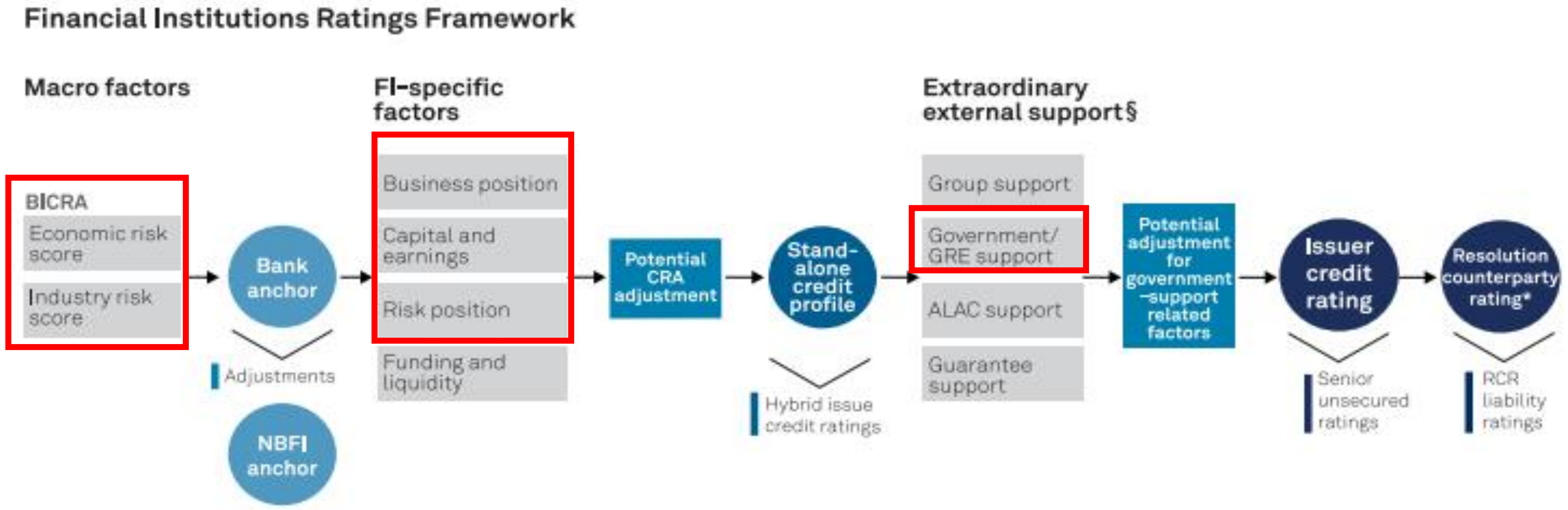
The materiality of ESG factors varies by sector and region and may or may not be relevant in our rating analysis (*See "ESG Principles In Credit Ratings" criteria published on Oct. 10, 2021).*



ESG--Environmental, Social, and Governance. Source: S&P Global Ratings.

- ESG factors incorporate an entity's impact from, and effect on the natural and social environment and the quality of its governance.
- **Not all ESG factors materially influence creditworthiness.**
- **ESG credit factors** are those ESG factors that can **materially influence the creditworthiness** of a rated entity/issue and for which we have **sufficient visibility and certainty** to include in our rating analysis.

ESG Factors Are Incorporated Into Our Ratings Analysis



Note: Issue credit ratings on hybrids typically reference the SACP, while issue ratings on senior unsecured instruments typically reference the ICR unless they are guaranteed by a higher-rated entity or are RCR liabilities (see "Hybrid Capital Methodology And Assumptions," published July 1, 2019 for more details on hybrids). *Subject to jurisdictional assessment and expected resolution strategy. §In some cases, an FI may also qualify for an additional support adjustment. BICRA—Banking industry country risk assessment. NBFI—Nonbank financial institution. FI--Financial institution. CRA--Comparable ratings analysis. GRE--Government-related entity. ALAC--Additional loss-absorbing capacity.

Categories most likely to include consideration of ESG credit factors.

Climate Risk Has Had A Limited Credit Impact On Banks — So Far

- We believe banks have generally a moderate direct exposure to climate transition risk in their lending and investment portfolios, thanks to their well diversified loan and securities portfolio.
- Regulators are pushing banks to incorporate climate risk in their strategy and risk management.
- Some climate risks have a long-term horizon with uncertainties on how and when they might materialize and the size of the impact.
- Some public policies not yet in place could impact bank creditworthiness.
- Acute physical risks are highly uncertain in terms of when and where they might occur.
- Disclosure on climate remains limited and difficult to compare.
- Impact of climate change to be uneven and largely depend on banks' concentration to specific sectors and geographies.
- Overall, we expect environmental factors will become more material for banks over time.

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ECB on Materiality Assessments

Rocio Falcones
Regulatory & Reporting Product Lead
S&P Global Sustainable1

Madrid, 29th May, 2024

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ECB on Materiality Assessments (1/2)

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You have to know your risks to manage them – banks' materiality assessments as a crucial precondition for managing climate and environmental risks - By Frank Elderson, Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB

- **Background**: **90% of banks' practices were only partially or not at all in line with the European Central Bank's (ECB) supervisory expectations.** In 2022 we conducted a thematic review on climate-related and environmental (C&E) risks and a climate stress test, which again confirmed that **banks considered themselves to be materially exposed to C&E risks.**
- **Materiality assessments as a precondition for sound risk management**:
  - At the end of 2023 around **90% of the banks under our supervision considered C&E risks to be material.**
  - **A materiality assessment is not just a "nice to have"** – knowing your risks is a precondition for being able to address them.
  - **Most banks have now drawn up materiality assessments** that are in line with our supervisory expectations.
- **Good practices:**
  - Overall, we see that banks' materiality assessments are becoming more robust. **Most banks now submit a meaningful overview of material C&E risk exposures for each risk category and across different time horizons** to their management bodies, enabling them to take informed decisions on follow-up actions.
  - However, there are materials gaps yet, such as:
    - banks' materiality assessments that **do not consider all relevant risk categories** (that focus only on transition risks);
    - banks adopting a **net approach** as opposed to a gross approach in the risk identification (which undermines banks' ability to measure actual impact and articulate commensurate risk mitigation);
    - banks using solely **backward-looking historical data** (which will inevitably lead to an underestimation of risks); and
    - banks **limiting to climate change** without considering broader **nature-related risks.**

Source: ECB You have to know your risks to manage them – banks' materiality assessments as a crucial precondition for managing climate and environmental risks (europa.eu) May 2024

ECB on Materiality Assessments (2/2)

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You have to know your risks to manage them – banks' materiality assessments as a crucial precondition for managing climate and environmental risks - By Frank Elderson, Member of the Executive Board of the ECB and Vice-Chair of the Supervisory Board of the ECB

- **The path ahead:**
  - **By the end of this year (2024), we expect all banks under our supervision to be fully aligned with all our supervisory expectations** on the sound management of C&E risks. And for this, **the materiality assessment is just the first step**.
  - To help banks advance their C&E risk management we (ECB) have published the **good practices we observed in both the climate stress test and the thematic review** [(1)]**,** and we intend to update the reports going forward.
  - We will closely monitor banks' progress towards meeting the supervisory deadlines. And, if necessary, as we did with the first interim deadline, **we will use all the measures in our toolkit to ensure the sound management of C&E risks**. These include **imposing periodic penalty payments but also setting Pillar 2 capital requirements as part of the annual Supervisory Review and Evaluation Process if necessary to cover not properly managed risks.**

Source: ECB You have to know your risks to manage them – banks' materiality assessments as a crucial precondition for managing climate and environmental risks (europa.eu) May 2024
(1) climate stress test and the thematic review

EBA Guidelines on the Management of ESG Risks

EBA Guidelines on the management of ESG risks

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- **Objective**: the European Banking Authority (EBA) guidelines **set requirements for the internal processes and ESG risks management arrangements** that institutions should have in place.
- **Main topics**:
    1. Institutions should ensure that they are able to **properly identify and measure ESG risks through sound data processes and a combination of methodologies** (incl. exposure-based, portfolio-based and scenario-based ones).
    2. Institutions should integrate ESG risks in their **regular risk management framework, including credit, market, operational, reputational, liquidity, business model, and concentration risks**. Institutions should have a robust and sound approach to **managing and mitigating ESG risks over the short, medium and long term**, including a time horizon of at least 10 years, and should apply a range of **risk management tools**. Institutions should embed ESG risks in their regular processes **(risk appetite, internal controls and ICAAP).** Besides, institutions should **monitor ESG risks** through effective internal reporting frameworks and a range of **backward and forward-looking ESG risks metrics and indicators**.
    3. Institutions should assess and embed forward looking ESG risks considerations in their **strategies, policies and risk management processes** through transition planning considering short-, medium- and long-term time horizons.
- **Next steps**:
    - Consultation period ended in April 2024. The **EBA is consulting draft guidelines for following months**.
    - **Guidelines will be finalized by end-2024. Application date TBD** (depending on CRD6 application date).

Source: EBA Draft Guidelines on the management of ESG risks. January 2024

ECB Climate & Nature 2024 & 2025 Agenda

ECB Climate & Nature 2024 & 2025 Agenda

ECB's Roadmap – Continue & Expand

<table>
<tr><th></th><th></th><th>H1-2024</th><th>H2-2024</th><th>H1-2025</th><th>H2-2025</th></tr>
<tr><td rowspan="16">Continue & Expand</td><td rowspan="2">Macroeconomic & financial stability analysis</td><td colspan="4">**Incorporate green transition policies** into conjunctural analysis and macroeconomic models</td></tr>
<tr><td colspan="4">Further develop **risk monitoring and the macroprudential policy framework**, and continue work on **sustainable finance**</td></tr>
<tr><td rowspan="2">Stress testing and scenarios</td><td colspan="3">Contribute to the **fit-for-55 stress test**</td><td></td></tr>
<tr><td colspan="4">**Chair the workstream of the Network for Greening the Financial System on Scenario Design and Analysis**, leading the development of short-term scenarios and the provision of regular updates and improvements of long-term scenarios</td></tr>
<tr><td rowspan="3">Monetary policy strategy & implementation</td><td colspan="2">**Implement climate-related pool limits** in the collateral framework assuming all technical conditions are in place</td><td colspan="2"></td></tr>
<tr><td colspan="4">Introduce **climate-related disclosure requirements** in the collateral framework from 2026</td></tr>
<tr><td colspan="4">**Consider climate change in the preparation of monetary policy decisions**</td></tr>
<tr><td rowspan="2">Banking supervision</td><td colspan="2">**Assess and follow up on Banks' alignment with ECB supervisory expectations**</td><td colspan="2"></td></tr>
<tr><td colspan="4">**Perform various supervisory actions on climate and environmental aspects**, including preparatory work on **transition planning**</td></tr>
<tr><td rowspan="2">Climate-related data</td><td colspan="4">**Regularly expand and release updates of climate change-related indicators**</td></tr>
<tr><td colspan="4">**Acquire and provide climate-related data and integrate climate data points into the ECB's own data collections**</td></tr>
<tr><td rowspan="3">Payments, banknotes and market infrastructure</td><td colspan="4">**Consider environmental aspects** in the preparatory phase of the design of a digital euro</td></tr>
<tr><td colspan="4">**Consider the relevance of environmental risks** in the oversight of financial market infrastructures</td></tr>
<tr><td colspan="4">**Eco-design of the next euro banknote series and of banknotes with 100% organic cotton** by 2027</td></tr>
<tr><td rowspan="2">Environmental performance of the ECB's own operations and portfolios</td><td colspan="2">Implement the **Environmental Management Program for 2022-2024** to continuously improve the ECB's environmental performance</td><td colspan="2">**Publish and implement the Environmental Management Programme for 2025-2027** to continuously improve the ECB's environmental performance</td></tr>
<tr><td colspan="4">Continue to **green the ECB's non-monetary policy portfolios** and disclose progress</td></tr>
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Source: ECB https://www.ecb.europa.eu/ecb/climate/our-climate-and-nature-plan/html/index.en.html

ECB Climate & Nature 2024 & 2025 Agenda

ECB's Roadmap – Initiative & Explore

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		H1-2024	H2-2024	H1-2025	H2-2025
Initiate & Explore	Navigating the transition to a green economy	• **Analyze the effects of transition funding and risks on the monetary policy transmission mechanism** • Explore, within our mandate, the case for **further climate change considerations in monetary policy instruments and portfolios** • **Assess green investment needs and its funding** • Analyze the **structural consequences stemming from the transition** • Advance the **macroeconomic modelling framework with a focus on climate aspects**			
	Addressing the increasing physical impact of climate change	• **Take further steps to integrate climate change impacts into climate scenarios and the analytical framework used for macroeconomic projections** • Explore the impact of **climate adaptation**, including the **insurance protection gap** • Improve the **availability of data to support physical risk analysis**			
	Advancing work on nature-related risk	• Further explore the economic and financial implications of **biodiversity loss and the degradation of nature**			

Source: ECB https://www.ecb.europa.eu/ecb/climate/our-climate-and-nature-plan/html/index.en.html

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Madrid, 29th May, 2024

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ECB Climate Stress Testing

Physical Risks in Spain

Sus Rajalingam
Sus.Rajalingam@spglobal.com
Sustainability Sales Director
S&P Global Market Intelligence

S&P Global
Market Intelligence

Measuring Climate Impacts - Challenges in Spain

1. Data availability and quality: Lacking granular, localized climate data for Spain.

2. Asset Vulnerability: Connecting physical risks to potential impact.

3. Modelling complexity: Integrating physical risk models with existing risk frameworks.

4. Regulatory Landscape: Staying compliant and adapting to new requirements.

5. Stakeholder Communication: Communicating findings of assessments to internal stakeholders.

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The Five Layers of Climate Physical Risk Analytics

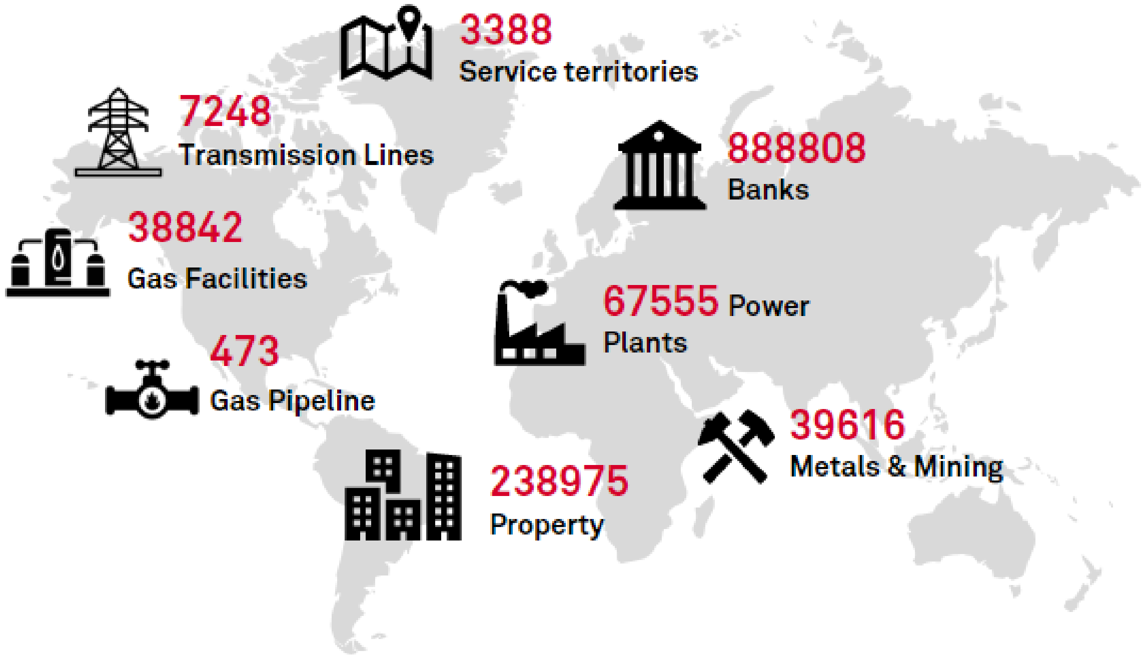
1. Climate Data Projections
To provide robust scientific grounding

2. Vulnerability Models
To empower geo-specific analysis

3. Asset-level data
To support decisions at all levels

4. Ownership mapping
To produce meaningful insight

5. Metrics
To facilitate action at scale



Industry and Asset data contributes to **91%** of current real asset coverage

Source: S&P Global. Data as of March 2024.

Climate physical risk solutions

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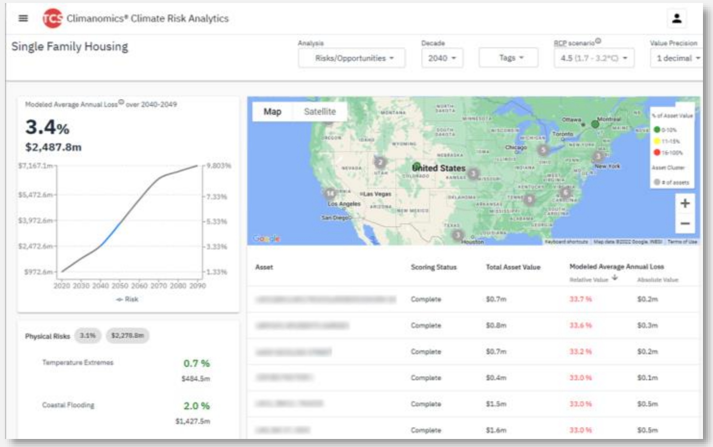
Reporting, SaaS, and data solutions to cover multiple asset classes

(1) Physical Risk for Real Assets

The **S&P Global Climanomics platform** helps customers to continually analyse climate risks to real assets in their portfolios, operations, and supply chains. Useful for **SMEs**, **Residential/Commercial** property and **Infrastructure**. Requires user input on locations and will produce financial impact metrics.

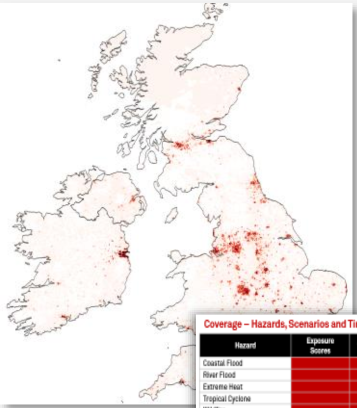


(2) Physical Risk for Listed Companies

Data solution that quantifies climate physical risk exposure for **930 thousand** companies based on **6.5 million+** underlying asset locations. This solution leverages S&P proprietary data and analytics to produce financial impact metrics and risk exposure scores.

(3) Physical Risk for Sovereigns

Data solution that quantifies country level climate physical risk exposure for 170 countries. The Sovereign dataset provides a range of metrics including % GDP at risk, % GDP exposed to different hazards, hazard exposures scores as well as population exposed to each hazard.



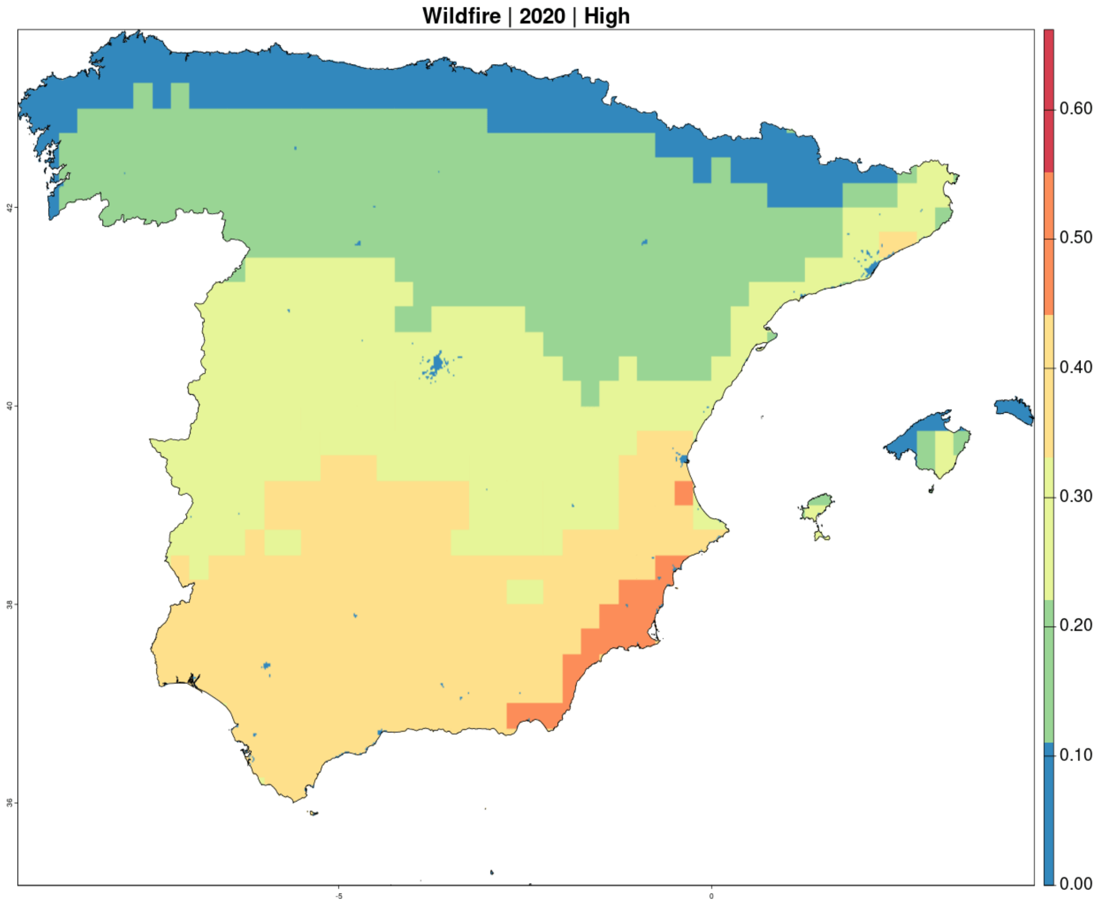
Scenarios – IPCC SSP/RCP

Scenario
High (SSP5-8.5)
Moderate-High (SSP3-7.0)
Moderate (SSP2-4.5)
Low (SSP1-2.6)

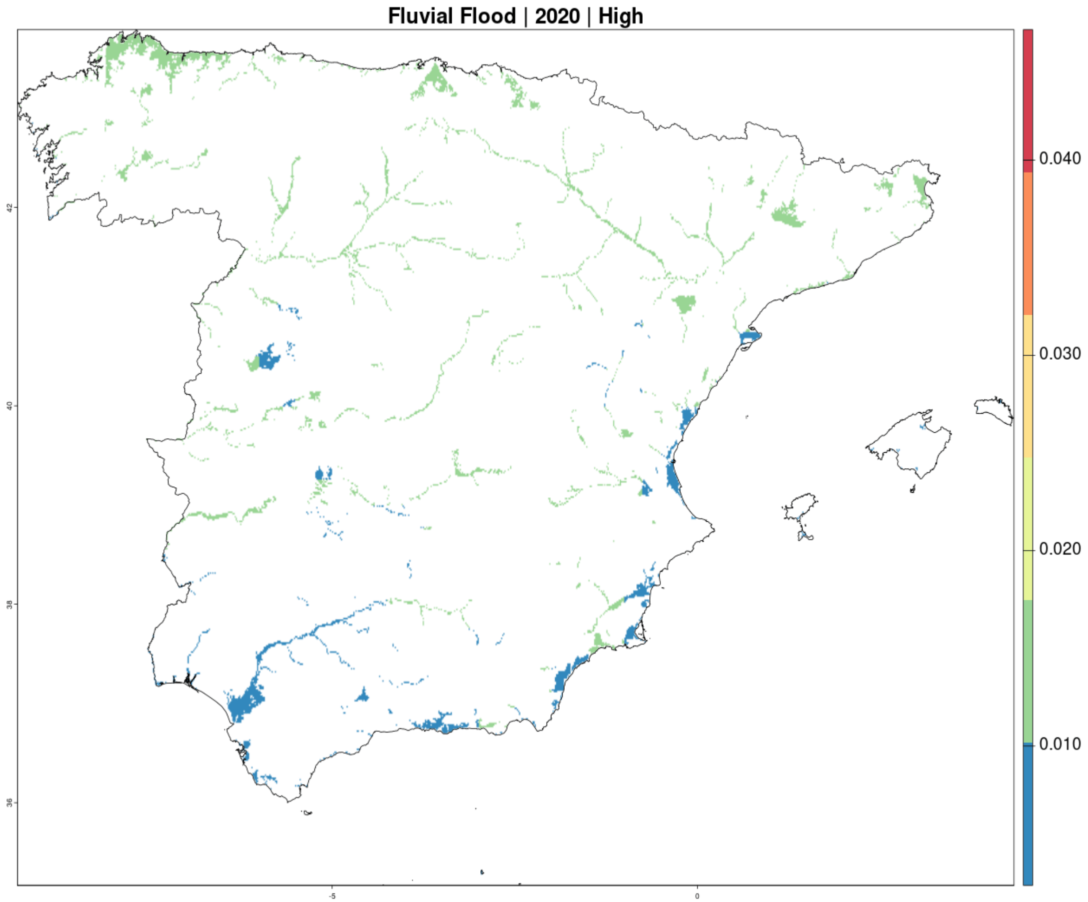
For illustrative purposes only. Source: S&P Global.

Physical Risk Hazards in Spain

Wildfire



Fluvial Flood



Source: S&P Global. Data as of May 2024.

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Market Intelligence

Most at Risk Industries in Spain

GICS Sector	Physical Risk (2050)	Perils Impacting Sector
Trading Companies & Distributors	13.10%	Water Stress
Indep. Power Producers & Energy Traders	9.71%	Water Stress
Electric Utilities	9.41%	Water Stress
Gas Utilities	9.04%	Water Stress
Multi-Utilities	7.62%	Extreme Heat
Renewable Electricity	7.03%	Extreme Heat
Integrated Oil & Gas	4.80%	Water Stress & Extreme Heat
Paper Products	4.49%	Water Stress & Extreme Heat
Food Distributors	4.21%	Extreme Heat
Steel	3.74%	Extreme Heat

Source: S&P Global. Data as of March 2023.

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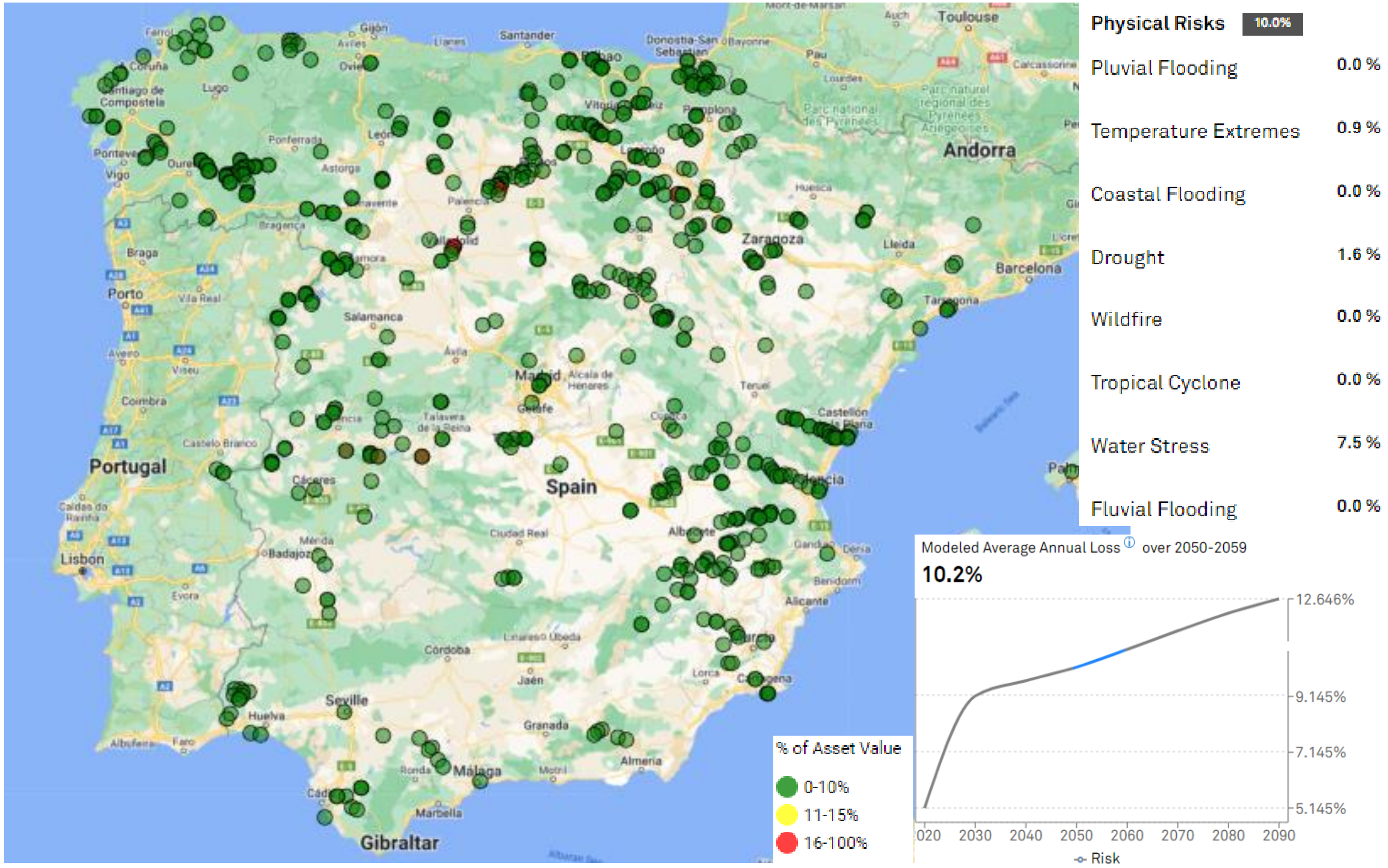
Market Intelligence

A Large Electric Utility Company's Asset Exposure



Source: S&P Global. Data as of March 2023.

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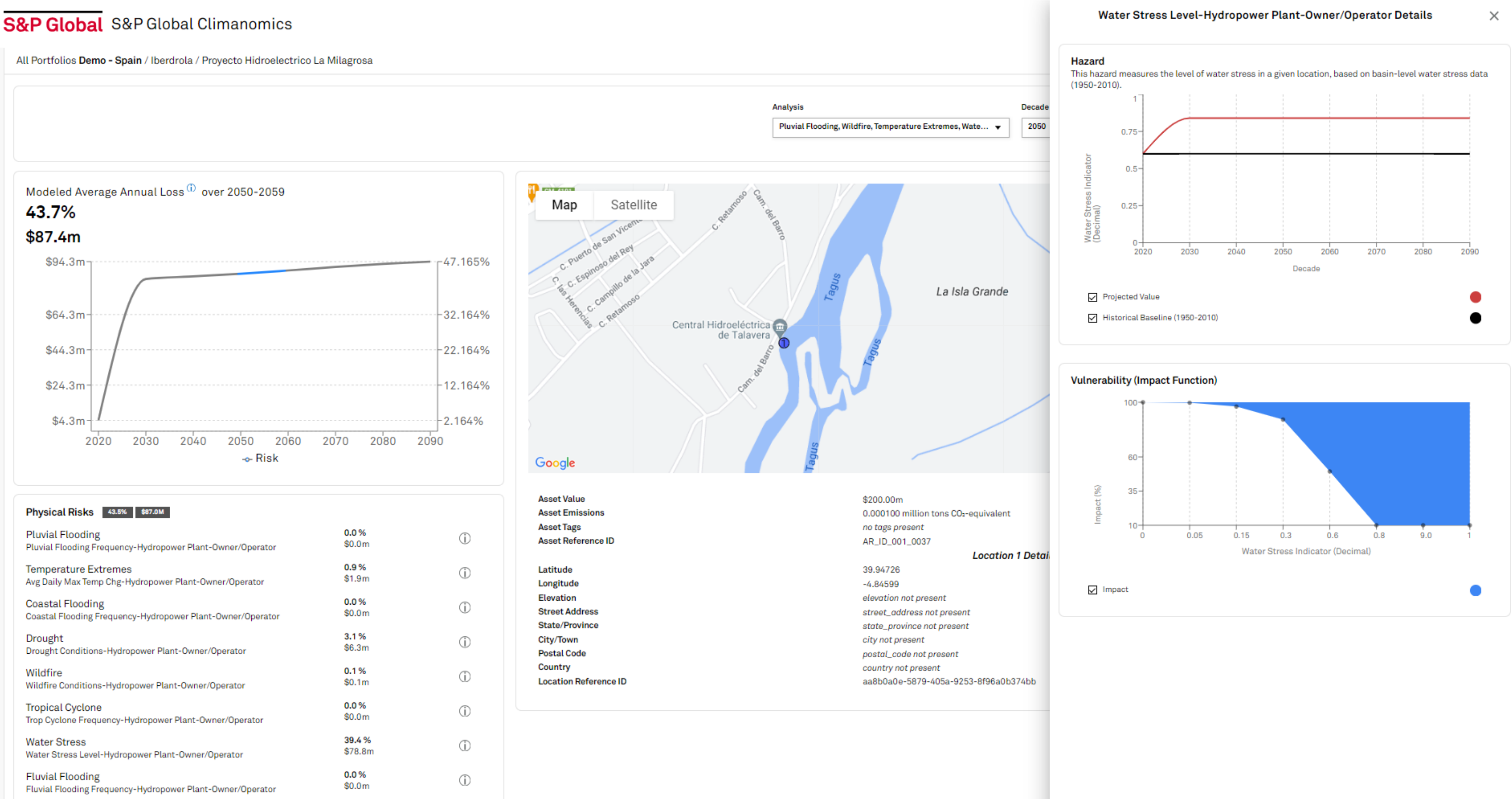
Market Intelligence

Utility Company's Hydroelectric Plant in Toledo



Source: S&P Global. Data as of May 2024.

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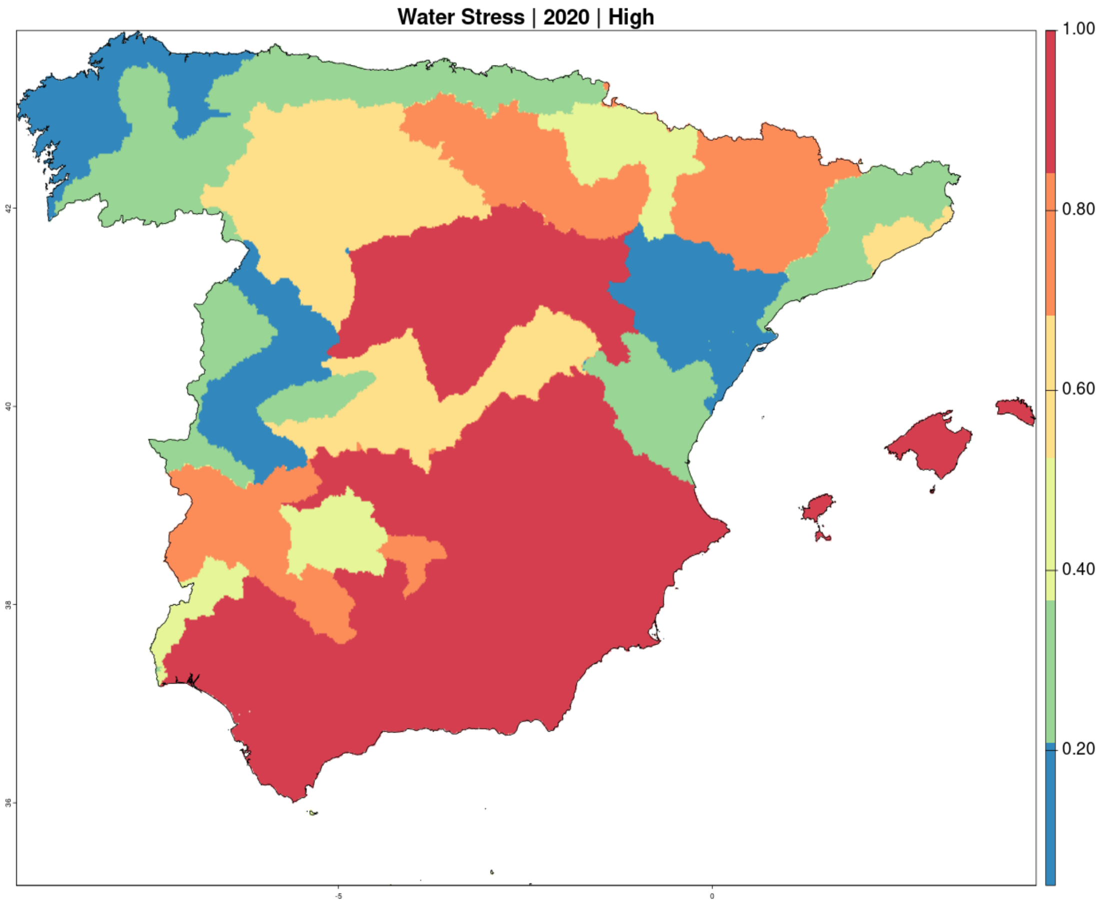
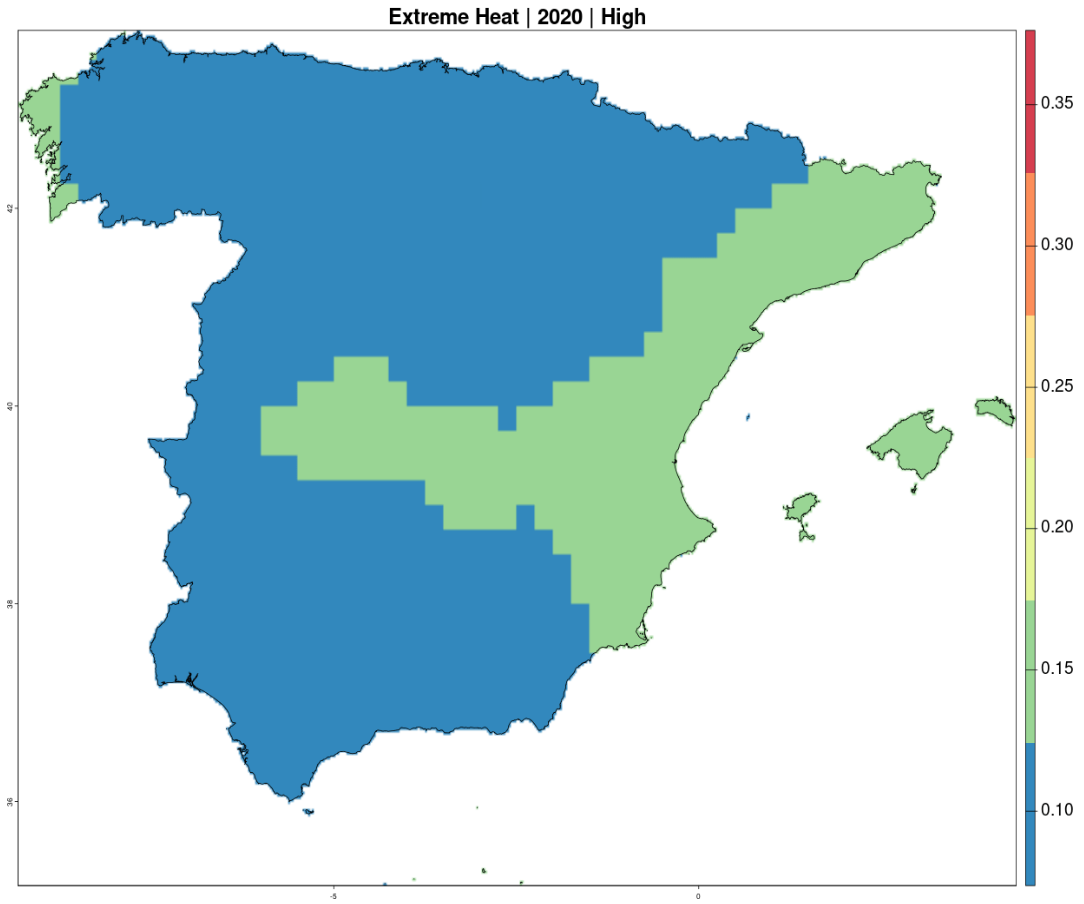
Physical Risk Hazards in Spain

Water Stress



Extreme Heat



Source: S&P Global. Data as of May 2024.

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ECB Climate Stress Testing

Financial Impact Analysis

Rafael Castro, CFA
Credit Product Specialist,
Credit & Risk Solutions
S&P Global Market Intelligence

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Market Intelligence

Climate & Physical Risk Financial Impact

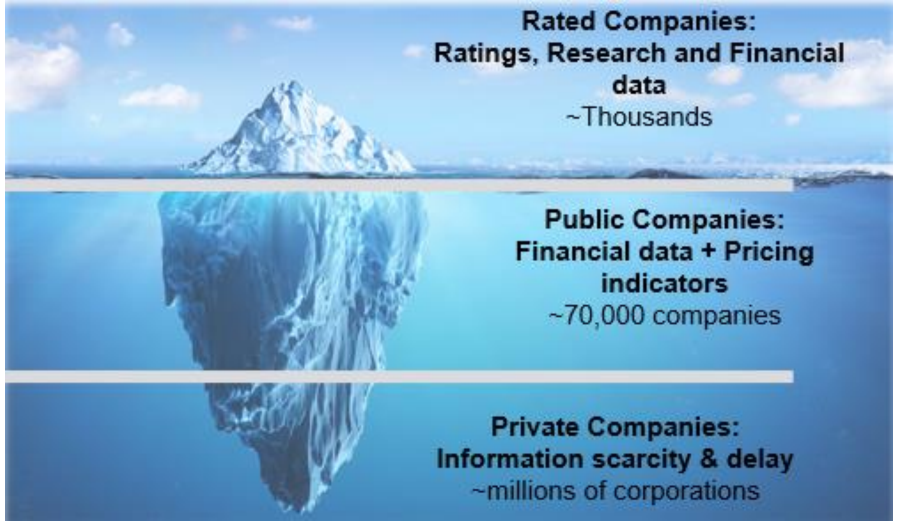
1. Intro & Discussion: ESG risks in practice

2. Modelling Considerations: Adapting existing risk models

3. Portfolio Scenario: Impact on a portfolio level

4. Exposure level: Considering sector level specificity

In Practice: Monitoring & Modelling ESG risks



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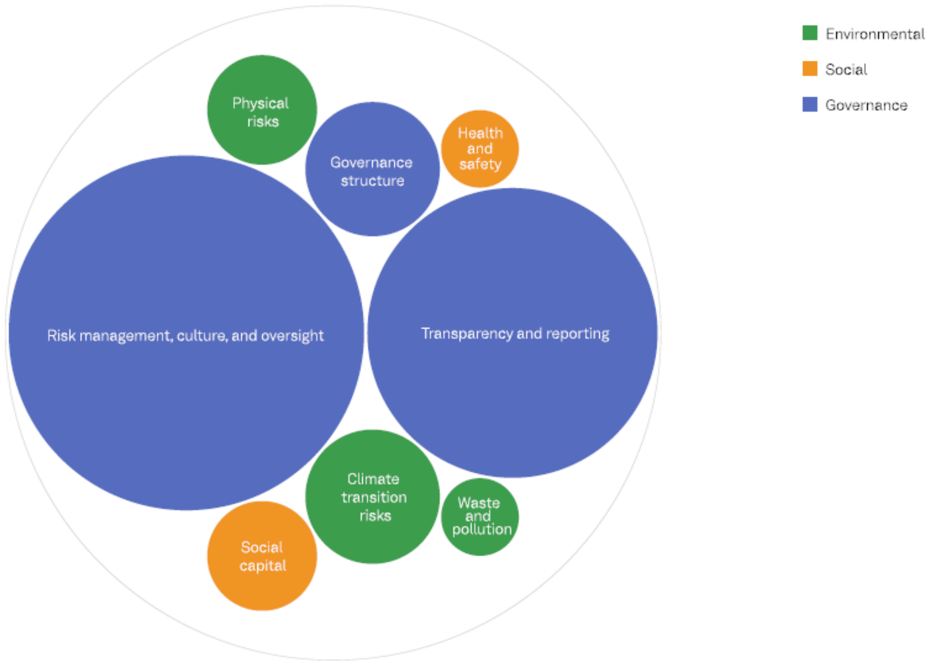
Leading factors cited in ESG-related rating actions
Year-to-date 2024



Data as of March 31, 2024. ESG tagged factors as a proportion of total tagged factors. Bubble size is determined by the occurrence of factors between January and March 2024. In instances where multiple ESG factors were recorded as the main drivers of the credit rating action, each is counted for the purposes of this infographic. ESG--Environmental, social, and governance. Source: S&P Global Ratings.

Source: RatingsDirect ESG In Credit Ratings April 2024

- For rated exposures backward & forward looking
  - ESG Factors Drove 13% Of Corporate And Infrastructure Rating Actions Since 2020. (Source: RatingsDirect ESG In Credit Ratings Deep Dive)
- Diverse portfolios with a mix of available data more challenging

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Innovations in integrating physical & climate transition financial impacts

Emissions	• Scope 1,2,3: direct and indirect emissions • Disclosure and data, Supply chain linkages
Physical Asset Risk	• Multiple physical risks may affect the same location, to a differing extent • Rare and extreme events • Company-level fixed assets' precise geo-location and emissions
Transition Speed	• Depends on targeted temperature increase and government action
Current Carbon Tax	• Wide range, by country: e.g., Poland (0.1 $/t$CO_2$) versus Sweden (120 $/t$CO_2$) • Within same country, carbon tax depends on industry sector
Horizons	• Looking beyond conventional banks' stress testing exercises
Response Type	• Adaptation, business as usual, net zero targets
Others	• The effect of technological breakthroughs – blue/green hydrogen • Increased competitiveness • Accounting standards

Extended time horizons beyond what is available for back testing default and transitions
Factoring changing business models & adaptations
Combining new datasets with limited coverage (allowing for SME coverage)
Model risk – different approaches may yield different results for a given scenario

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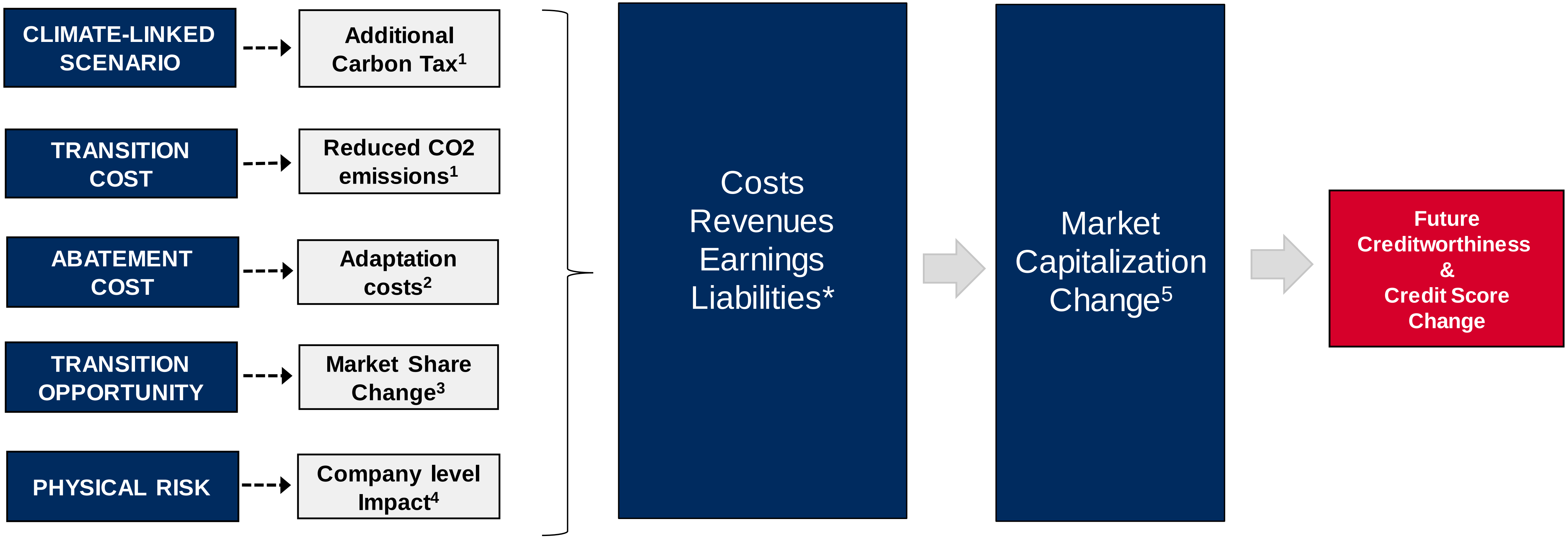
Portfolio Scenario: Impact on a portfolio level

Climate Risk Gauge considers multiple company responses and captures both transition risks and opportunities at an individual company level. Additionally, the macro-economic impact of physical risk and its related downstream effect on individual companies is factored in.

Financial impact



*Increase can be switched on/off

1 Applied to Scope 1 and 2 emissions. Includes forecasted CO2 reduction.
2 Depends on oil price and long term interest rate
3 Based on proxies for company investments and "fire-power" and "consumer awareness"
4 Financial impact function
5 Assuming "Valuation multiple" remains constant.

Source: S&P Global Market Intelligence, as of November 1st, 2021. Charts and graphs are for illustrative purposes only

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Use case Parameters

- Scoring Model: RiskGauge PD
- World view: Regional / Sector View:- Aggregation of emissions and carbon taxes for a specific industry at a specific region (that is the NGFS Region which can also be country-level).
- Baseline financials: 2022
- 53 Non financial Corporate constituents of S&P Spain BMI

	Model Inputs
Current Date	26/05/2024
Baseline Scenario	Current Policies
Model	GCAM v.4
Scenario	Net Zero 2050
World View?	Regional/Sector View
Year	2050
Total Liabilities	Increasing
Abatement Costs	No
Physical Risk Impact	Yes

Yes

Group Statistics	Total Projected Emissions	Physical Risk Costs ($m)	Future Total revenue	Future Market Cap	Adjusted Credit score - 2050
Minimum	-5,582,231	0	10	-3,091	a
Lower Quartile	-34,531	6	493	184	bb+
Median	-2,772	20	1,220	946	bb
Upper Quartile	26,437	75	4,127	4,034	b-
Maximum	1,466,997	1,551	51,430	148,851	c
Average	-114,100	132	4,698	6,473	b-

Climate Risk Gauge Portfolio level results with Physical Risk Impact

No

Group Statistics	Total Projected Emissions	Physical Risk Costs ($m)	Future Total revenue	Future Market Cap	Adjusted Credit score - 2050
Minimum	-5,582,231	0	11	45	a
Lower Quartile	-34,531	0	540	716	bbb-
Median	-2,772	0	1,599	1,844	bb
Upper Quartile	26,437	0	4,399	5,334	b+
Maximum	1,466,997	0	56,656	162,871	c
Average	-114,100	0	5,145	8,703	b

Climate Risk Gauge Portfolio level results with out Physical Risk Impact

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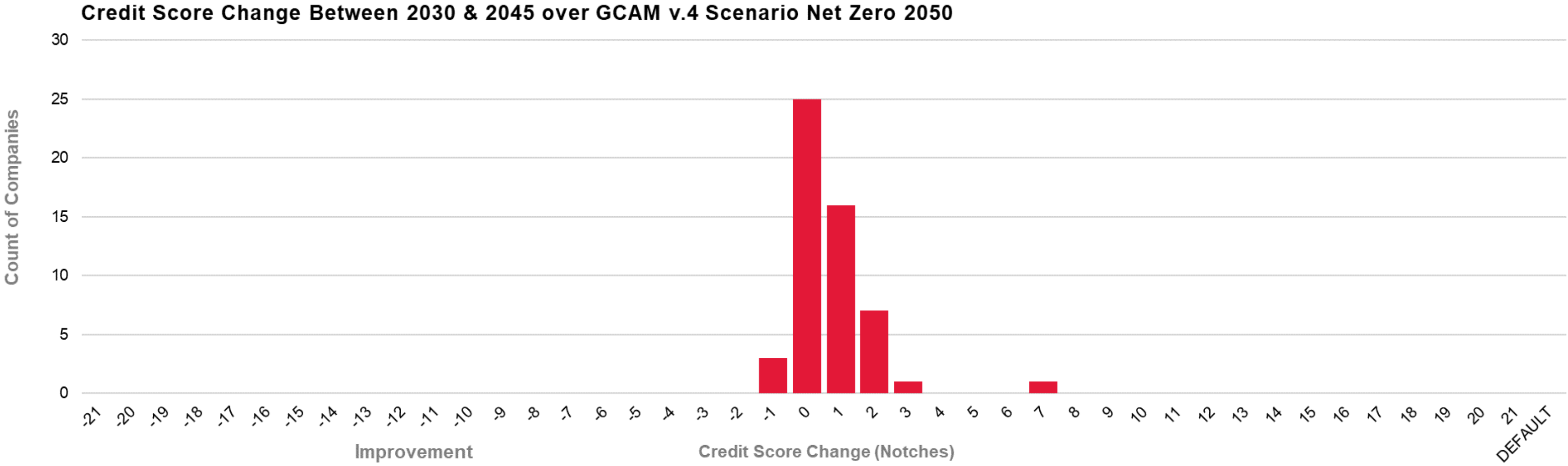
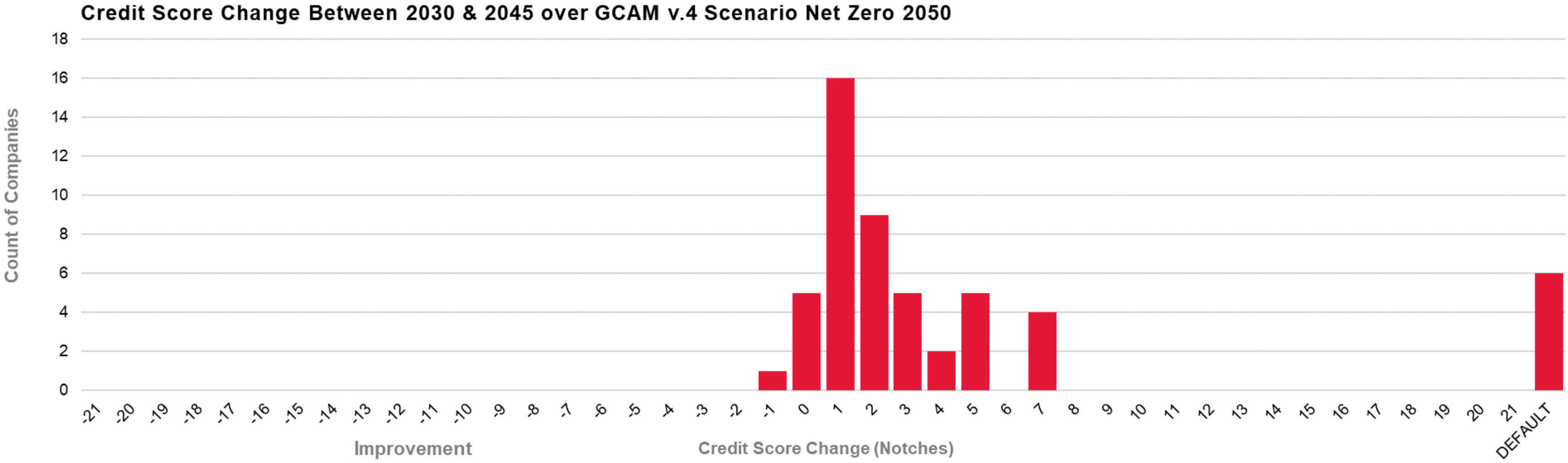
Credit Risk impact: overall impact

With no Physical Risk Impact



With Physical Risk



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Source: Climate RiskGauge. As of: May 2024

Exposure Level: Considering sector level specificity

Input data

Climate scenarios
- NGFS, regulatory, and custom climate scenario variables (e.g., ECB, FRB, MAS) with flexibility available for prop input

Company financials
- Financials and industry segment-specific data from S&P Global Market Intelligence with flexibility available for prop input

Emissions
- Scope 1, 2, and 3 emissions data for over 20,000 public companies, sourced from S&P Global TruCost with flexibility available for prop input

Physical financial impact
- Estimated financial impact % based on ~3.1M asset locations linked to c.150,000 corporate entities, sourced from S&P Global Sustainable1 with flexibility available for prop input

Transition plans
- ~1,000 company emission transition plans, pre-loaded from third-party sources with flexibility available for proprietary user inputs

Industry-specificities
- Industry data from S&P Global (e.g., OEM industry forecasts and R&D from S&P Mobility, oil & gas reserves from S&P Commodity Insights)

Data provided by S&P Global

Climate credit analytics methodology

Bottom-up module

OliverWyman

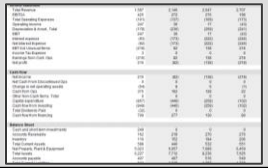
Key drivers	Financial statements (scenario-adjusted)	Financial metrics (scenario-adjusted)
Transition Risk / Physical Risk: Price, Volume, Unit Cost, Capital Expenditure, Asset Value	Income Statement, Cash Flow Statement, Balance Sheet	Credit Scores[1], Bond Valuation, Equity Valuation
Link scenario variables to drivers of performance based each company's characteristics	Produce annual financial statements for each company up to 2050	Assess company's scenario-adjusted credit scores or valuation

For each company covered (i.e., 2.2M companies)

Key outputs

Driver drill downs

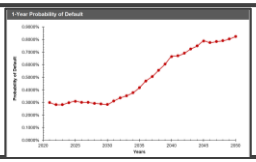
Financial statements



Financial metrics *(e.g., credit score)*

Top-down module
- Privileged user data supplements S&P sources (e.g., Identifier, PD, EAD, industry information)

Extrapolation
based on company characteristics and bottom-up population (for companies where data is not sufficient to run bottom-up and in order to ensure comprehensive coverage of portfolios)



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Exposure level: Considering sector level specificity Power Generation

NGFS (Phase 3) Scenarios

Net Zero 2050

Limits global warming to 1.5 °C through stringent climate policies and innovation, reaching global net zero CO2 emissions around 2050.

Current Policies

Assumes that only currently implemented policies are preserved, leading to high physical risks.

Model parameters

Choose additional Inputs	Optional
Financial Statement Forecast Parameters	**Model Inputs**
Dividends	Scale total payout with net income
Max. dividend payout ratio (integrated scenario only, if "hold	100%
Min. dividend payout if 0% in baseline (integrated scenario o	60%
Positive cash flow	Reduce debt to target debt/equity, then repurchase shares
Target Debt-to-Equity ratio	1.34
Maximum Debt-to-Equity ratio	3.02
Modify Production Growth Based on Debt to Equity Check?	Yes
SG&A Growth	Scale with volume
Electricity-Specific	**Value**
Regulated segment: percent of costs passed on to customer	100%
Maximum capacity factor for fossil generation	90%
Allow coal to bounce back? (fall initially and then rise)	No
Nuclear generation/capacity (long-term scenarios only)	Use world variables
Potential Default Flag	**Model Inputs**
Net Debt to EBITDA Ratio exceeds limit	Yes
Net Debt to EBITDA Ratio limit	10
NiGEM Scenario Variable Parameters	**Model Inputs**
Use NiGEM variables?	No
Interest rate	Use company historical average
Physical Risk Parameters	**Model Inputs**
Include Physical Risk?	Yes
Physical Risk multiplier	2.00
Use Revenue by Geography for Physical Risk	Yes
Early Reporting Flag	**Model Inputs**
Apply early reporting flag	No

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Power Generation Example

Climate scenarios are expected to impact all drivers of performance for power generation companies

Input data

Company-specific

- Company financials
- Fuel mix
- Emissions profile
- Volume of production and cost profile
- Transition plans
- Capital expenditure
- (Un)regulated capacity
- Asset exposure to physical risk (damage, downtime)

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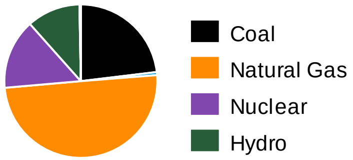
Current fuel mix (illustrative)



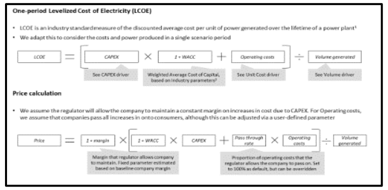
Scenario data

- NGFS
- Regulatory scenarios
- Customized scenarios

key drivers

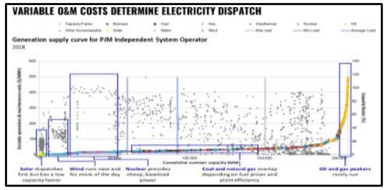
Price

- Higher price due to increased demand, costs, and investment in scenarios
- Depends on (un)regulated capacity for a given company



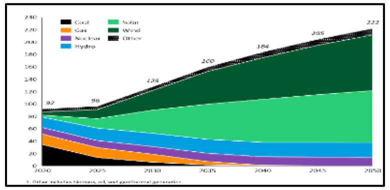
Volume

- Volume evolves following the company's transition plans, capex spend, and scenario demand for a given fuel in a given geography
- Physical risk creates additional downtime[1]



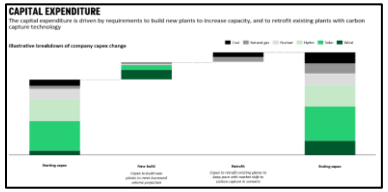
Unit Cost

- Cost of production depends on the company's energy mix and the carbon price from the scenario
- Heightened physical risk leads to increased insurance costs



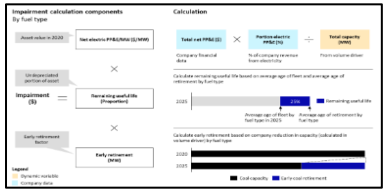
Capital Expenditure

- Investments driven by company transition plan, scenario demand, resilience spendings, and ability to invest (through debt or cash)



Asset Value

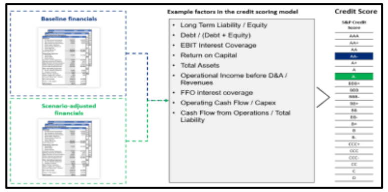
- Impairments booked when assets are retired before the end of their useful life ("stranded assets")
- Damage to assets from physical risk effects[1]



Financials

Financial Statements

Financial metrics
(e.g., change in credit score)



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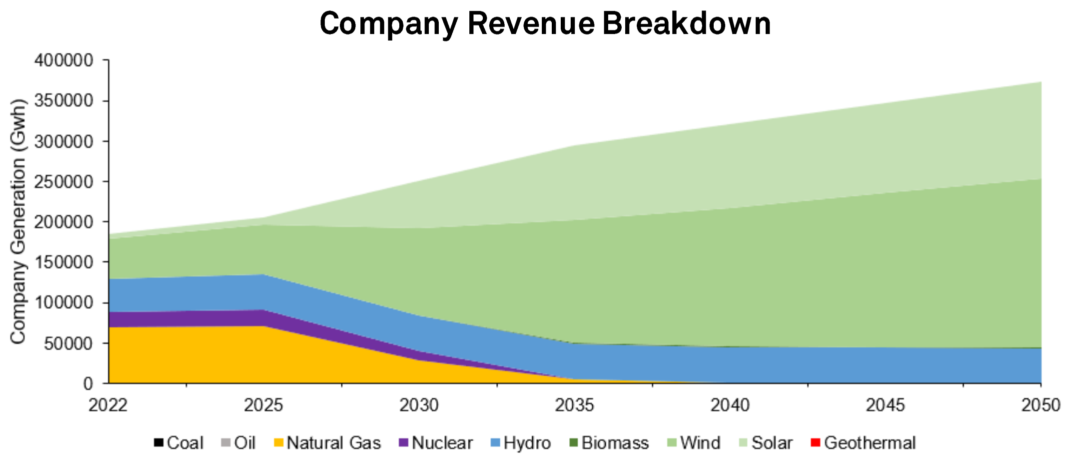
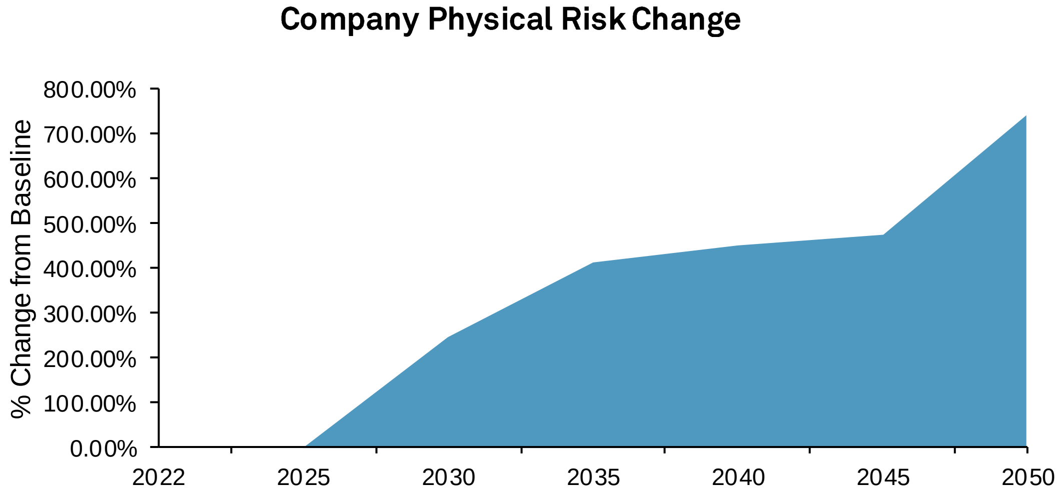
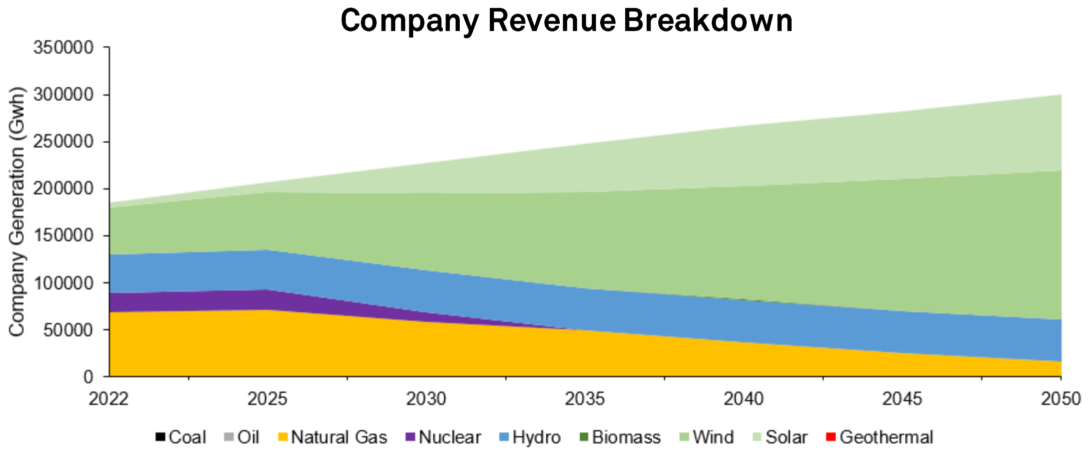
Energy Mix & Physical Risk Scenarios Impact Iberdrola

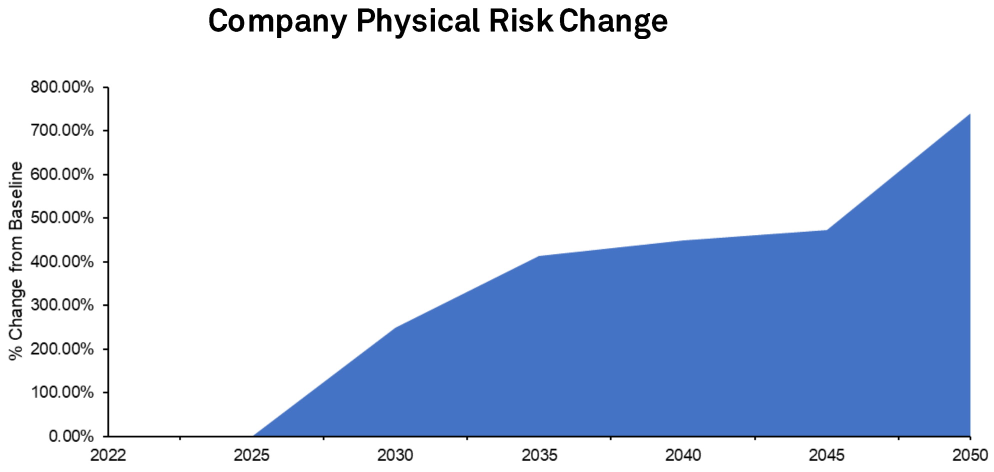
Net Zero 2050





Current policies





Source: Climate Credit Analytics. As of: May 2024

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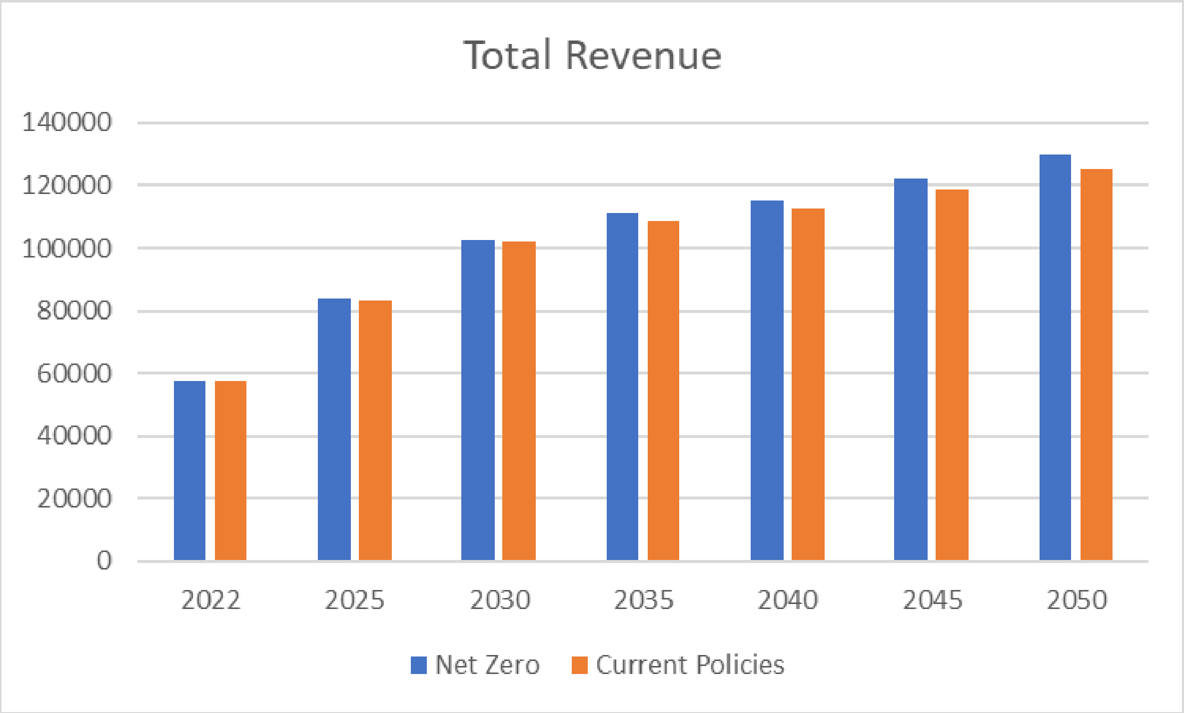
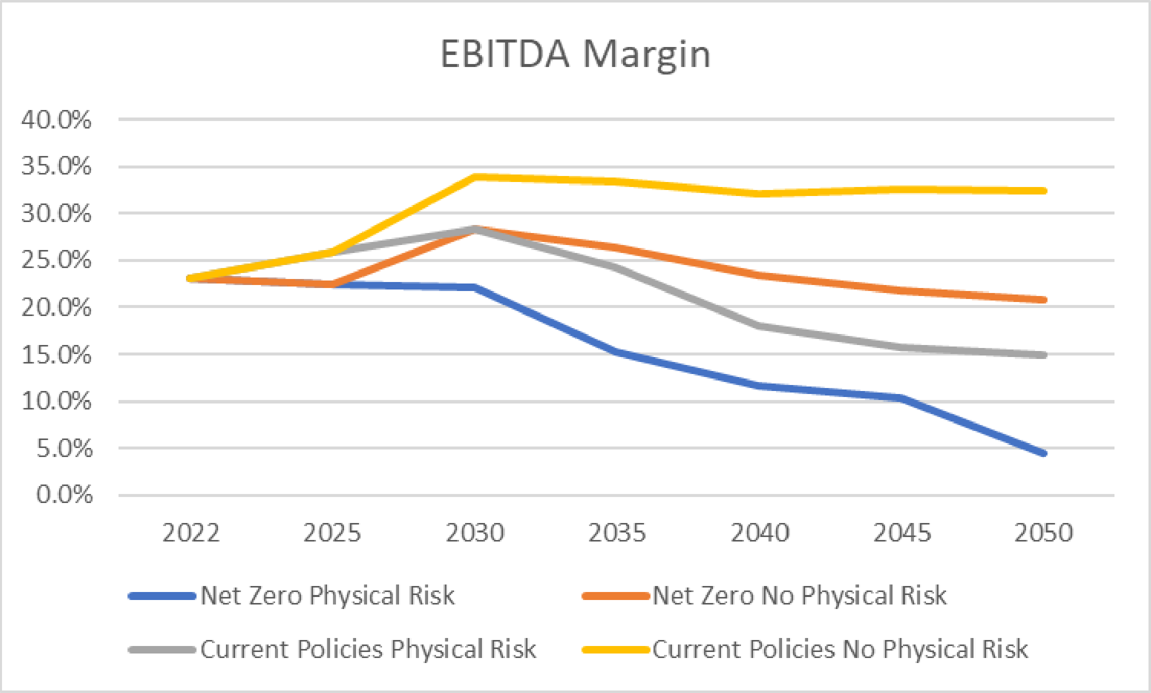
Revenue & Profitability: Impact of the Production Forecast & Physical Risk





Source: Climate Credit Analytics. As of: May 2024

- Iberdrola benefits from strong renewable share (52%) in its production, which makes the company less sensitive to the transition, whatever the scenario. Nevertheless, revenues in Net Zero 2050 are slightly higher due to higher volumes in that Scenario (stronger electrification of the economy)
- EBITDA margin impacted largely due to physical risk from 2030. As a function of both scenario and production the impact is greatest in Net Zero 2050

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Sustainable1

S&P Global Sustainable1 Compass Series

Avanzando hacia el Horizonte del Riesgo Climático

Madrid, 29th May, 2024

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