Network for Greening the Financial System

Technical document

Capturing risk differentials from climate-related risks

A Progress Report: Lessons learned from the existing analyses and practices of financial institutions, credit rating agencies and supervisors

May 2022

NGFS

Central Banks and Supervisors Network for Greening the Financial System

Foreword

Ravi Menon
Chair of the NGFS

Gek Choo Goh
Chair of the Workstream on "Micro-prudential and Supervision"

The ability to identify and price climate-related risks is a key enabler for financial institutions and investors to integrate climate-related risks and opportunities into their business strategies, risk management processes and capital allocation decisions. This will in turn help to accelerate the channelling of capital to green and transition activities, thereby helping to foster a more sustainable future.

The Network for Greening the Financial System (NGFS) has been an early advocate of this important work. In May 2020, the NGFS published its "Status Report on Financial Institutions' Experiences from working with green, non-green and brown financial assets and a potential risk differential". This Report updates on the progress made by financial institutions, credit rating agencies, and supervisors in accounting for climate-related risk differentials. The perspectives offered by this broader group of financial market participants should catalyse further analyses and advance our collective understanding of such risk differentials.

In assessing climate-related risk differentials, this NGFS work highlights a decisive shift from applying a 'greenness' lens at the activity or asset level in a backward-looking manner to assessing vulnerabilities at the counterparty level in a forward-looking manner. Further work is necessary to refine the use of forward-looking tools such as scenario analysis and stress testing in quantifying risks, as well as to examine the relevance of transition plans of green, transition-ready and transition-unprepared companies. This work could also feed into future Pillar 2 considerations and supervisory assessments of material risks faced by financial institutions.

Furthering work on quantifying climate-related risk differentials remains a focus for the NGFS and is factored into our work programme on supervision and scenario analysis for the next two years. The NGFS stands ready to work closely with standard-setting bodies and other stakeholders to mainstream sustainable financial practices and to enhance the resilience of the global financial system to climate-related and environmental risks.

We deeply appreciate the commitment and dedication of all Workstream members who have contributed to the drafting of this progress report, as well as the financial institutions and credit rating agencies who took part in the survey. Our special thanks go to Banco de España and Nadia Lavin for leading the work on this Progress Report, as well as to the NGFS Secretariat.

Table of Contents

Executive Summary

Context of the NGFS study

In recent years, supervisors have intensified their efforts to integrate climate-related and environmental risks into their day-to-day activities and supervisory frameworks[1]. In this context, the supervisory community has been exploring ways to measure and mitigate the impact of these risks on financial stability and increase the resilience of individual financial institutions. One of the avenues explored by supervisors is the adjustment of Pillar 1 capital requirements following a risk-based approach. Such recalibration of existing capital requirements calls for an accurate quantification of the impact of climate-related and environmental factors on financial risks. **This paper explores the supporting evidence for introducing adjustment factors into Pillar 1 capital requirements[2] based on the greenness of an asset, underpinned by the theory that risk differentials could arise from potential greater exposure of non-green assets to transition risk.**

To follow up on the NGFS' previous study[3] ("Status Report") aiming at detecting potential risk differentials between green and non-green assets, **this report presents the results of a second survey conducted in 2021 among a wider pool of financial institutions** (97 banks, insurance companies and development banks[4]). This second survey sought to identify the most advanced practices in the areas of green/non green classification and the assessment of risk differentials. **This report also offers the complementary perspective of credit rating agencies (CRAs)** by presenting their methodologies for assessing and attempting to quantify the impact of climate-related credit factors on credit ratings.

Key takeaways

- **This report analyses the attempts to study and quantify potential credit risk differentials between green and non-green assets/activities. Stocktakes conducted on this front revealed that there is still limited empirical evidence of ex-post risk differentials.**

Only a small number of financial institutions conducted backward-looking risk differentials analyses but did not arrive at robust conclusions. This notwithstanding, about half of the surveyed financial institutions have developed or plan to develop internal methodologies to track specific risk profiles of green and non-green assets in the coming future. A number of them have also identified specific sectors or asset classes to focus their analysis such as private assets, mortgages and other carbon-intensive sectors such as oil and gas.

From the analysis of CRAs' methodologies and research findings, there is also no clear direct evidence of a correlation between the final credit rating and the ESG[5] credit factors[6] affecting an entity, due to the presence of other non-ESG-related credit factors (e.g. cash, liquidity, capital structure, competitive positioning). ESG factors are considered as part of the credit rating process but backtesting exercises by CRAs have not attempted to disaggregate the credit impact of ESG factors.

- **Given persistent methodological and data-related challenges, conducting risk differential analysis is not a straightforward exercise.**

The methodologies for assessing risk differentials are still affected by the challenges highlighted in the Status Report and the surveys conducted among financial institutions and CRAs brought greater focus on the methodological challenges.

1 See *NGFS Progress Report on the Guide for Supervisors*, October 2021.

2 Such as "green supporting" or "brown penalising" factors.

3 The NGFS had first conducted a survey among financial institutions in 2019 and published a study on risk differentials in 2020, which was inconclusive as methodologies to assess risk differentials were still nascent and the prerequisites to track the risk profiles of green and non-green assets were not in place. See "*A Status Report on Financial Institutions' Experiences from working with green, non-green and brown financial assets and a potential risk differential*" ("Status Report"), May 2020.

4 See "Box 1 Scope and methodology of the NGFS exercise" included in this report.

5 The focus of our analysis is on the E pillar, even though the CRAs' approach to the other pillars is similar.

6 ESG credit factors are those deemed relevant by CRAs to assess entities'/issuers' creditworthiness.

First, financial institutions' approaches to classification remain rather heterogeneous, which hampers the accurate and consistent assessment of risk differentials.

Second, these classification methods occur at the activity or asset level and do not directly translate to potential green and non-green risk differentials at the counterparty level. Therefore, there is a need for further study and guidance to enhance the articulation between activity-level and asset-level risk profile information with the credit risk profile at counterparty level. Ongoing international efforts towards greater interoperability between classification approaches and the development of transition taxonomies should also facilitate a more consistent and granular assessment of climate-related risks going forward.

Third, assets' risk profiles remain highly dependent on factors that are not always controlled for in current risk differentials analyses. This holds particularly true for transition risk where multiple idiosyncratic factors and other non-climate-related risk drivers can have a more decisive influence on assets' credit risk[7] profile.

Fourth and importantly, conventional risk differential analysis based on historical data are backward-looking and unable to fully account for the potentially longer time horizon, the uncertain and non-linear nature of the impact and the likelihood of materialisation of climate-related risks. For example, climate-related transition risks are expected to intensify in the next ten years due to accelerating actions and commitments by governments and private sector actors and are challenging to model.

- **Surveyed financial institutions are turning to other methodologies – and in particular, forward-looking methodologies – for identifying and assessing climate-related risks.**

Financial institutions are making progress in assessing their vulnerability via various qualitative and quantitative tools and methodologies (such as heat mapping, scoring, concentration analysis or sensitivity and scenario analysis). The results of these exercises could be used to distribute a shock asymmetrically over the portfolio when running a stress testing exercise and even in internal rating models.

Methodologies developed by both financial institutions and CRAs suggest moving away from classification-based, backward-looking analysis of risk differentials to a more granular, forward-looking assessment of counterparties' vulnerability to climate-related risks. In this respect, they have been exploring transition readiness of counterparties in non-green sectors as potential means through which climate-related risk differentials could manifest. Findings from the 2021 survey therefore lend further support to risk-based forward-looking methodologies as better suited to assess the distinct features of climate-related risks, explore the relative riskiness of sectors and assets under different climate-related pathways and assess the alignment of counterparties with different transition scenarios.

Building on that, a risk differential aspect that could merit further analysis is between green, transition-ready and transition-unprepared companies and the credibility of their transition plans. Further, financial institutions' forward-looking approaches – including methodologies to analyse the credibility of counterparties' transition plans and those relating to scenario analysis and stress testing – need to be further refined.

- **CRAs' methodologies with respect to the integration of ESG factors in credit rating and related research findings can help advance the analytical approach towards assessing risk differentials from a more granular and forward-looking perspective.**

CRAs' methodologies provide a complementary perspective on how to assess the impact of ESG factors on financial risks, as well as the relevance and the materiality of ESG factors to counterparties' creditworthiness. In particular, CRAs can provide additional insights on how transition readiness can be assessed, as well as how initial applications of scenario analysis can be used to assess the medium and long-term vulnerability of creditworthiness to ESG factors.

7 Such as cash flows, capital structure, liquidity, management, industry risk, competitive position.

Looking forward

- **Through this update on risk differentials' analysis, the NGFS has identified three key strands of work for our supervisory community that could improve the resilience of financial institutions to climate-related and environmental risks.**

(i) Supervisors could seek to further their understanding of the range of potential risk differentials as manifested through scenario analysis and stress testing, how this could be applied at the individual institution's level and how this could eventually factor in climate mitigation and adaptation strategies by their counterparties.

In light of the limitations of the backward-looking methodologies, supervisors could consider encouraging financial institutions to further develop risk-based forward-looking tools to assess the impact of different climate change pathways on financial risk parameters as well as the alignment of financial institutions' balance sheet and risk mitigation and adaptation strategies with climate policy scenarios.

Climate-related forward-looking methodologies are still faced with some challenges (in particular at the stage of scenario design) and limitations (relating to data availability) that supervisors should be mindful of. However, they are useful tools to assess the magnitude of these risks to the economic and financial system and evaluate the climate resilience of financial institutions' business models. Further refining scenario analysis to facilitate supervisory understanding of financial institutions' vulnerabilities to climate-related and environmental risks is therefore crucial.

(ii) With a view to enhancing the management and monitoring of transition risk in a forward-looking manner, supervisors could examine the relevance and extent to which financial institutions should consider their counterparties´ transition plans.

In particular, supervisors could consider developing supervisory expectations for financial institutions to consider counterparties' transition plans in their analysis of exposures to and management of transition risks. Such an approach would allow the financial institutions to better understand how climate-related and environmental risks can or will affect their counterparties over the short, medium and long terms, and under the various scenarios. Importantly, this is not intended to call for outright divestment of carbon-intensive sectors; rather, this is to allow the banks to more fully appreciate the differentiated transition paths of different sectors and geographical regions and to proactively manage the risks.

Progress on that front will hinge on the issuance of guidance to ensure the consistent and more systematic elaboration by non-financial corporates of transition plans and their adequate disclosures, which might not be under supervisors' mandates. More broadly, disclosures of relevant metrics by non-financial corporates such as their transition plans and consistent alignment and activity metrics should be encouraged, and could eventually become mandatory, for due diligence and approval of financing where relevant. Overall, there is a need for enhancing linkages between climate-related and environmental disclosures and financial statements and for consensus practice on the accounting treatment of ESG factors.

(iii) Supervisors could further advance their understanding of the impact of environmental and climate-related risks on credit ratings and internal credit risk modelling at financial institutions.

Given that climate-related risk differentials could manifest at counterparty level, rather than at activity level, further work could be conducted to examine how to integrate climate-related and environmental factors into credit rating and internal credit risk modelling.

- **The above three strands of work would allow supervisors to contribute to further analytical work and discussion to determine whether and where a potential adjustment of the existing capital framework is justified and feasible in relation to climate-related and environmental risks (and if so, which part of the framework).**

The NGFS is supportive of future work on this front and stands ready to coordinate with Standard-Setting Bodies to clarify to which extent climate-related and environmental risks are already captured by the current regulatory framework (through the three Pillars of banking supervision, and equivalent standards in the insurance sector), assess gaps and consider possible enhancements.

Given the current data and methodological limitations, introducing adjustment factors in the Pillar 1 capital framework using conventional risk differential analysis based on historical data remains a challenge.

In light of the practices discussed in this report, there may be greater potential to consider Pillar 2 measures, when addressing material idiosyncratic climate-related and environmental risks faced by individual financial institutions – this does not exclude potential use of Pillar 1 tools. Progress made by supervisors in setting supervisory expectations on the management of climate-related risks – as highlighted in the *NGFS Progress Report on the Guide for Supervisors* – is likely to accelerate the development of more sophisticated climate-related risk management tools by financial institutions as they implement these expectations. With improved capabilities to assess the adequacy of financial institutions' climate-related risk management, supervisors will also be more equipped to assess quantitative and qualitative measures in a comprehensive manner. Supervisors have also identified forward-looking assessments as a useful tool to address climate-related and environmental risks and future work will shed more light on their use in determining potential quantitative and qualitative Pillar 2 measures and requirements[8]. **Considering climate-related and environmental risks as part of Pillar 3 requirements could also be beneficial given the general use of disclosures in facilitating measurement and monitoring of these risks.**

8 As highlighted in the NGFS' *Progress report on the Guide for Supervisors* and *Scenarios in Action* published in October 2021.

1. Introduction

In May 2020, the NGFS published its "Status Report on Financial Institutions' Experiences from working with green, non-green and brown financial assets and a potential risk differential" (*Status Report***).** The report focused on the work performed by financial institutions to track specific risk profiles of green and non-green financial assets[1], develop specific risk metrics and analyse potential risk differentials. Risk differentials analyses aim at exploring whether, all other things being equal, the greenness or non-greenness of an asset, the associated counterparty or underlying activity affects its financial risk profile. In particular, excluding other relevant risk factors affecting their riskiness, these analyses aim at seeking evidence of a consistent link between the greenness or non-greenness of assets and their credit profile. Such evidence could provide the grounds for introducing adjustment factors in Pillar 1 framework depending on the "greenness" or "non-greenness" of assets[2]. Depending on the level at which the risk differential analysis is conducted, further methodological work may be needed to find evidence, if there is a need to introduce adjustment factors when assessing capital requirements (i.e. if the analysis is conducted at the activity, sector or asset-level, but not at the counterparty level).

The results of the Status Report did not allow the NGFS to conclude on a risk differential between green and non-green assets as the prerequisites for tracking the risk profile of green or non-green assets from a backward-looking perspective were not yet in place. The main obstacles for assessing risk differential were: (i) the lack of consistent, comparable, and reliable data at global level to analyse the effect of climate-related or environmental factors on risk related to exposures and a clear taxonomy to classify those; (ii) the discrepancy between measuring greenness/non-greenness at exposure level and measuring credit risk at counterparty level; and (iii) organisational challenges in internal risk assessment and risk measurement processes. However, it provided useful insights into the practices of a sample of financial institutions around the globe to monitor climate-related risks and the challenges these institutions were facing.

Following up on this Status Report, this report provides an updated overview of practices by 97 institutions[3], which were surveyed in the second quarter of 2021 on their methods to classify assets according to green and non-green factors and to assess financial risk differentials. As the sample of surveyed institutions partially differs from that of the Status Report (see Box 1 on the scope and methodology of the exercise), **this report aims to highlight whether the trends reported in the areas of classification and risk differentials have significantly evolved since then.**

- **First, the report provides an overview of where financial institutions stand in the implementation of classification methods** as these are considered a prerequisite for deepening analytical work on possible risk differentials between assets with green and non-green profiles (chapter 2).

- **Second, the report aims to identify the most advanced practices in terms of risk differentials analysis, and more broadly in terms of climate-related and environmental risks assessment, which are supported by detailed case studies that could serve as a source of inspiration for other institutions** (chapter 3). In addition to the backward-looking approaches, which aim to assess ex-post risk differentials between green and non-green assets, the report provides a deeper dive into forward-looking methodologies. As mentioned in the Status Report, forward-looking approaches may be better suited for capturing the unprecedented impacts of climate-related risks and, in particular, researching the risk profile relationship between climate-related factors and financial risks. These impacts are usually estimated on variables of interest, such as institutions' risk parameters or companies' financials, and the comparison of results under different climate-related scenarios can provide insights into potential risk differentials.

- **The report discusses the complementary approach adopted by the three main credit rating agencies (CRAs)** with respect to the classification systems and the assessment of risk differentials (chapter 4). To this end,

1 As of yet, there are no clear, uniform definitions of the commonly used terms "green" and "non-green". We abstain from adhering to any particular definition (See chapter 2 of the report).

2 One could expect that this would be expressed in capital requirements by decreasing those for "green" assets and/or increasing those for "environmentally harmful" assets.

3 Including 94 banks and insurance companies as well as 3 development banks.

this report analyses CRAs' methodologies to integrate climate-related and environmental factors into their credit rating processes. It looks at how they measure and classify the relevance and materiality of Environmental, Social and Governance (ESG) factors for credit ratings, the interaction between ESG factors and credit parameters, and how they use scenario analysis to assess long-term vulnerability of creditworthiness to ESG factors.

- **Finally, the report presents supervisory authorities and regulators' perspectives on risk differentials and proposes a way forward** (chapter 5).

Box 1

Scope and methodology of the NGFS exercise

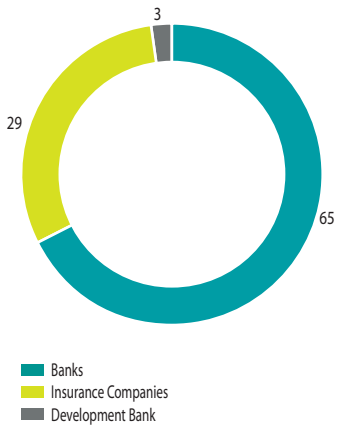
The NGFS conducted a survey among financial institutions and NGFS Observers in the second quarter of 2021. This new survey aims to obtain an updated overview since the *Status Report* of institutions' practices in terms of classification methods and with respect to the assessment of risk differentials between green and other assets. Moreover, this survey intends to take stock of new areas of development, such as the forward-looking methodologies from a risk differentials perspective or the changes pertaining to the risk management frameworks. This report brings to the fore the most advanced practices that were observed.

The practices showcased in this report are based on information shared by a sample of 97 institutions.

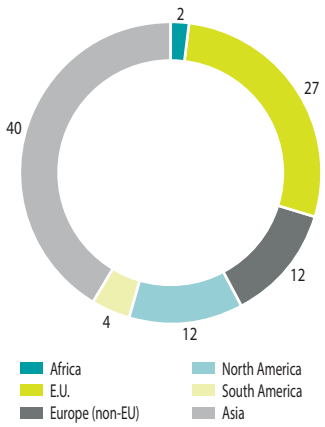
- This sample cannot be considered as fully representative. The NGFS Secretariat and its Members have circulated the survey to over 150 institutions with the purpose of targeting those most likely to be able to share significant progress in the area of risk differentials' analysis. In order to dive deeper into the most advanced practices in terms of risk differentials assessment, the NGFS conducted bilateral meetings with six private financial institutions and one development bank.
- A total of 97 responses were received and analysed representing: (i) in terms of activities: 65 banks, 29 insurance companies, 3 development banks (ii) in terms of jurisdictions: 22 countries (mostly from Europe and Asia).
- The asset size of the respondents ranges from EUR 0.22 billion (bn) to EUR 2,282 bn for banks and less than EUR 0.1 bn to EUR 890 bn for insurers, the average asset size being EUR 338 bn for banks and EUR 214 bn for insurers.
- All but three of surveyed financial institutions are parent companies/financial groups. In two instances, the NGFS received responses from the parent companies and one or two of their subsidiaries. When computing statistics in the report and when the content of their responses did not materially differ, the content of these responses were treated as a single contribution to the survey.

…/…

Breakdown by sector



Breakdown by geographic area



The list of institutions surveyed in 2021 differs from the preceding one even though 28 institutions have contributed to both Q3 2019 and Q2 2021 surveys. More precisely, **the scope of surveyed institutions has been extended from a geographical perspective,** as the Status Report was based on contributions from five insurance companies in a single jurisdiction whereas the practices of 29 insurance companies from three continents (Asia, America and Europe) are reflected in this report. Moreover, the practices of 65 banks from all continents (but mostly from Europe and Asia) have been considered in this report (compared to 49 banks in the Status Report).

In addition to financial institutions and development banks, the NGFS surveyed three credit rating agencies (Moody's, Standard & Poor's and Fitch Ratings). This survey aims at collecting information about CRAs' methodologies for integrating climate-related and environmental considerations into their credit rating processes and for assessing risk differentials between green and other assets. Chapter 4 of this report dedicated to CRAs' approaches is based on information provided in their responses to the survey, during interviews conducted by NGFS representatives with each of them, and on other information from their published reports and the NGFS team's literature review.

With its extended coverage giving more visibility, this report addresses whether the trends reported in classifying financial assets according to green and non-green criteria and in analysing risk differentials have significantly evolved compared to the last report. As a result, the findings do not allow for judgement on the progress made by specific institutions.

2. Surveyed institutions' approaches to green and non-green classifications

This chapter provides an overview of where financial institutions stand in the implementation of classifications methods as defined in the Status Report (see Box 2). In this report, we abstain from adhering to any particular definition, as there are no clear, uniform definitions of the commonly used terms "green" and "non-green". Nonetheless, "non-green" should be understood broadly, as encompassing exposures that can lie in the spectrum that runs from "environmentally harmful" (including "brown", "red" or, in the case of climate change, "emission intensive") to "neutral" and "intermediate" (or "amber")[4] to allow for the presentation in this report of a wide range of institutions' practices.

Key takeaways:

- **More than half of the surveyed financial institutions either have implemented or are actively implementing methods to classify assets according to green factors.**

Financial institutions report using a wide range of classification methods. Compared to the Status Report, they seem to rely as much on taxonomies and on international classifications and principles as on internally developed classifications. These classification methods are primarily used as a screening tool for activities, counterparties and assets while internal classifications can be designed by financial institutions to serve additional purposes such as ensuring the alignment of their portfolios with the Paris Agreement.

- **Financial institutions' approaches to classification remain rather heterogeneous in terms of granularity, scope and definitions of "green" and "non-green" which hampers the accurate and consistent assessment of risk differentials.**

Although classification methods are applied to a broader scope of assets than reported in the previous study, a small number of surveyed financial institutions are applying these methods to all their asset classes. Even within the eligible asset classes, the majority of financial institutions apply these classifications methods only to specific types of exposures. Furthermore, most respondents use or plan to use more than one classification method, combining different definitions of green and non-green ranging from a strict focus on climate-related risks to the consideration of broader ESG factors.

This persistent heterogeneity in defining "green" and "non-green" across jurisdictions and the fact that established taxonomies are usually directed to identifying "green" hamper the rigorous analysis of risk differentials and, most importantly, can prevent from reaching consistent conclusions on the risk profile of assets based on "green" and "non-green" classifications. Strengthening synergies across classification methods by developing a common set of technical criteria and yielding a certain degree of equivalence regarding the asset classifications under different methods therefore appears as a prerequisite to further assessing potential risk differentials between green and non-green assets in the future.

- **Financial institutions are seeking ways to have a more granular and less binary approach to classification by examining counterparties' transition readiness with a view to enhancing their management of transition risk.**

The most common methods used to classify assets remain (i) the use of proceeds by applying existing standards and (ii) sectoral approaches of green and/or non-green. Based on such classification approaches, financial institutions are still facing challenges in determining where assets lie in the scale from green to non-green. In addition, these classification methods occur at the activity and asset level, which requires additional work to articulate the various levels and quantify potential green and non-green risk differentials at the counterparty level.

As a result, if sectoral classification is still a crucial first step, some financial institutions are going deeper than the sectoral level to account for differences between counterparties – within "environmentally harmful" sectors – based on their transition readiness. As current classification

4 See for instance, *NGFS Status Report*, May 2020, Appendix I, Figure 14.

methods do not cater for the consistent categorisation of counterparties' transition readiness, financial institutions are developing their own methodologies.

2.1. Status of implementation by surveyed institutions of classification methods

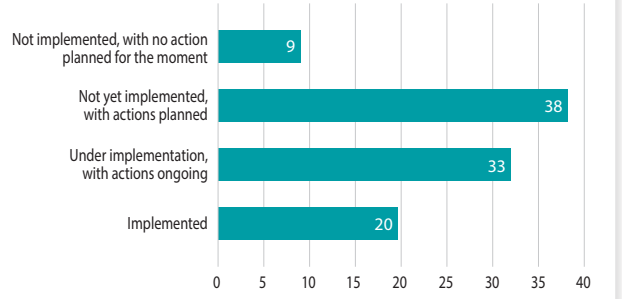
Most of the surveyed financial institutions are implementing a method to classify assets according to green and/or non-green factors. Among surveyed financial institutions:

- 53% of respondents either have implemented or are actively implementing classification methods, with insurers and banks having about the same percentage within their respective industry.

- 38% of financial institutions plan to take actions towards implementing a classification method, such as reviewing existing classification methods, relevant regulations, or establishing the organisational structure for implementation, usually within the next three years for those which provided information with regard to the time horizon.

- Only 9% of surveyed institutions have not implemented any classification method, and do not plan any action in that regard for the moment (see Figure 1) – most of them pointing out the deterrent effect of the challenges identified. The challenges frequently cited include a lack of sufficient data, standardisation among classification methods, resources (human, IT or financial) and expertise to classify assets (challenges which are similar to those reported in the Status Report).

Figure 1 **Status of implementation of classification methods**



2.2. Financial institutions' approaches to classification remain heterogeneous in terms of methods and definitions

2.2.1. Heterogeneity in terms of methods

Respondents report using a wide range of classification methods (see Box 2). Compared to the Status Report[5], **financial institutions seem to rely as much on taxonomies and internally developed classifications as on international classifications and principles** (see Figure 2).

5 The most common approach was to implement and use a voluntary international or national classification or principle; this was followed by the use of internally developed classifications (see NGFS Status Report).

Box 2

Typology of classifications methods

This report refers to the main classification methods as defined in the Status Report:

i) **Taxonomy** refers to a taxonomy (established or under development) that has been awarded an official status and/or is mandatory.

ii) **International and/or national classifications and principles** refer to all voluntary international and/or national classifications and principles.

iii) **Internally developed classifications** refer to a classification developed by the institution itself. If the classification has been inspired in whole or in part by international classifications or principles, there needs to be some sort of an internally developed classification system for it to qualify for this group.

…/…

In addition to this typology, this report aims to clarify how financial institutions can use these classification methods. Classification methods reported by financial institutions are:

i) **Mostly impact-oriented and rarely risk-oriented**, meaning they usually consider the environmental materiality rather than the financial materiality. Impact-oriented classification methods can either rely on top-down frameworks (which are public authorities-led approaches) such as the European Union (EU) taxonomy[1]or bottom-up ones (voluntary and market-led solutions) as the International Capital Market Association's Green Bond Principles (ICMA-GBP). Even though such classification methods are not designed for risk management purposes, they can be used as a basis for risk differentials[2] and, more generally, climate-related risk assessments, e.g. by providing proxies for low transition risk (in the case of green assets) or high transition risk (in the case of assets that are harmful to the environment or not compatible with net zero pathway). In contrast, risk-oriented approaches are typically based on reporting principles or requirements (see below), rather than classification methods.

ii) **Mainly designed for classification purposes, but are sometimes based on reporting principles and requirements.** The latter include, among others, the Task Force on Climate-related Financial Disclosures (TCFD) framework and the EU disclosure framework, which applies to financial institutions through the Sustainable Finance Disclosure Regulation (SFDR)[3], in addition to disclosure requirements applicable to large non-financial corporates (see Appendix I). Disclosing according to the chosen or required framework and relying on similar disclosures by counterparties is not a classification method per se, but this may include metrics that are useful for classification. In the TCFD framework, concentration of credit exposures to carbon-related assets is cited as an example of a transition risk metric, which implies identifying carbon-related assets[4] in the first place.[5]

iii) **Mainly static and binary, rather than transition-oriented and involving various shades of colour**, meaning they tend to classify assets according to either their greenness or non-greenness, with limited consideration for intermediate situations and the path towards greenness. For example, the EU and Chinese taxonomies may be regarded as binary at the present stage, as they focus on identifying economic activities and/or defining thresholds and criteria for identifying sustainable activities ("green"), even though the EU taxonomy already includes "transitional activities"[6]. With a view to better supporting transition activities, among other objectives, the EU is considering extending its taxonomy to create additional categories, covering in particular activities that are either significantly harmful to the environment ("red") or in the intermediate space between green and red ("amber", "orange" or "yellow", echoing a traffic light)[7]. In this discussion, consideration is given to the ability of activities to improve environmental performance and change category. Some other jurisdictions are also introducing transition taxonomies[8]. This could help provide a more complete overview of activities by non-financial corporates and of the related financial assets in the future.

1 While the EU taxonomy can be mainly considered as a "top-down" classification method, this framework was elaborated with bottom-up inputs, through the former Technical Expert Group on Sustainable Finance (TEG) and now the EU Platform on Sustainable Finance serving as advisory body to the EU Commission, with experts from academia, NGOs, public authorities and industries.

2 Bearing in mind the ICMA-GBP is used to classify green activities for use of proceeds instruments, and can be used as a basis for risk differentials only at the activity level. Credit counterparty risk differential analysis may require classification at the counterparty level.

3 As amended by the Taxonomy Regulation EU/2020/852.

4 TCFD (2021), *Implementing the Recommendations of the TCFD* states "The term carbon-related assets is not well defined, but is generally considered to refer to assets or organizations with relatively high direct or indirect GHG emissions."

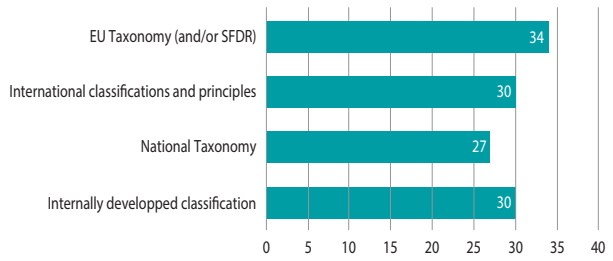
5 See TCFD (2021), *Guidance on Metrics, Targets, and Transition Plans*.

6 See Ehlers, Dao and Packer (2021), *BIS Papers No 118, A taxonomy of sustainable finance taxonomies*; see also the *EU Taxonomy Climate Delegated Act*.

7 See Platform on Sustainable Finance, *The Extended Environmental Taxonomy*, March 2022.

8 An increasing number of jurisdictions are exploring transition taxonomies, which define and identify activities consistent with a "transition" towards green objectives. Such taxonomies are characterised by a greater focus on entity-level transition and transformation of the fundraiser's business model. See NGFS Report on Enhancing Market Transparency in Green and Transition Finance, April 2022.

Figure 2 **Types of classification methods used or planned to be used by respondents**



- **Given the geographic coverage of responses and the binding nature of these frameworks, respondents mainly refer to the EU Taxonomy and the SFDR**[6], which are implemented by 34% of the total respondents (see Appendix 1). National taxonomies, such as the Climate Change and Principle-based Taxonomy (CCPT) of Bank Negara Malaysia (BNM), are used by 27% of the respondents.

- **International and/or national classification or disclosures principles**, such as ICMA's, the Climate Bonds Initiative's (CBI), TCFD's, UNEP FI's and International Finance Corporation's (IFC), are used by about one third of respondents.

Both taxonomies and international/national classification principles used by financial institutions have expanded[7] compared to 2019[8]. Besides the ones reported by respondents in their responses to the 2019 survey[9], methods used by respondents include the IFC / World Bank system, the CBI[10], BNM's CCPT, the ASEAN Green/ Sustainability Bond Standards and the LEED/Energy Star.

- Finally, 71% of financial institutions have developed or plan to develop an **internal classification for determining the greenness or non-greenness of financial assets**.

External classifications are primarily used as a tool to help financial institutions filter activities, counterparties, and assets to determine their eligibility relative to the classification method that is used[11]. However, when financial institutions design their internal classifications, they tend to design it to pursue specific objectives such as alignment with the Paris Agreement and are typically inspired by existing taxonomies.

As part of these methods, respondents are determining the greenness of a financial asset by:
- using third party ratings or certifications;
- leveraging publicly available news and data using a manual approach;
- classifying counterparties using carbon footprint data and individual stock specific assessments;
- classifying counterparties according to their transition plans;
- screening assets/counterparties (negative and positive screening based on policies defining "green"/"sustainable" and "brown"/"non-sustainable" sectors and the identification of the best-in-class);
- developing a specific category of financial products defined internally as "sustainable".

Most respondents combine several classifications methods and consider multiple climate-related and environmental factors within them (see chapter 2.2.2.), **which can result in complex, multi-layered, and thus less comparable classification approaches** (see Figure 3).

6 The SFDR (as modified by the Taxonomy regulation) and Article 8 of the Taxonomy regulation set out a variety of extensive disclosure requirements, including some taxonomy-related ones.

7 This might be linked to the rise of taxonomy projects across the globe (see *Common Ground Taxonomy – Climate Change Mitigation (europa.eu) – pages 35 to 43 where a stocktake of sustainable finance taxonomies can be found).*

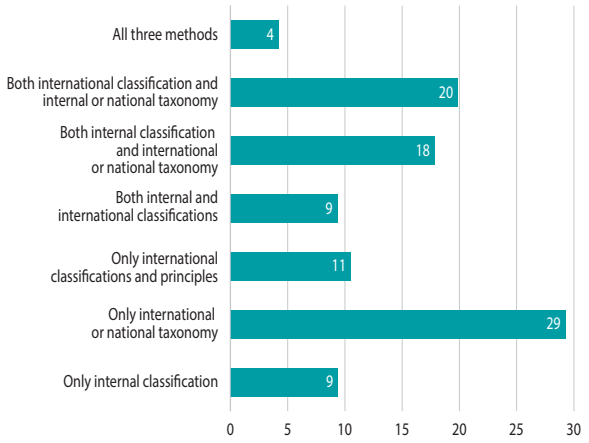
8 This might also reflect the evolution in the sample of surveyed financial institutions.

9 Namely the International Capital Market Association's Green Bond Principles (ICMA-GBP), the EU Taxonomy, Green Loan Principles, Climate Bond Initiative principles, UNEP FI, IFC principles and the Brazilian banking federation's (Febraban) classification framework.

10 In the 2020 survey, CBI was used for financial institutions' decisions in investing green bonds, but in the 2021 survey, it was also used for classification.

11 OECD 2020, Developing Sustainable Finance Definitions and Taxonomies.

Figure 3 **Distribution of the classification methods used by financial institutions**



2.2.2. Heterogeneity in terms of definitions

Financial institutions take multiple green and non-green factors into account when classifying or screening assets and counterparties. There continues to be a wide spectrum of approaches in terms of how climate-related and broader environmental considerations are captured in these processes. This ranges from assessing climate-related risks on a standalone basis to considering such risks as part of wider Environmental, Social and Governance (ESG) considerations.

Box 3 provides an overview of classifications of green and non-green according to the main sustainability "factors" ('E', 'S' or 'G') they are covering. However, the boundaries are not always clear. This is partly because financial institutions do not always precisely associate their assets only with the "E factor" as many adopt a broader ESG approach to classify their assets. While some of the classifications are focused on the 'E' component, such as the current EU taxonomy, they include the social component by requiring a "minimum social safeguard". As a result, they are not designed with the purpose of classifying assets according to the sole green and non-green criteria. Financial institutions can merge both 'E' and 'S' criteria by adapting the taxonomies or the voluntary principles for internal classification purposes or by combining those. As an example of the adaptation of the "official taxonomies" for internal classifications, one financial institution explains that its own classification is aligned on a best effort basis with the EU Taxonomy and the internationally acknowledged principles i.e. ICMA Social and Green Bond Principles.

Financial institutions are also considering additional ESG factors in their risk management processes, for instance by applying specific ESG-related policies or factors in their investment or credit granting process or ESG indicators to countries and corporates. They also report using ESG overrides for counterparties in the credit rating process or applying internal ESG policies in their due diligence and screening processes.

Box 3

Approaches to defining green and non-green remain rather heterogeneous among surveyed financial institutions

Focus on climate change: among the "classification" methods used by a large share of financial institutions, the *TCFD framework* is one of the few that focuses on climate change and explicitly covers physical and transition risks. While the purpose of this voluntary standard is to improve and increase disclosure of climate-related financial information, some financial institutions have based their internal classification on it. Some financial institutions consider this framework, on which they rely to classify their balance sheet assets according to the definition of "carbon-related assets" (given by the Global Industry Classification Standard), as approximating a "brown climate change" taxonomy.

Focus on environmental aspects: the *EU taxonomy*, *ICMA GBP* and *BNM's CCPT* could be grouped under this category. In most classifications mentioned in the survey, the environmental component goes beyond climate change including, among others, biodiversity conservation or sustainable water use. The term "green" is usually understood as covering environmental objectives or at least low-carbon activities. Such classification methods may nevertheless put stronger emphasis on climate change. For example, the EU Taxonomy includes technical screening criteria for the two climate objectives as a first step. BNM's CCPT includes the assessment of broader environmental outcomes through the

…/…

guiding principles of 'no significant harm to the environment', which requires verification that the economic activities do not contravene with Malaysian environmental laws.

Focus on social and environmental aspects: while it seems that there is currently no official "E&S" taxonomy, many financial institutions (28%) are considering both the Environmental and Social components in their classification methods. To do so, some financial institutions have developed and implemented specific Environmental and Social frameworks. These types of frameworks usually define E&S standards for product development, investments and financing and define the boundaries of what is not acceptable in terms of E&S practices (exclusion criteria).

Covering broadly all ESG components: Some financial institutions are using ESG classifications or scoring methodologies. They typically consist of a set of broad principles rather than a strict list of factors. Financial institutions are also using ratings as a classification method and explain that the granularity of ESG ratings (and associated ESG risk assessments) helps integrate ESG considerations in their investment decision-making process. On the social component side, while many financial institutions do consider social aspects in their internal classification, they seem to provide more details on the environmental component. Financial institutions mentioning the social aspects in their classifications are either investing in and/or issuing social bonds or applying exclusion policies for harmful social practices in certain sectors. Nonetheless, the size of the social bond market, while growing, is still much smaller than the green bond market. In general terms, this somehow shows that the relative weight of the 'S' in the sustainability matrix used or designed by financial institutions is lower than the 'E' (see for instance the *analysis* conducted by Moody's).

2.3. Financial institutions' approaches to classification remain heterogeneous in terms of coverage and granularity

2.3.1. Coverage: although classification methods are applied to a broader scope of assets, only a minority of surveyed financial institutions are applying these methods to their whole range of assets

As mentioned in the Status Report, a minority of respondents (10% of them) apply their classification to all their asset classes. Some of the financial institutions that apply a classification to all (or almost all) their assets tend to cover a more limited spectrum of activities, for instance, when they act only as investors and not as lenders. Another possible reason for the limited application to the range of assets could stem from the fact that some of the most comprehensive classifications have been recently introduced, such as the BNM's CCPT, which was only published in April 2021, or the EU taxonomy whose technical criteria for the climate objectives were adopted in December 2021. Implementation of these classifications are currently on going[12] as financial institutions gradually integrate them into their internal processes. Before that, financial institutions were mainly relying on other classifications that were voluntary principles, such as for instance the Equator Principles, which have been designed more narrowly for a particular type of exposure[13].

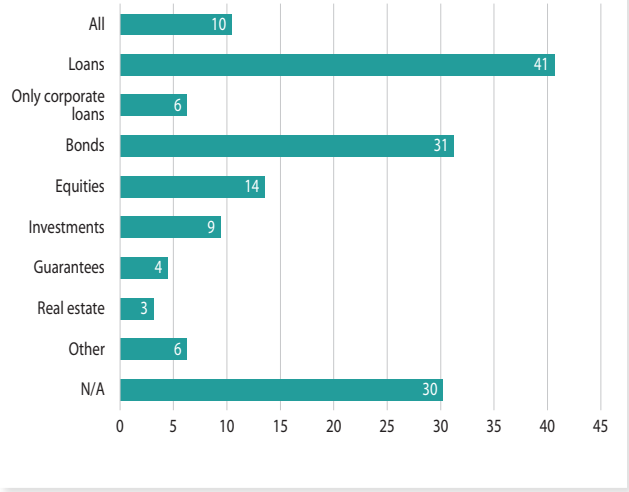
The asset classes covered by classification methods[14] have expanded. Compared to 2020 where classification methods were mainly applied to loans and bonds, they are now also applied to equities, investments, guarantees, and others (such as leases, project finance, insurance products, foreign exchange assets, and real estate assets). Loans continued to be the most frequently mentioned asset class (41% of financial institutions mentioned loans and in addition 6% of financial institutions mentioned that they apply it only to corporate loans), followed by bonds (31% of financial institutions) (see Figure 4).

12 An industry driven initiative like the CCPT Implementation Group was established in August 2021 by financial institutions in Malaysia to promote and advocate consistent industry-wide implementation of the BNM's CCPT.

13 The Equator Principles were designed to be applied in the area of project finance.

14 As mentioned previously, classification methods may include reporting and disclosures principles/regulations.

Figure 4 **Percentage of respondents applying classification methods to one or more asset categories**



Of those who specified the level of application of their classification methods, **around 60% answered that all assets are included (or will be included) within the applicable asset categories**, while others only consider certain types of assets (mortgages, assets which can be funded by green bond proceeds etc.). Among those institutions that apply the classification to certain types of exposures within an asset class, some financial institutions consider specific types of activities (retail banking, corporate segment, only car loans within the consumer finance activity etc.) while others also consider the upstream and downstream activities linked to these assets. A minority of institutions only consider new assets, assets with third-party ESG ratings or those subject to reporting requirements.

Financial institutions usually combine several classifications and tend to choose one over another depending on which type of asset they want to classify. The most common approach used by surveyed financial institutions and applied to bonds remains "the use of proceeds" by applying existing standards at activity/project level. The most frequently used standard to identify the greenness of the bond remains the ICMA framework[15] and in particular the GBP. Some financial institutions apply local standards consistent with the ICMA principles such as the ASEAN Green Bond Standards while others plan to use the recently proposed EU Green Bond Standard (see Appendix I).

2.3.2. Granularity: even though most classifications are based on a sectoral approach of green and non-green, some financial institutions are starting to categorise counterparties within environmentally harmful sectors according to their transition readiness

Financial institutions classify assets based on a sectoral approach. The general rationale underpinning these classifications is that inevitably some sectors are not compatible with the transition pathways towards a low-carbon economy[16], the scaling up of sustainable finance or the promotion of a circular economy. As a result, the most frequently applied granularity of classification by financial institutions (which in many instances is determined by the taxonomy adopted) is by sector as well as by type of activity and these methods focus on green[17]. On the opposite end of the spectrum, some taxonomies identify sectors that cannot be regarded as green[18] while financial institutions have sometimes designed their own internal "brown" classifications. In many instances, these are incorporated into exclusion policies to avoid financing harmful sectors[19].

Apart from such binary approaches (green vs. non-green) which are applied at asset or activity-level, it is very challenging for classifications (either internal or external) to determine the scale from green to non-green, also known as "transition taxonomies".

15 Which includes the Social Bond Principles and the Sustainability Bond Guidelines (as reported by respondents issuing green bonds).

16 This can mean from a risk management perspective that these sectors and/or activities are and will be impacted harder by climate-related risks and possibly by other environmental risks.

17 In terms of the sectors or activities which were mentioned as "green" or sustainable, many classifications concur on the following ones: renewable energy, energy storage, energy efficiency, sustainable water management, clean transportation, waste management, organic farming, green renovation loans, eco car, etc.

18 The EU taxonomy identifies in its article 19.3 a set of activities that cannot be green: "power generation activities that use solid fossil fuels do not qualify as environmentally sustainable economic activities" from an impact perspective.

19 They usually cover some of the followings: coal (entire sector or just financing of new coal mines and expansion of existing ones; new coal-fired plants), tar sands, oil shale, artic oil and gas, new nuclear plants, exploration and production of oil sands, forestry and logging.

In reality, current taxonomies provide a limited set of tools to allow users to evaluate assets or activities in terms of their transition from "non-green" to "green".

The results of the survey show that financial institutions are considering (i) more granular approaches to cope with differences in exposure to transition risk within sectors and (ii) counterparties as a relevant level of categorisation. Considering counterparties allow financial institutions to refine their categorisation by going deeper than the sectoral level (which current classification methods consider). Such approaches might be more relevant to identify risk drivers (see chapter 3). In that respect some respondents have been developing internal methods, which differentiate within "brown" sectors between counterparties depending on whether they have designed transition plans or set decarbonisation targets (see Case Study 1). Some respondents factor in the assessment of the credibility of such transition plans (conducted by credit risk and ESG experts). However, most of them have not yet developed a systematic approach and rely on a case-by-case analysis of counterparties (combining the review of public or disclosed information and regular interviews), which might not be easily replicable.

Case study 1

Internal "risk taxonomy" developed by a respondent to the NGFS survey

As an initial step towards a fully-fledged heatmap, one institution developed a transition risk taxonomy in 2019. The starting point was the EU Taxonomy as it stood at that time and the methodology factored in the EU Technical Expert Group's proposals on low-carbon benchmarking, analysis of sectoral carbon intensity and internal expert judgement. The institution mapped ~ 1000 NACE codes to determine the Taxonomy-eligibility of specific sub-sectors. **However, where a company exhibits a significantly different carbon footprint than the NACE[1] sector it was allocated to, the company is reclassified.** This approach caused some difficulties regarding companies active in multiple sectors. The emission profiles of borrowers and the institution's financed emissions are calculated using the Partnership for Carbon Accounting Financials (PCAF) methodology. **The primary purpose of the risk taxonomy is to monitor the diversification of the institution's corporate and financial institutions lending portfolios in terms of exposures to "brown", "green" and "neutral" companies.** The institution has recently started using the risk taxonomy to trigger a more in-depth client due diligence process.

As its next step, the institution envisages including transition pathways and analysing its counterparties' transition plans. Counterparties would then be differentiated between those without transition plan, those with transition plans, and those with Paris Agreement aligned plans.

1 NACE refers to "Nomenclature of Economic Activities" which is the statistical classification of economic activities in the European Community.

2.4. Heterogeneity in terms of classification approaches hampers the accurate and consistent assessment of green/non-green risk differentials

As several respondents highlighted, the lack of standardised classification criteria could lead to different green and non-green classifications of the same economic activity under different classification methods. If the criteria differ strongly, for example across jurisdictions or asset classes (e.g. fixed income vs. equity instruments), the efforts to classify assets appropriately and to assess the assets' classification-related risk profile could be substantial for financial institutions with international business or investors with diverse asset portfolios. **Without a high level of commonality underpinning classification criteria across the different systems, it will be difficult to find robust evidence of potential green and non-green related risk differentials between activities or assets. The need to converge towards a minimally accepted global taxonomy has already been underlined in several NGFS publications.**

Financial institutions have showed their support for initiatives and coordination among authorities to provide a common reference point for the definition of green/non-green activities. Such initiatives include the work of the International Platform on Sustainable Finance (IPSF). In particular, in July 2020, the EU and China initiated a Working Group on taxonomies with the aim of identifying commonalities between the EU and China's taxonomies to enhanced interoperability and provide other jurisdictions with a starting point on which to build their own taxonomies with features consistent with the CGT. In the meantime, the NGFS can facilitate the sharing of best practices across jurisdictions in that respect.

3. Given the limitations of the backward-looking assessment of climate-related risk differentials, surveyed financial institutions are turning to other methodologies for identifying and quantifying these risks

Chapter 3 presents methodologies developed by financial institutions for exploring risk differentials between green and non-green financial assets or counterparties and for assessing and managing[20] climate-related and environmental risks more broadly. Advanced practices developed by financial institutions in these areas are presented through case studies.

Risk differentials analysis aims at exploring whether, all other things being equal, the greenness or non-greenness of an asset, the associated counterparty or underlying activity/sector affects their financial risk profile. Methodologies can be either backward-looking (using historical data) or forward-looking (generally using scenarios as inputs to run sensitivity analyses or stress tests). In the case of the latter, it is worth recalling that any forward-looking analysis builds on certain assumptions and scenarios, which nevertheless reflect considerations regarding risks that could potentially materialise and should be estimated based on science (i.e. anchored in global warming paths). Another difference is that, the *ceteris paribus condition* (all else being equal) in the backward-looking analyses is achieved by comparing assets, liabilities or counterparties sharing the same characteristics with the exception of their greenness. Under forward-looking methodologies, risk differentials can be observed through the comparison of the results under different climate-related scenarios.

Key takeaways:

- **Based on current financial institutions' practices, there is still limited empirical evidence for ex-post green/non-green risk differentials** (chapter 3.1.).

Results from the survey show that conducting risk differential analysis between green and non-green activities and/or assets is not a straightforward exercise and that there is still no clear historical evidence of such risk differentials. **Only a small number of respondents have conducted backward-looking risk differentials analyses, which aim at comparing default rates as measured by probability of defaults or rating spreads between specific green and non-green sectors or assets, and do not reach robust conclusions on the existence of such risk differentials**.

Such approaches to assessing risk differentials are still affected by the same challenges as those reported in the Status Report[21]. In particular, **analysing risk profiles of activities and assets based on green and non-green classifications has inherent limitations** as determining the greenness of assets and activities is not sufficient to assess vulnerability to climate-related risks**. Furthermore, assets' risk profiles can be highly dependent on other factors that are not always controlled for in current risk differentials analysis.** This particularly holds true for transition risk where the risk profile of assets depends on multiple factors and is reinforced by the fact that other drivers have a decisive influence on credit risks.

In addition, there is a need for **better articulating activity-level and asset-level risk profile information with the credit risk profile at counterparty level** to ensure a more comprehensive and granular assessment of risk differentials and its potential use for prudential matters.

Finally, as any backward-looking methodologies, conventional risk differential analysis based on historical data are not able to fully account for the specific time horizon, uncertainty of the impact and likelihood of materialisation of climate-related risks. Such challenges are echoed by methodologies developed and analyses carried out by Credit Rating Agencies and Supervisors, which are presented in chapters 4 and 5 respectively.

20 An updated overview of financial institutions' risk management practices is included in Appendix II of this report.

21 With respect to the classification of assets, and thus the analysis of risk differentials between green and non-green assets, financial institutions are facing the following challenges: (i) the lack of sufficiently available granular, consistent and reliable climate-related and environmental data, (ii) the lack of consistent classification methods and disclosures, (iii) and a lack of internal capacity within financial institutions.

- **Rather, surveyed financial institutions are turning to other methodologies – and in particular, forward-looking methodologies – for identifying and assessing climate-related risks** (chapter 3.2.).

Financial institutions have made progress in developing tools and methodologies to assess their vulnerability to climate-related and environmental risks, mixing qualitative and quantitative approaches (such as heat mapping, scoring, concentration analysis or sensitivity and scenario analysis). The results of these exercises could be used in order to distribute a shock asymmetrically over the portfolio when running a stress testing exercise and even in internal rating models. For this reason, these tools and approaches can be regarded as first steps toward a more fully-fledged financial risk differential assessment.

One of the main outcomes from the survey is the relevance of analysing exposures in a granular way, by disaggregating them according to their different vulnerability to climate-related risks. Financial institutions have made considerable efforts to break down their exposures by determinants to capture specific climate-related risks. In particular, as underlined in the case studies, financial institutions have considered sector-based classifications as a useful starting point for a more comprehensive assessment of counterparties' vulnerability to climate-related risks.

More particularly, financial institutions are developing methodologies to assess whether counterparties operating in the same economic sector or segment differ in terms of their preparedness for the transition as evidenced by a credible transition plan. Such approaches show that transition risk is a function of many variables that cannot be limited to the categorisation of activities and assets according to their greenness[22]. They also suggest moving away from classification-based, backward-looking analysis of risk differentials to a more granular forward-looking assessment of counterparties' vulnerability to climate-related risks. Therefore, a risk differential aspect that could merit further analysis is between green, transition-ready and transition-unprepared companies.

This would require tools to analyse the credibility of counterparties' transition plans and refining forward-looking methodologies (in particular scenario analysis) – which financial institutions are increasingly using – to assess their vulnerability to different transition scenarios. As the transition readiness of counterparties impacts vulnerability of creditworthiness to climate-related risks, there is a need to conduct more advanced scenario analysis that factors in adaptation and mitigation capacity, and measures resilience to climate shocks. In addition, consistent, comparable disclosures of transition plans, past track record on achieving targets, current versus forecast green/"brown" ratios are required for entity-level analysis of adaptation capacity and credibility of transition plan.

3.1. Based on current surveyed institutions' analyses, there is still limited evidence of ex-post risk differentials between green and non-green assets or activities

No major additional insight on quantitative risk differentials was reported since the last survey[23]. Only very few institutions reported results of a quantitative, backward-looking risk differential analysis (such as the analysis detailed in the Case Study 2). Nevertheless, some institutions would deem it useful to undertake further analysis on ex-post risk differentials for specific sectors and asset classes. The asset classes would include private assets (equity and debt), where high demand for such assets could lead to overvaluation or low risk premia (for example in the case of green bonds), and mortgage assets, which are distributed across different geographies and regions. Suggested sectors would include climate-sensitive sectors and carbon-intensive sectors, comprising utilities, materials, oil and gas, power generation, automotive, agriculture and residential mortgages.

22 For example, a "brown" company that is sufficiently capitalised, has a strong management and a credible long-term strategy might manage the transition well. At the same time, "green" companies can face transition risks, too, e.g. because their business model might be based on new technologies that have yet to be proven at scale (see *NGFS Guide for Supervisors*, box 26).

23 As per Box 1 in the introduction, one cannot draw any conclusions about the progress achieved by individual institutions, since there is only partial overlap of the samples used in this and the past surveys. Rather, the results should be read as a description of the general trends and progress achieved.

Where methodologies are not in place, the reasons most frequently stated are **a lack of internal capacity, sufficiently available granular, consistent and reliable climate-related and environmental data and of consistent classification methods and disclosures for climate-related risks** (issues similar to those reported in the Status Report). These challenges are to some extent echoed by Credit Rating Agencies (see Chapter 4).

Case study 2

Backward-looking risk differential analysis carried out by a surveyed financial institution

One of the surveyed financial institutions analysed the changes in credit ratings from 2015 (when the Paris Agreement was adopted) to 2020. The institution compared the ratings of assets (including loans, foreign exchange assets, acceptances and guarantees, and committed lines of credit for corporate loan portfolio) through **two distinct approaches**: (i) a comparison of the renewable energy generation sector and carbon-related sectors; and (ii) an analysis using an internal transition risk framework («Risk Control in Carbon-related Sectors») which combines a sector classification and an assessment of counterparties' transition readiness[1].

The analysis yielded the following results:

- There was no difference in the degree of rating change between the renewable power and the carbon-related sectors. **In case of default risk, the results of the analysis showed there was no significant difference between the probability of default (PD) in the renewable energy sector (2.5%) and the PD in the carbon-related sector (2.3%)**.
- According to the second methodology, **results did not point to the expected differentiation of rating and defaults depending on the exposure to transition risk. The percentage of rating improvement was highest for high-risk borrowers, and the rating of medium-risk borrowers tended to deteriorate more than that of high-risk borrowers[2]**. In case of the PD, when the carbon-related sector was classified into three categories (high risk, medium risk, and low risk) based on sector and response to transition risk, no borrower defaulted at low-risk. **The PD of medium-risk borrowers (3.1%) was higher than the PD of high-risk borrowers (0.8%). In addition, the lower the level of transition readiness of counterparties, the higher the percentage of rating deterioration tends to be**. By classifying the response levels into four categories, with a higher level equating to a more robust response to transition risk, the percentage of borrowers that experienced a downgrade in credit rating was 17%, 20%, 25%, and 28%, respectively, in descending order of the response level. Statistical correlations were not analysed. Other factors (such as the lack of preparation being potentially correlated to poor management in general) may account for the observed outcomes, but no such analysis has been conducted. **As for the PD, when the response levels were divided into four categories, no borrower defaulted in the category with the highest response level. PD in the other three categories had similar levels (2.2 ~ 2.4%)**.

1 The measurement of the level of response to transition risks was based on the status of efforts towards targets consistent with the Paris Agreement, taking into account the client's awareness of transition risk and the status of strategy development (quantification, alignment with the Paris Agreement, specificity, track record, etc.).

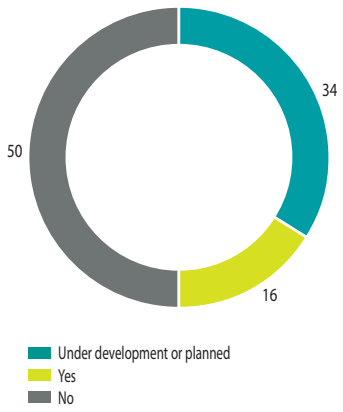
2 Of the 126 high-risk borrowers, 69 (55%) were in the coal power sector. Of the 40 high-risk borrowers whose ratings improved, 26 were in the coal power sector (65%). In the coal power sector, demand has been strong in Asia, for example, which may have led to improved corporate earnings and a better rating. Of the 356 medium-risk borrowers, 286 were in the oil and gas sector (80%), and of the 94 medium-risk borrowers with deteriorating ratings, 84 were in the oil and gas sector (89%). This sector may have experienced more rating volatility than other sectors due to the impact of fluctuations in oil and other energy prices on corporate performance.

Nevertheless, many respondents to the survey have at least started to develop internal methodologies to track specific risk profiles of green and non-green assets. Around 16% already have in place methodologies to assess specific risk profiles of green or non-green exposures. Approximately one third of respondents have plans to develop internal methodologies or are in the process of developing these. Half of the respondents do not have internal methodologies on risk differentials, do not plan to develop methodologies or are still uncertain.

Many of the institutions with no methodology in place to-date have started to flag green and/or non-green exposures in their IT systems and hope to be able to run a risk differential analysis in the near future. Several respondents in this bucket are from the insurance sector (63%): they have developed approaches based on exclusion criteria rather than the climate risk profile of exposures and investments. Many respondents highlighted that they plan to rely on external providers or methodologies, while few of them consider such analysis unnecessary for their business model (e.g. custodian banks).

However, in several instances, respondents' internal methodologies to track specific risk profiles appear to be ESG scoring methodologies in a more general, qualitative sense, rather than methodologies for performing an analysis of actual financial risk profiles. For instance, some have in place an ESG scoring system across sectors or at borrower level. Using a narrower interpretation of the methodology in the financial risk context, just under 10% of the respondents seem to have an internal methodology to perform analysis of actual financial risk profiles already in place. Among those, few reported to focus on "environmentally harmful" exposures only, in order to shield their activities and portfolios from transition risk.

Figure 5 **Percentage of respondents that already have in place, are in the process of developing or plan to develop internal methodologies to assess whether green or non-green assets have specific risk profiles**



3.2. Financial institutions are turning to other methodologies for identifying and assessing climate-related risks

3.2.1. Financial institutions' methodologies to assess the materiality of climate-related and environmental risks: a case-study approach

Financial institutions have further developed their methodologies to assess the materiality of climate-related and environmental risks from qualitative and quantitative perspectives (see Box 4).

Box 4

Climate-related risk assessment methodologies developed by surveyed financial institutions

- Qualitative methodologies mainly focus on identifying sensitive sectors and lead to measures such as reductions in the exposures or exclusions of some counterparties and/or sectors in accordance with their risk appetite. In this category, there are heatmaps, sensitivity analysis and scoring methodologies, which may include a quantitative component. This type of qualitative assessments could represent a basis for further quantitative assessments, such as more comprehensive scenario analysis or stress testing, by considering different scenarios or shocks (for example, an increase in price per tonne of carbon emissions) and applying them asymmetrically, based on previously identified sensitivities of the exposures. These assessments can be used as inputs to internal rating models.
- Quantitative methodologies attempt to quantify the risk and lead to measures such as recalibration of lending rates, price premium, changes in the value of guarantees and collateral; this category encompasses scenario analysis[1], including stress tests.

Most of the time, the methodologies designed by financial institutions provide a more qualitative mapping, scoring or view on sensitivities to certain climate-related and environmental risks (and, very often, to ESG risks in general). Whilst not leading to a quantification of financial risk, these methodologies contribute to climate-related and environmental risks management by mapping the sensitivities of exposures. These results can feed into and inform quantitative risk analysis. They represent important first steps by financial institutions towards a more complete climate and environmental-related financial risk assessment.

In particular, a significant proportion of institutions use "heatmaps" that classify economic sectors or segments thereof as more or less sensitive to climate-related and environmental risks. In such approaches, financial institutions have considered sector-based classifications as a useful starting point for a more comprehensive assessment of the impact of climate-related risks on counterparties' credit risk. Heatmaps are used at client-level as part of rating or scoring processes, or at portfolio level to assess or monitor the extent to which a portfolio is exposed to carbon-intensive industries and therefore vulnerable to transition risk. The heatmap exercises can be backward-looking or current point in time, assessing the current exposures to transition or physical risks or to opportunities based on current data and information. But they can also be forward-looking, measuring transition readiness, or how well companies can cope with the transition to a low-carbon economy (this takes into account a company's current business model, its transition strategy, how and over which time horizon it is implemented, and whether the company has a proven track record of successful adaptation).

1 Definitions of scenario analysis as well as of stress testing and sensitivity analysis, which are specific subsets of the former, can be found in Box 17 of the *Progress Report on the NGFS Guide for Supervisors*, referencing the Basel Committee on Banking Supervision's recent *report on climate-related financial risks measurement methodologies*.

The level of application varies. Around half of the responding institutions with internal methodologies apply or plan to apply them at the borrower level while a quarter apply them at the sector level. In several instances, industry level application is used if application at borrower level is not possible and in some instances, they are used in conjunction (e.g. filtering by sectors first, followed by a more in-depth assessment at borrower level or vice-versa by assessing first at borrower level during client due diligence and thereafter monitoring of climate-related and environmental risks at portfolio level by exposures to certain sectors).

Institutions make substantial use of external data. External information considered by responding institutions include Partnership for Carbon Accounting Financials (PCAF) emissions data, modelled carbon emissions, public commitments and rankings, Energy Performance Certificate (EPC) ratings, energy markers for mortgages, flood risk, coastal erosion risk, geological stability, consultants' assessment of climate-related risk, and international standards and frameworks. Less than one fifth of respondents use ESG ratings.

The focus is generally on credit risk. More than half of the respondents that have in place or are developing or planning to develop internal methodologies focus on credit risk. In some instances, it was stated that this was most relevant for the portfolio. Approximately a quarter of the responding institutions with internal methodologies do or are planning to take into account market risk. Only a few respondents made explicit reference to liquidity risk. Some institutions indicated that the risk assessment might inform other traditional risk categories, such as reputational risk, or general investment decisions.

Around half of the respondents differentiate their methodologies by counterparty, size of counterparty, asset class or transition vs. physical risk. Reasons provided include that relevant indicators will differ, or that some portfolios might be assessed at aggregate level (due to data availability issues, e.g. for SMEs and retail). Some respondents took the view that transition and physical risks may not apply equally across all counterparties (in some instances, retail exposures are only considered in the context of physical risk, whereas corporate exposures are assessed under both transition and physical risks) and that sensitivity to climate-related risk will differ by counterparty.

Among the respondents already having in place methodologies or planning to develop internal methodologies, several report a phased approach, with an initial focus on the most material portfolios. These are based on either relative sensitivity of the portfolio to ESG risks, or the proportion of total exposure within that portfolio (i.e. portfolio concentration). Respondents mostly focused on corporate (large) exposures and mortgage portfolios, whilst some institutions exclude retail exposures.

Not all methodologies reported by financial institutions are designed to directly measure the financial risk of exposures. In particular, external or internal ESG ratings assess the performance of a company in terms of its environmental impact, social behaviour, governance and/or disclosure practices depending on the criteria used in each framework. However, the credit risk of such company is dependent on a variety of factors not necessarily related to its ESG performance, such as its cost-to-income ratio, leverage, competitiveness, innovative capability etc. A significant negative impact on the environment can potentially influence a company's financial performance and ultimately its credit risk, e.g. if new legislation introduces a price on externalities (GHG emissions, waste production, and land use) and the company is unable to pass on increasing costs to its clients. However, ESG ratings measure factors that do not necessarily create financial risks for the company, e.g. when negative environmental impacts are not prohibited by local laws, or are not deemed socially unacceptable in the company's target consumer markets.

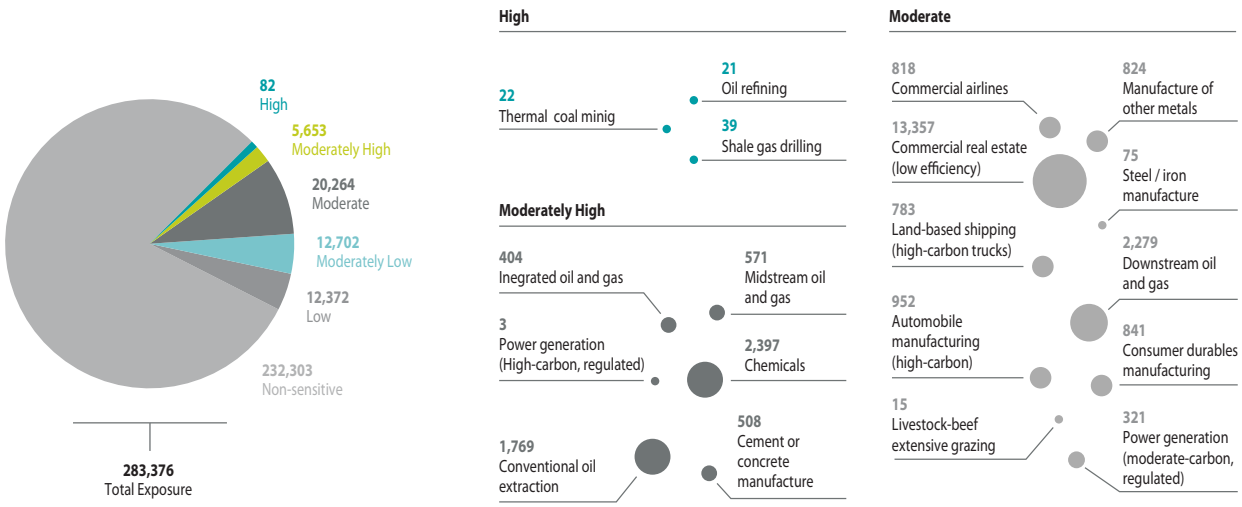
Below are presented advanced practices used by surveyed financial institutions to assess the materiality of climate-related and environmental risks and quantify the vulnerability of their balance sheet to these risks. It is worth noting that, based on these aforementioned climate-related risk assessment methodologies, financial institutions have advanced on integrating climate-related risks into their risk management framework (see Appendix II).

Case study 3

Example of a "transition risk heatmap"

One financial institution is using a transition risk heatmap, which allows the institution to classify borrowers and issuers into different risk segments. The approach was developed within the UNEP FI's TCFD working group[1]. The heatmap builds around the segmentation of credit exposures into groups of non-financial corporates with similar risk profiles. **The transition risk of each segment, in terms of vulnerability to climate policy, new low-carbon technology and potential changes in income streams under a Paris-aligned scenario, is rated from low to high. This is based on the climate-related risk ratings and guidance provided by rating agencies, regulators and experts and encompasses a holistic view, including direct risks to a company and indirect risks from its value chain.** For example, power generation with high carbon emissions would fall into a different segment from moderate or low-carbon power generation. Shale gas drilling and oil sand production receive a higher climate-related risk rating than conventional oil and gas exploitation.

The institution does not yet use the heatmap to inform its internal capital allocation or differentiate the pricing of its products for borrowers in different climate risk segments. Nevertheless, the heatmap enables the institution to identify concentrations of exposures and potential gaps in their modelling that point to a potential need for further analysis.



Going forward, the institution envisages the development of a heatmap illustrating physical risks. Similar to the transition risk heatmap, it will help identify companies that require an in-depth analysis at counterparty level. The physical risk heatmap would be based on a country risk score (incremental and acute climate change impacts and the country's adaptive capacity), a sectoral score rating the vulnerability to climate impacts and value chain vulnerabilities in a business as usual scenario.

1 *https://www.unepfi.org/publications/banking-publications/beyond-the-horizon/*

Case Study 4

Example of an internal methodology to assess the climate risk sensitivity of exposures

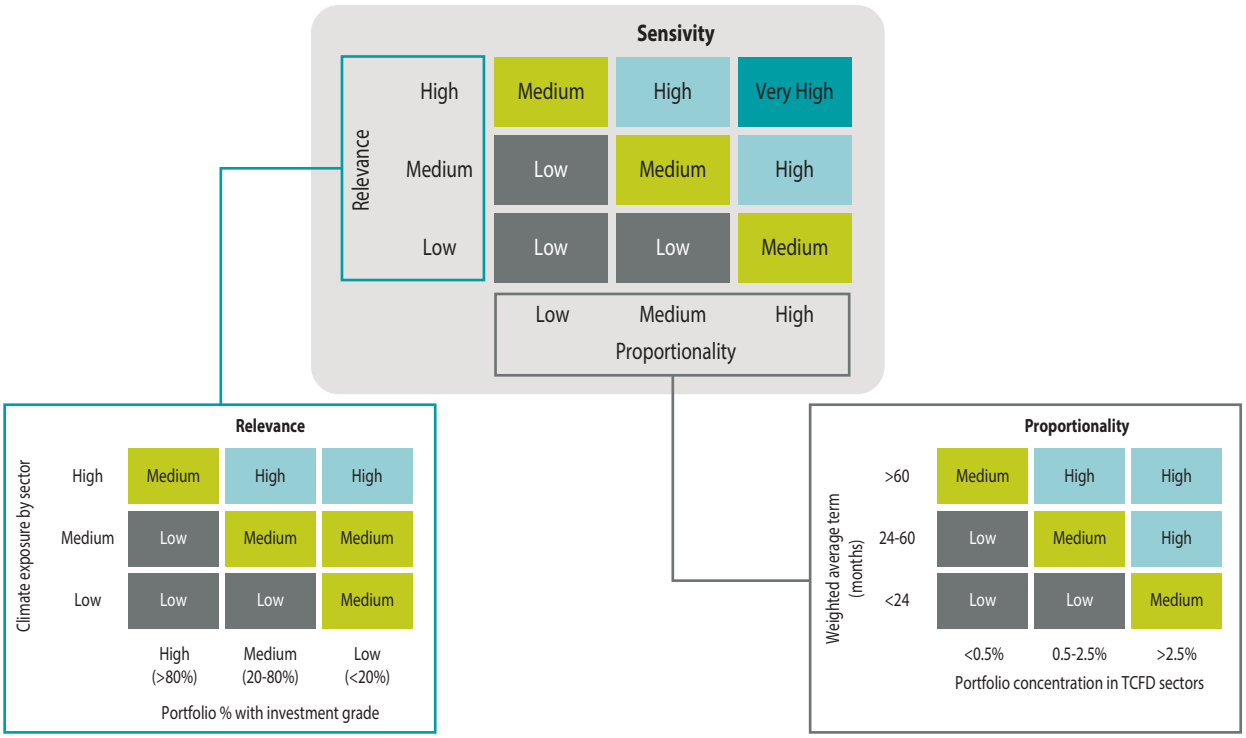
One financial institution implemented a Climate Sensitivity assessment tool[1], developed by the Brazilian Federation of Banks (FEBRABAN) in order to help Brazilian banks in their TCFD implementation trajectory. Sensitivity is identified from the combination of the principles of "**relevance"** (which takes into account the nature of activities in the economic sector and the portfolio's quality in the economic sector) **and "proportionality"** (which takes into account the credit portfolio amount in the economic sector). It can be applied in three layers: at sectoral level, at client level, as well as at operational level.

Elements of the Climate Risk Sensitivity Assessment Tool

Layers (by unit of analysis)	Principles		Expected messages
	Relevance	Proportionality	
SECTOR Sectorial portfolios that make up credit portfolio	1. Nature of the economic sector activities 2. Quality of the economic sector portfolio (based on rating)	1. Amount of the active credit portfolio of the economic sector	• Degree of sensitivity of the portfolio, in a macro look, that does not demand great detailing effort • More sensitive sectors • Reasons that contibute to greater sensitivity
CLIENTS Clients who make up a sector portfolio	1. Nature of activities 2. Client Rating	1. Weighted average term of the client's operations 2. Exposure per client	• Clients to be prioritized in climate risk management • Reasons that contribute to the greater sensitivity of the clients that make up the sector portfolio
CREDIT OPERATIONS Operations which make up a client's portfolio	1. Nature of activities 2. Operations Rating 3. Locational climate risk of the operation	1. Operation tenor 2. Operation amount	• Operations to be prioritized in climate risk management • Reasons that contribute to client sensitivity • Need for adjustment in the process of granting credit and monitoring operations

…/…

1 Climate Risk Sensitivity Assessment Tool, *Implementation Guide for Banks*, June 2019



The financial institution uses the Climate Sensitivity Assessment to assess the impact of climate change on each industry and uses the ESG risk assessment methodology as one of the inputs to their credit risk rating models applied to large corporate clients within the sensitive industries, on a scale from low to very high ESG risk. Riskier classifications decrease the model's score, resulting in worse credit risk ratings.

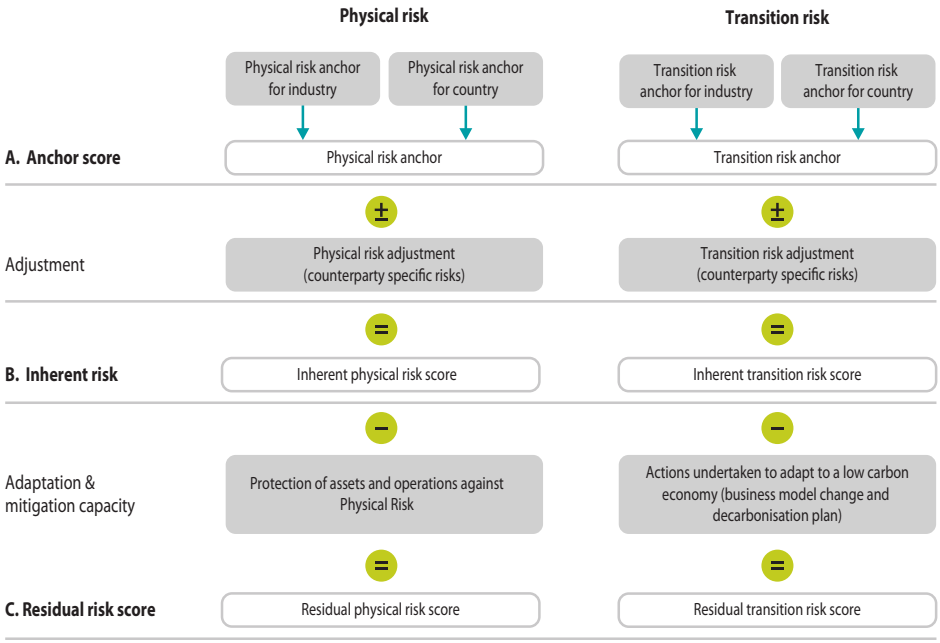
Case Study 5

Example of a counterparty-level screening tool used to assess climate-related risks

One institution has developed a tool to separately assess physical and transition risks at the counterparty level based on a scoring system (from 1-5 with 5 as highest) that takes into account the sector and geographic exposure, idiosyncratic risks and the adaptation/mitigation capacity of each borrower. The focus is on credit risk and the tool is intended to be applied to the whole portfolio.

In particular, the approach to score every specific borrower's risk characteristic on a scale relies on three steps:

1. **Anchor score**: the inputs are geographical and industry information. Corporates are assessed through their industries of activities while banks are assessed through the composition of their books.
2. **Counterparty adjustment**: consists of applying specific adjustments for the individual counterparty (i.e. historic physical events for physical risks; taxonomy-alignment for transition risks). Information gathered for the assessment in this step is based on questionnaires, past events, public databases and peer benchmarking, among others.
3. **Adaptation & mitigation adjustment**: adjustments are mainly based on information about protection of assets and operations against physical risks and action undertaken to adapt to a low-carbon economy (business model change and decarbonisation plans).



The outputs of this tool are two standalone scores: one for physical risk and one for transition risk, which are used on a standalone basis to create transparency over the institution's exposure to climate-related risks.

The climate risk scores are used for i) enhanced internal reporting and external disclosures, ii) climate risk sensitivity analysis/stress testing, iii) as well as for the Risk Appetite Framework. At the moment, preliminary analyses of the correlations between climate-related risk scores and internal credit ratings are being carried out, in order to explore possible ways of including the output of the counterparty-level screening tool into the Internal Rating models for credit risk.

Case Study 6

Internal classification based on TCFD recommendations as a basis for risk mapping

One financial institution mapped the potential impacts of climate-related risk and their channels of transmission onto risk categories (e.g. environmental and social risks, credit risk, operational risk, reputational risk etc.). The mapping was based on the valuation of almost 60 reports of scientific organisations, consulting agencies, central banks, benchmarks and TCFD recommendations[1]. The risks were mapped by tenor (terms of up to 2 years, 2 to 5 years, 5 to 10 years and over 10 years) and classified according to their origin (physical, transition or both) and possible qualitative materialisation scenarios (orderly transition, disorderly transition, physical risk).

The institution followed the TCFD's recommendations, which provide a variety of inputs for mapping potential risk in different qualitative scenarios. **Therefore, this risk mapping procedure is a step to implement the TCFD recommendations by looking at qualitative scenario analyses to understand the institution's resilience to climate-related risk.**

The results of the analysis are summarised in the table below:

Climate risk factor and materialization tendency	Terms in years	E&S Risk	Credit	Insurance	Operational	Market	Compliance	Reputation	Strategic
Climate regulations and authority supervision	Up to 2								
Disclosure obligation	Up to 2								
Credit portfolio deterioration	2 to 5								
Portfolio exposure to climate and taxonomy	2 to 5								
Pricing variation in assets and real state	>10								
Climate litigation	5 to 10								
Stranded assets	>10								
Credit underwriting	5 to 10								
Carbon pricing	2 to 5								
Carbon reduction, neutralization and removal	>10								
Changes in environmental legislation	5 to 10								
Market barriers and stakeholders demands	Up to 2								
Physical risk impacts	>10								
Other secondary consequences due to climate risk			Impact on each risk dimension						
	Governance		Strategy			Risk management			Metrics and Targets
Affected recommendations	a	b	a	b	c	a	b	c	a	b	c

1 From sources as UNEP FI, FEBRABAN, ECB, WEF, TCFD – FSB, BIS, IMF, OECD, NGFS, PRA, EBA and consultancies.

3.2.2. Financial institutions are exploring transition readiness of counterparties in non-green sectors as potential means through which climate-related risk differentials could manifest

Around 40% of financial institutions are differentiating or are planning to differentiate between companies or borrowers with credible transition strategies and those without. Many banks consider credibility of transition strategies in their risk management framework and processes (see Case Study 7), such as risk scoring, credit risk assessment, and scenario analysis. However, financial institutions are still at an early stage regarding this, and there are various challenges, including insufficient data and information.

The assessment of the credibility of a transition strategy varies across responding financial institutions. Six respondents use internal, qualitative assessments such as expert judgement by credit analysts and climate experts. One indicated that narrow, pre-determined criteria are unlikely to work since the assessment depends on the client's risk profile, business sector and geographical operating area. About 11% of responding institutions use specific criteria to assess transition strategies such as: disclosure in line with TCFD recommendations; alignment of clients' behaviour with external commitments; involvement in external climate and or sustainability initiatives; publication of externally benchmarked data; sufficiency of targets and their consistency with the Paris Agreement; publicly disclosed transition plans with defined timeframes which can be included in their internal scoring systems. Three respondents use external providers for the assessment, such as the Science Based Target initiative (SBTi)[24], the Transition Pathway Initiative (TPI), or energy transition scores obtained from ESG data research providers such as Moody's ESG Solutions and MSCI ESG. Information is mainly obtained from dialogue with counterparties, disclosed data or targeted questionnaires and on-site visits.

In general, responding institutions feel it is too early to draw conclusions on the differentiation of transition strategies, however considering them is crucial, as it facilitates engagement with counterparties and companies to progress in addressing climate-related risks. Consequences of differentiation on transition strategies take several forms. Examples provided by responding institutions include removal of corporates from the investment universe, limits on maturity lengths if transition plans are deemed key for the credit rating of a security, increased investment in companies with high-energy transition scores, exemptions from exclusion list for counterparties with credible transition strategies, and restriction of credit for companies without credible transition plans.

Case Study 7

Transition Risk Indicator

One financial institution developed a transition risk indicator to calculate transition-risk adapted probabilities of default, although the tool is still at an early stage.

The tool is essentially a **scorecard methodology** and comprises two main indicators: A "**brown-to-green indicator**" assesses the current exposure to transition risks and opportunities, based on the carbon intensity of companies**. A "transition-to-green indicator"** measures on a forward-looking basis how well companies can cope with the transition to a low-carbon economy. A major advantage of this indicator in terms of resource requirements in the operating phase is that it uses data points which can be automatically sourced from ESG data providers. These data points include the country of incorporation of a company, economic sector, quality of its corporate governance, current and estimated future carbon profile, emissions compared to peers, existence, credibility and aggressiveness of its transition plan.

The outcome of the tool is a dashboard that allows the institution to group companies into "climate laggards", "transitioning companies" and "green leaders". In the future, the institution envisages backtesting these categories for potential risk differentials. For the moment, a deep-dive analysis into oil and gas and utilities companies has been performed and these companies are assessed as having a distinct risk profile due to their environmentally harmful business models. The majority of companies in the electric utilities sector are found to be transitioning companies.

24 The Science Based Targets initiative aims to measure companies' alignment with 1.5° and 2° emissions targets respectively and is an example of a "context-based" indicators.

In this context, there is a need to improve the consistency, reliability and quality of forward-looking data to be disclosed in order to better and consistently gauge counterparties' transition readiness. Such measures would also reduce the likelihood that financial markets misprice transition risk (see chapter 5 – Box 6). The availability and consistency of such transition-related data could help, to a certain extent, assess risk differentials from a more granular (at counterparty level) and forward-looking perspective.

In particular, as regards metrics, there is growing consensus on the need for more forward-looking and context-based[25] metrics as highlighted by the NGFS *Progress Report on Bridging the Data Gaps* to allow for the assessment of companies' alignment with specific climate-related scenarios/targets. In particular, the NGFS underlined that there is still a lack of forward-looking data and metrics such as countries and companies' emission pathways, companies' transition targets (including interim targets) and consistent alignment metrics. In the aforementioned NGFS publication, stakeholders reported the need to understand the point-in-time performance of an exposure against a transition pathway – hence the need for firms to disclose their transition plans – as well as the impact of adaptation and mitigation measures on the evolution of the risks.

Some ongoing international public and private initiatives are contributing to more consistent, comparable, and reliable information disclosed by firms on their transition plan. In its 2021 report, the TCFD provided high-level guidance on considerations around the disclosure of transition plans. The TCFD has identified key characteristics of effective transition plans that are in line with its fundamental principles for effective disclosures[26]. The IFRS Climate Standard Prototype, published in November 2021 also provides for transition plan reporting. Besides, the Glasgow Financial Alliance for Net Zero (GFANZ)[27] is currently working on setting out guidance on financial sector expectations of corporate transition plans. However, such information remains high level and may lack quantitative elements. Therefore, further work should be undertaken on the elaboration of consistent granular quantitative forward-looking metrics to be disclosed by firms. In addition, guidance around the independent assessment of the credibility of such transition plans is necessary.

3.2.3. Noticeable growing use by financial institutions of forward-looking methodologies to assess relative riskiness and quantitative impact of different climate pathways on their portfolios

The Status Report suggested that forward-looking approaches[28] might be a better tool for capturing emerging climate-related and environmental risks given the unprecedented nature of climate-related risks and the flexibility of these approaches to incorporate different scenarios. Findings from the 2021 survey confirms this statement. The inherent limits of backward-looking analysis prevent from tracking correlation between the greenness of the asset and its financial risk (see introduction of chapter 3 and chapter 3.1.). Moreover, the insignificance of risks stemming from climate change and the energy transition in the available historical data could lead to an underestimation of climate-related risks' impacts. Backward-looking quantification based on historical data are not taking into account the anticipated intensification of transition and physical risk based on policy announcements, global commitments and scientific research. On the contrary, forward-looking methodologies appear better suited to the distinct features of climate-related risks and, therefore, represent sound alternatives to explore the relative riskiness of sectors, assets and counterparties.

25 Context-based indicators are based on relative industry benchmarks or absolute benchmarks such as "carbon budgets" that are derived from certain climate goals.

26 Transition plans should be (i) aligned with the organisation's strategy and anchored in quantitative elements, including climate-related metrics and targets; (ii) subject to an effective governance process and articulate specific initiatives and actions the organisation will undertake to effectively execute the transition plan, including regular milestones; (iii) including sufficient information to enable users to assess its credibility; (iv) periodically reviewed and updated and be subject to annual reporting. Further "elements to be considered" by organisations are detailed in the TCFD report.

27 GFANZ is a collaboration between UN Race to Zero, the COP26 Presidency and private financial sector firms. Since its launch in April 2021, GFANZ has grown to represent over 450 financial institutions, from 45 countries, who are responsible for assets of over US$130 trillion. Its work is supported by an expert advisory panel including technical NGOs, academics, and multi-lateral institutions.

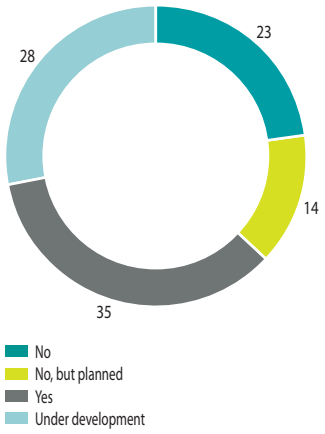
28 Under forward-looking methodologies, risk differentials can be observed through the comparison of the impact of climate-related risks on the PD and LGDs of green vs. non-green assets and/or activities under a climate-related scenario (or several of such scenarios).

Findings from the survey

In the context of the 2021 survey, the NGFS has explored whether financial institutions have further developed forward-looking methodologies, such as stress tests, scenario analysis or sensitivity analysis, to assess default rates on green and other assets and the level of alignment of sectors or customers with different climate change scenarios as these were still in their preliminary stages of development in 2019.

The most recent survey confirms financial institutions' continued engagement in forward-looking analysis, with 63% of respondents already having developed or being in the process of developing forward-looking methodologies[29], such as stress tests, scenario analysis or sensitivity analysis, to assess the potential impact on default rates of green and other assets. This is a substantial increase in the share of financial institutions (up from 22% in the last Status Report[30]). Only 23% do not have nor plan to develop methodologies, while the remaining 14% of respondents are planning their development.[31]

Figure 6 **Percentage of surveyed financial institutions that have developed, are in the process of developing, or plan to develop forward-looking methodologies**



During the last survey, forward-looking analyses were in most cases at an early stage, and in several cases were driven by institutions' involvement in international initiatives such as the UNEP FI pilot and TCFD. For this reason, the recent stock take exercise has focused on an in-depth analysis of the advances made by banks and insurance companies since then.

A key outcome from this survey is the diversity of methods, time horizons, scenarios and assumptions used, as well as the different approaches taken by institutions with regard to the type of assets or the level of disaggregation of sectors included in the analysis. A combination of bottom-up and top-down methodologies is used and forward-looking methodologies are applied at the borrower, sectoral, or portfolio level.

All respondents use, to varying degrees, external scenarios, materials and guidance provided by international organisations and initiatives, regulators and other public authorities or external private providers. In other words, the scenarios used by institutions are based at least partially (as some institutions apply their own supplementary internal assessments) on public research and models. These include: Representative Concentration Pathways (RCPs, for physical risk); Shared Socioeconomic Pathways (SSPs); Integrated Assessment Model (IAMs); data and research from the International Energy Agency (IEA), NGFS, PACTA, UNEP FI/Oliver Wyman, OECD, TCFD; scenarios developed by central banks such as the Bank of England; scenarios and tools from private external providers such as SASB's Materiality Map® and Moody's Environmental Risks Global Heatmap (see chapter 4 for more detail on CRAs' methodologies).

Almost all responding institutions have built or are building in-house models. However, several respondents outsource forward-looking metric calculations to third-party providers, whilst they investigate possible frameworks to fully internalise the process (with two exceptions).

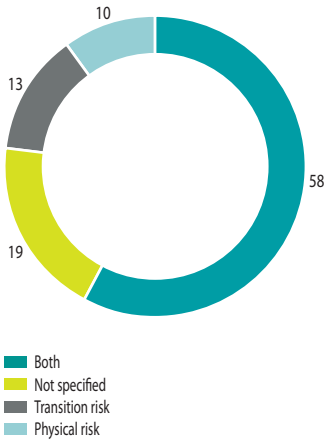
29 Such methodologies include in particular scenario analysis and two specific subsets of it, namely stress testing and sensitivity analysis, as defined the *Progress Report on the NGFS Guide for Supervisors*, referencing the Basel Committee on Banking Supervision's recent *report on climate-related financial risks measurement methodologies*.

30 In particular, considering the increased sample size of the most recent survey, this may imply a substantial increase in the actual number of institutions conducting forward-looking analysis.

31 The vast majority of institutions that do not have in place forward-looking methodologies state they face challenges such as data gaps, lack of internal expertise, resources, IT, etc. Nevertheless, some of these institutions replied that they are already starting to collect ESG rating and ESG-related raw data and will focus their efforts in the near future to apply forward-looking methodologies to estimate environmental and climate-related risks.

The majority of respondents that have developed or are developing forward-looking methodologies consider both physical and transition risks (58%). The most commonly considered transition risks include carbon taxes, carbon price increases of varying degrees, potential changes in housing regulations (energy performance certificate-EPC minimum standards), energy sector restrictions, and a sudden and disruptive transition without adequate technological innovations. The most significant physical risks considered include flooding, subsidence, coastal erosion, rising sea levels, hurricanes and wildfires.

Figure 7 **Type of environmental and climate-related risks considered (Percentage of the total number of surveyed financial institutions that have developed or are developing forward-looking methodologies)**



As expected, the time horizons considered vary substantially across responding institutions. Some institutions consider relatively short time horizons of 3-7 years; however most responding institutions consider longer time horizons, namely 15, 20, 30 or even 60-year time horizons.

In terms of methodologies applied, two key areas were identified from the responses:

- **Modelling mortgage portfolios:** Based on mortgage level data, key aspects considered include modelling events that significantly affect borrowers' ability to repay debt or damage the collateral value, affecting the Probability of Default (PDs) and the Loss Given Default (LGDs) respectively. The effects of rising insurance premia in flood-prone areas and the resulting effect on Loan-to-Value ratios (LTVs), as well as effects of tightening energy efficiency standards are also considered.
- **Modelling corporate portfolios:** Some institutions run stress tests based on classifying corporate portfolios (for example based on emission levels) and modelling carbon (and electricity) prices based on assumptions on policy changes, and how they affect companies' financials. One institution uses its credit rating models to simulate the impact of the financial cost resulting from carbon price increases under various scenarios, whilst one respondent conducted a sensitivity analysis of its agriculture portfolio, looking at the sensitivity of the portfolio to different levels of carbon taxes.

From the analysis of forward-looking methodologies in the banking sector, it can be concluded that banks have started to apply them but generally only to a subset of their overall exposures, namely corporate loan portfolios. Therefore, the picture still seems incomplete. In terms of risk differentials' findings, carbon-intensive industries appear more vulnerable to transition risk, although there may be counterbalancing effects for specific sectors, namely increasing energy demand and a shift in business models towards renewable energies. Lastly, scenario analysis is challenging and the application of tools available on the market to institutions' distinct portfolios requires considerable own efforts. Regarding insurance companies, the most advanced forward-looking analysis relate to their investment portfolio.

Overall, based on scenario analyses and a substantial amount of expert judgment, carbon-intensive sectors (e.g. power generation, automotive, real estate) seem to be more likely affected by climate-related risks, although the quantification analyses are still preliminary. Most responding financial institutions have not achieved conclusive results on the impacts on PDs and LGDs to-date, similar to the outcomes observed under the backward-looking analysis. Only a few institutions have estimated the impact of climate change on PDs and LGDs. Some institutions calculated the monetary impact rather than the impact on PDs and LGDs and some stress that green assets can carry additional risks, such as technology risk.

Case studies

The following case studies (8 and 9) show the most advanced practices found in responses to the survey regarding forward-looking methodologies applied by financial institutions.

Case Study 8

Implementation of bottom-up and top-down climate-related scenario analyses within a bank

One bank has conducted different scenario analyses in two consecutive years and thereby refined its approach to quantitatively measuring climate-related transition risks.

In 2019, the institution performed **a bottom-up scenario analysis covering loan exposures to selected carbon-intensive industries** (oil and gas, electricity, transportation, steel, metals, and mining). **The aim was to estimate the shift in expected losses of corporate loan portfolios in the medium to long term by applying rating downgrades depending on the borrowers' sensitivities to transition risk**. The factors considered were the current business mix, respective ratio of "green" to "brown" activities, CDP scores and financial capacity to implement the transition. PD rating migration was primarily determined by expert judgment, and supplemented by an analysis of borrowers' loss-given-default. The analysis used the International Energy Agency (IEA)'s Sustainable Development Scenario[1].

As a preliminary result, the institution found that carbon-intensive sectors would experience the highest impact on operating margins and financial results and therefore could be subject to downgrading, unless mitigating actions were taken.

One year later, the same institution set up **a top-down scenario analysis**, again on its corporate lending portfolios, but this time applicable to all economic sectors. **The aim of this exercise was to estimate impacts from different scenarios on operating margins across industries relative to their historic performance and thereby to identify sectors most sensitive to each scenario**. Data on sales and operating margins at client and sector levels were mapped with data on actual scopes 1 and 2 emissions[2]. Where client-level data was not available, the institution used sector averages.

The impact on operating cash flows from (1) potential carbon costs, (2) decarbonisation costs, and (3) effects from a potential contraction on the demand side were analysed under different temperature and policy scenarios over a 15-year time horizon. The scenarios were based on the IPCC and the simplified constant decarbonisation rate assumed for the construction of EU Low Carbon Benchmarks[3]. The policy shock applied was a simplified version of the NGFS disorderly transition scenario with a spike in carbon prices in 2025. As NACE level 2 data were used, this exercise was more granular than the previous one; however, the capacity of borrowers to finance the transition was not specifically tested this time.

The analysis showed that transition risks would be higher in a 1.5°C scenario compared to a 3°C scenario due to more stringent carbon pricing. **A stronger effect was estimated for the oil and gas industry, whereas there was no strong effect on the demand side for power utilities given that the energy transition is expected to increase the overall demand for electricity**.

1 *https://www.iea.org/reports/world-energy-model/sustainable-development-scenario*.

2 Due to scope 3 emissions data being largely unavailable, the institution opted for excluding those from the analysis.

3 See Recitals 5, 10, 11, and Articles 2 and 7 of Commission Delegated Regulation (EU) 2020/1818 of 17 July 2020 supplementing Regulation (EU) 2016/1011 of the European Parliament and of the Council as regards minimum standards for EU Climate Transition Benchmarks and EU Paris-aligned Benchmarks.

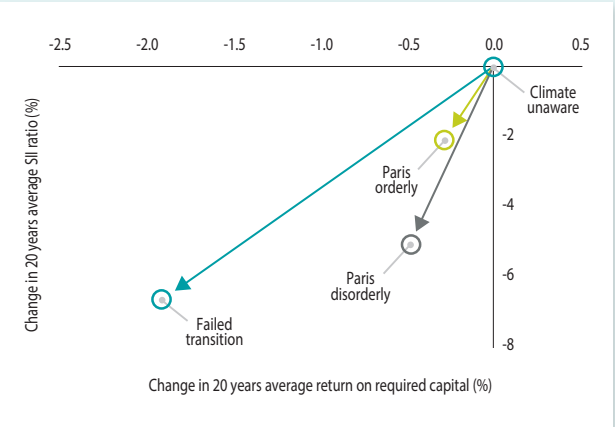
Case Study 9

Implementation of a top-down scenario analysis within an insurance company

An insurance company has been developing additional top-down scenario analyses since 2018 to estimate the impacts of climate change on various metrics based on scientific climate scenarios sets and has incorporated these impacts on the most relevant asset classes (equity, real estate and fixed income) in its annual strategic asset allocation assessment. The most recent version of the top-down analysis takes into account three climate scenario sets that combine both physical and transition effects: (i) Paris-aligned orderly transition; (ii) Paris-aligned disorderly transition; and (iii) failed transition scenario. While the first two scenarios assume a transition towards a low-carbon economy – generally in accordance with Representative Concentration Pathway (RCP) 2.6 – the failed transition scenario implies that no action is taken to limit global warming, resulting in no additional economic growth effect and gradual reductions in asset returns due to the impacts of environmental effects.

In the 2020 Strategic Asset Allocation, the three scenarios mentioned above were used to project the entire balance sheet 20 years forward. Each scenario set consisted of 2,000 scenario outcomes, which fed into a stochastic financial model to generate a probability distribution and estimate the impacts of these climate-adjusted GDP shocks on a range of more than 600 financial and economic variables. Following this approach, the company quantified climate-related risk-aware economic outlooks per pathway, compared to the neutral economic scenario.

Impact of the climate analysis on the three climate scenarios for the average Solvency II ratio and the return on capital



The chart shows the average impact of the three climate change scenarios on the Solvency II ratio and the return on required capital (annualised) over 20 years, relative to the climate unaware outlook. The average impact depends on the scenario:

- Paris-aligned orderly transition: this scenario assumes that the substantial investments in low-carbon technologies and substitution of fossil fuels with clean energy sources to limit climate change are performed in a planned and structured way. This results in higher returns on some assets and in other assets becoming stranded. For the company, the average return on capital is slightly reduced on average over the next 20 years by approximately 0.3% per annum and the average solvency ratio over the next 20 years decreases slightly by approximately 2%.
- Paris-aligned disorderly transition: this scenario includes additional energy transformation shocks due to stranded assets as it assumes investments are not made in a planned and structured way. This results in higher volatility of the returns on assets. For the company, the average return on capital is slightly reduced on average over the next 20 years by approximately 0.5% per annum and the average solvency ratio over the next 20 years is decreased by approximately 5%.
- Failed transition scenario: CO_2 emissions will not be reduced. This results in lower returns on all asset classes due to the negative impact of extreme global warming. For the company, the average return on capital is reduced on average over the next 20 years by approximately 2% per annum and the average solvency ratio over the next 20 years is decreased by approximately 7%.

4. Deep-dive into credit rating agencies' (CRAs) practices with respect to ESG classification and risk differentials analysis

Key takeaways:

- **This chapter discusses the complementary approach taken by CRAs to classify issuers and corporates according to green and non-green factors and to assess risk differentials.** The methodologies developed by CRAs can be of interest to financial institutions[32]: the ESG-related inputs and outputs of the credit rating assessment process, such as ESG scores, sector vulnerability analysis and ESG heatmaps, can be potentially useful external inputs for financial institutions to consider in their credit risk assessment process.

- **To assess risk differentials from ESG factors in credit ratings, the analysis looks for evidence as to the impact that these ESG factors have had on the credit rating of a company or institution.** The focus of our analysis is on the E pillar, even though the CRAs' approach to the other pillars is similar. The ratings framework, including credit watch and ratings outlooks (which may be a leading indicator for potential credit rating changes), during the tenor of a debt instrument can provide useful insights into the assessment of any green credit risk differentials as environmental considerations evolve with changes in policy, technology, customer preferences and scientific knowledge.

- **Integrating ESG factors in credit ratings is fundamentally different from providing ESG ratings. Credit ratings are forward-looking opinions of an issuer's[33] overall creditworthiness.** They are a result of the assessment of a wide range of material credit considerations, such as cash flows, capital structure, liquidity, management, industry risk, competitive position etc., including ESG issues. In integrating ESG factors in credit ratings, credit rating agencies do not measure the issuer/issue/transaction's ESG merits but only consider those ESG factors that they deem relevant and material for their credit risk profile. Where CRAs create individual ESG profiles or sector heatmaps, these may be inputs into the credit rating process rather than ESG performance scores. The same holds true for ESG credit impact or ESG relevance or vulnerability scores, which are outputs of the credit rating process and measure the actual (or forward-looking potential) impact or materiality of ESG factors on credit ratings rather the ESG performance.

- **To identify environmental considerations that can affect sectors and entities, CRAs refer to existing and widely accepted sustainability classification and disclosure standards and frameworks.** CRAs usually measure the relevance and materiality of individually identified ESG factors to the credit rating decision by means of combined top-down or bottom-up qualitative approaches that typically provide a score across a range e.g. 1-5. The materiality of ESG factors to credit risks are usually assessed first at a sector-level and subsequently at individual entities/transactions/programs level within that sector. As the regulatory, market and scientific framework of ESG credit risk factors may change over time, the classification methods designed by CRAs are dynamic by necessity.

- **From the analysis of CRAs' methodologies and research findings, there is no clear direct evidence of a correlation between the credit rating and the ESG credit factors affecting an entity, due to the influence of other material credit considerations.** ESG factors are considered as part of the credit rating but there are limitations to quantify their exact influence. Backtesting exercises by CRAs on the default experience (which is calculated at the issuer/credit counterparty level rather than at the activity level) have not attempted to disaggregate the credit impact of ESG factors. There is also no sufficient historical data to quantify the statistical relationship between climate-related factors and credit ratings, partly exacerbated by the poor quality of disclosures on these factors.

32 While noting the need to improve the robustness, comparability and transparency of these methodologies with respect to the integration of ESG factors in credit ratings. See for instance, European Securities and Markets Authority, "*Text mining ESG disclosures in rating agency press releases*", February 2022.

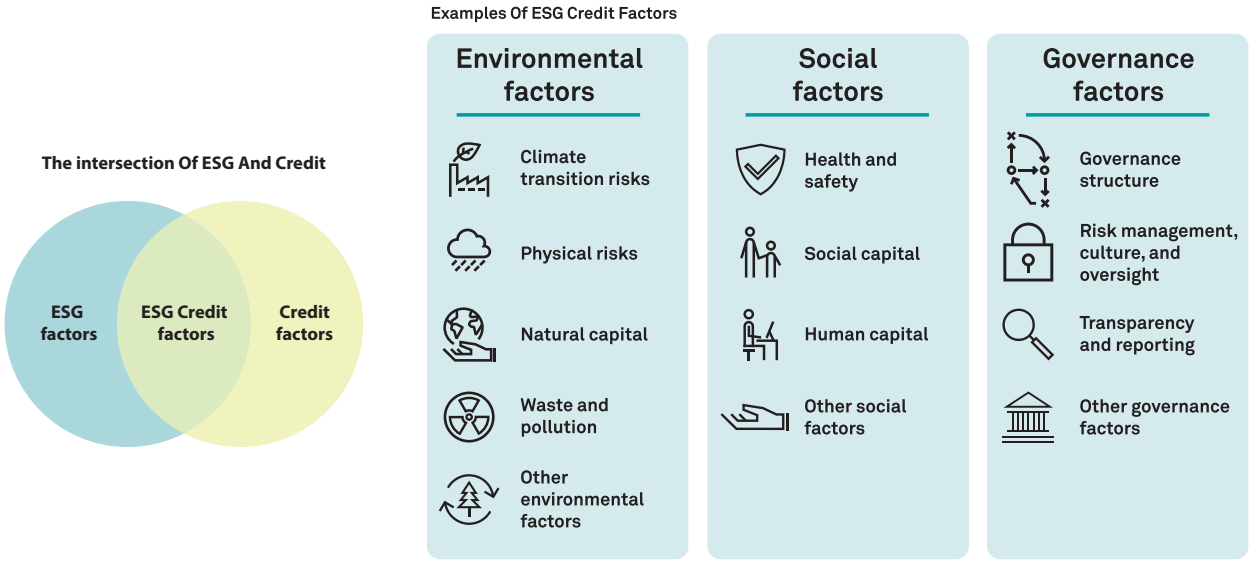
33 The credit rating methodology is applied to the issuer and/or to transactions including project finance transactions and structured finance.

- **When non-climate credit factors are controlled for, some academic studies using historical data find a correlation between credit ratings and both firm-level carbon emissions and emissions reduction targets.** At least, these findings underscore the need for consistent, comparable and reliable corporate disclosures on carbon emissions and forward-looking transition plans through a global baseline of sustainability disclosure standards. This will facilitate more robust assessment and quantification of green risk differentials going forward.

4.1. Credit Rating Agencies' approaches to classifying according to ESG factors

To provide transparency into their assessment of ESG factors, CRAs usually develop an ESG classification system that includes, for each E, S and G category, the list of factors that they consider to be most relevant in assessing the creditworthiness of rated entities or issues (i.e. ESG credit factors), as illustrated by S&P in the diagram below.

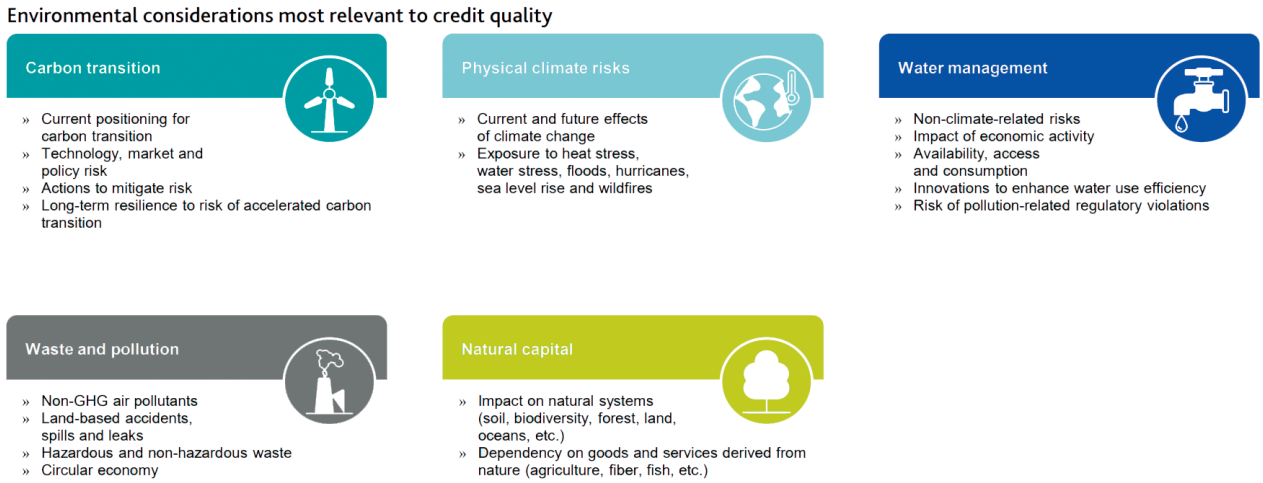
Figure 8 **S&P approach to ESG classification**



To identify environmental considerations that can affect sectors and entities, CRAs refer to existing and widely accepted sustainability classification and disclosure standards and frameworks. These include those developed by the Sustainability Accounting Standards Board (SASB), the Global Reporting Initiative, the Task Force on Climate-related Financial Disclosures, the European Union taxonomy, and market conventions among issuers and investors. Against this backdrop, the environmental classification changes progressively over the time to better align to these standards, which are typically created with multi-stakeholder inputs, via public consultation or working groups and reflect changes in scientific knowledge, customer preferences, stakeholder concerns, policy actions and technology.

Environmental risk factors include: climate transition risk factors (e.g. climate policy, regulations, new technologies, changes in market sentiment); physical risk factors, both event-driven and longer-term shifts in climate patterns (such as hurricanes or chronic heat stress); natural capital factors (e.g. soils, minerals, air, animals, plants); waste and pollution factors (e.g. waste products, water pollutants, and air emissions other than greenhouse gas emissions). The diagram below illustrates how typical environmental risk factors are classified, using Moody's as an example.

Figure 9 **Moody's approach to environmental risk classification**



Source: Moody's Investors Service

CRAs usually measure the relevance and materiality of individually identified ESG factors to the rating decision by means of quantitative scores.

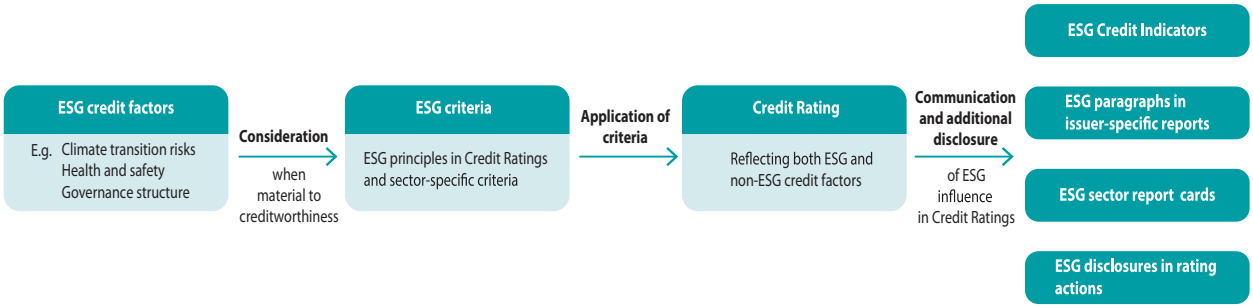
Moody's differentiates the relevance from the credit impact of individual ESG factors by defining two separate scores: the Issuer Profile Score (IPS) that assesses an entity's exposure to the three categories of risks (E, S and G) from a credit perspective and is used as inputs to the credit rating assessment; the Credit Impact Score (CIS) that is an output of the credit rating process and indicates the extent, if any, to which ESG factors impacted the rating of an issuer or transaction. Both the IPS and CIS scores have a 5-level scoring system from 1 for positive through to 5 for very highly negative, with the IPS scores split by E, S and G scores versus the CIS composite score.

Fitch's ESG relevance score (ESG.RS) reflects the credit analyst's observation on how up to 15 ESG factors impacted the credit for an entity, including whether the impact is credit negative or credit positive. The ESG.RS for each ESG issue ranges from 1 with no impact due to irrelevance through to 5 with high impact where one or more ESG elements are "highly relevant, a key rating driver that has a significant impact on the entity, transaction or programme rating on an individual basis". The ESG.RS is similar to Moody's CIS in that it is an output of the credit rating process and reflects the credit analyst's observations on how ESG factors impacted the final credit rating decision. Similarly, S&P will publish ESG Credit Indicators, as shown in the diagram below, to delineate and summarise the impact of ESG factors on the credit rating analysis[34]. The indicators will be determined during the rating reviews by a rating committee. Separate scores will be provided for each of the three ESG categories and will range from 1 for a positive influence to 5 for a highly negative influence. The ESG credit indicator can change if the impact of ESG factors on creditworthiness contributes to a rating action[35].

34 S&P 13 October 2021. ESG Credit Indicator Definitions and Application.

35 Rating action can refer to initial rating, change to a rating, withdrawal or suspension of a rating, creditwatch action and assignment of a new outlook.

Figure 10 **S&P approach to incorporating ESG factors in their credit rating analysis**



Source: S & P Global Ratings.

They can adopt either a top-down or a bottom-up approach.

Sector level analysis is typically the starting point of any top-down approach to the assessment of ESG factors on credit risk. CRAs have developed their own methodologies to identify material sector-specific environmental factors that are common to all or most issuers in the same sector and can therefore act as a ceiling for the issuer's individual score. This approach recognises that the materiality of pre-determined environmental factors on credit risk, as well as mitigating factors can differ significantly between sectors. Fitch publishes ESG.RS dashboards, which highlight ESG relevance and materiality across analytical groups (financial institutions, non-financial corporates, sovereigns, structured finance etc.), split by geographic location and development stage of the market.

Figure 11 **Fitch ESG.RS Dashboard**

FitchRatings

FINANCIAL INSTITUTIONS

Select Sub-Region
or All Sub-Regions
Select Region
or All Regions
Select Percentage Threshold
10%

		BANKS					INSURANCE						MBFI				
		Retail	Trading and Investment	Universal Commercial	Wholesale Commercial	Development Bank	Non-Life	Life	Composite	Reinsurance	US Health	US Title	Business Development Companies	Finance and Leasing Companies	Investment Managers	Securities firms	Financial Market Infrastructue
	Number of Fitch-Rated Issuers In Sector	123	30	620	60	0	77	93	54	17	11	3	14	140	34	25	6
Environmental	GHG Emissions & Air Quality	1	1	1	1	1	1	1	1	1	1		1	3	1	1	
	Energy Management	1	1	1	1	1	1	1	1	1	1		1	3	1	1	
	Water & Wastewater Management	1	1	1	1	1	1	1	1	1	1		1	1	1	1	
	Waste & Hazardous Materials Management, Ecological Impacts	1	1	1	1	1	3	1	2	3	1		1	1	1	1	
	Exposure to Environmental Impacts	2	2	2	2	2	3	2	3	4	2	2	2	3	2	2	2
Social	Human Rights, Community Relations, Acces & Affordability	2	2	2	2	2	1	1	1	1	1		1	2	1	1	
	Customer Welfare – Fair Messaging, Privacy & Data Security	3	3	3	3	3	3	3	3	3	3		2	4	3	3	2
	Labor Relations & Practices	2	2	2	2	2	2	2	2	2	2		2	3	2	2	2
	Employee Wellbeing	1	1	1	1	1	1	1	1	1	1		1	1	1	1	
	Exposure to Social Impacts	2	2	2	2	2	3	3	3	3	3		2	3	3	3	2
Governance	Management Strategy	3	3	3	3	3	3	3	3	3	3		3	3	3	3	
	Governance Structure	3	3	4	3	4	3	3	3	3	3		3	4	3	4	4
	Group Structure	3	3	3	3	3	3	3	3	3	3		3	3	3	4	3
	Financial Transparency	3	3	3	3	3	3	3	3	3	3		3	4	4	3	3

NOTES
Fitch's Financial Institutions ESG Relevance Heatmap shows the highest ESG Relevance Score for a given element that applies to at least a selected percentage of a given sector, region and country. The percentage threshold can be changed using the yellow cell under "Select Percentage Threshold" in the top left corner of the worksheet.

Date are as of 31 December 2021.

Source: Fitch Ratings

No Impact on Credit		Low Impact	Medium Impact	High Impact
1	2	3	4	5
Irrelevant to the entity rating and irrelevant to the sector.	Irrelevant to the entity rating but relevant to the sector.	Minimally relevant to rating, either very low impact or actively managed in a way that results in no impact on the entity rating.	Relevant to rating, not a key rating driver but has an impact on the rating in combination with other factors.	Highly relevant, a key rating driver that has a significant impact on the rating on an individual basis.

At least 10% with Relevance Score '1' or more
At least 10% with Relevance Score '2' or more
At least 10% with Relevance Score '3' or more
At least 10% with Relevance Score '4' or more
At least 10% with Relevance Score '5'

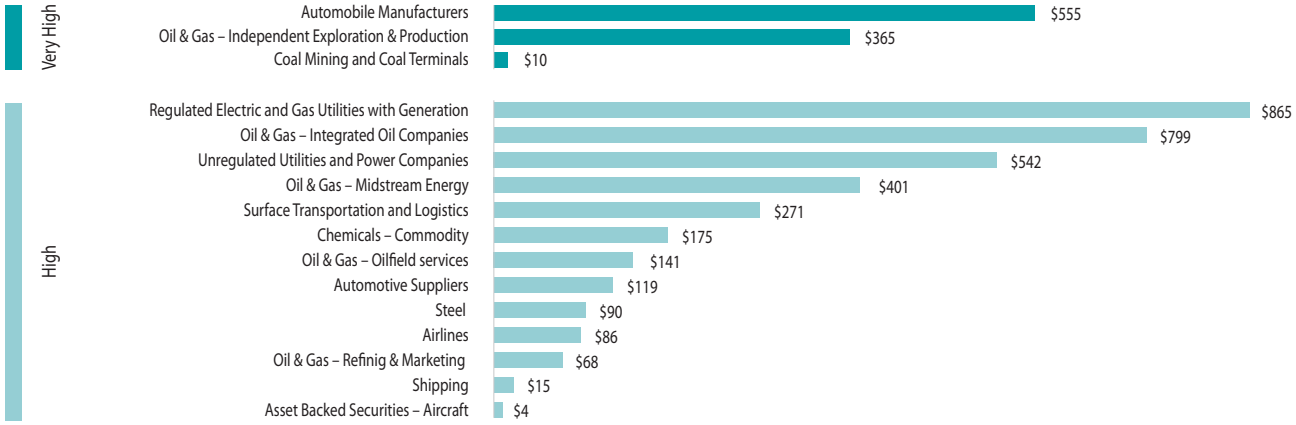
Less than 10 Issuers in Sector

Both Moody's and Fitch produce **heatmaps** providing information on the overall credit materiality of environmental factors at the sectoral level, ranging from low risk to very high risk. For example, the diagram below shows sectors defined by Moody's as having very high or high inherent (unmitigated) exposure to carbon transition risk[36]. Factors are deemed *"material if they result in visible pressure on the credit profiles of a broad set of issuers, either today or in the foreseeable future"* after considering industry-wide mitigants to these risks. The impact of specific sector factors is determined following the same transmission mechanism used for the other known credit factors; for example, brand positioning, profitability, cost structure, financial structure, leverage.

Figure 12 **Moody's mapping of sectors according to their exposure to carbon transition**

16 sectors, $4.5 trillion, have very high or high inherent exposure to carbon transition risk

Sectors with "Very High" or "High" exposure to carbon transition (in US $ billion)



Debt numbers as of June 2020.
Source: ESG – Global: Environmental heat map update: Risks rise for oil & gas, chemicals, metals & mining, 27 May 2021.

S&P Global Ratings corporate issuer ratings incorporate an industry risk assessment, which considers industry-level cyclicality and a prospective analysis of competitive risk and growth. This analysis includes an assessment of long-term trends and uncertainties including relevant ESG-related issues. Given increased industry level environmental and social risks, changes were made in 2021 to the industry risk assessments of 10 of the 38 corporate and infrastructure sectors, which resulted in a number of credit rating changes.[37]

The materiality of the environmental-related factors can broadly differ by geographic area, especially with reference to physical risk exposure. S&P note that *"a higher exposure to the impact of physical risks through extreme weather events depends on, among other things, geographic location, levels of economic development and vulnerability, and the choices and implementation of climate adaptation and mitigation options."*[38] In addition, Moody's has highlighted that "*small scale, geographic concentration, low income levels and deteriorating demographic trends make some issuers much more susceptible to environmental hazards or less likely to be able to implement adaptation strategies".* Whereas Fitch has noted that sovereign issuers' capacity to adapt and mitigate the effects of climate change are linked to various factors that are highly correlated with sovereign ratings[39].

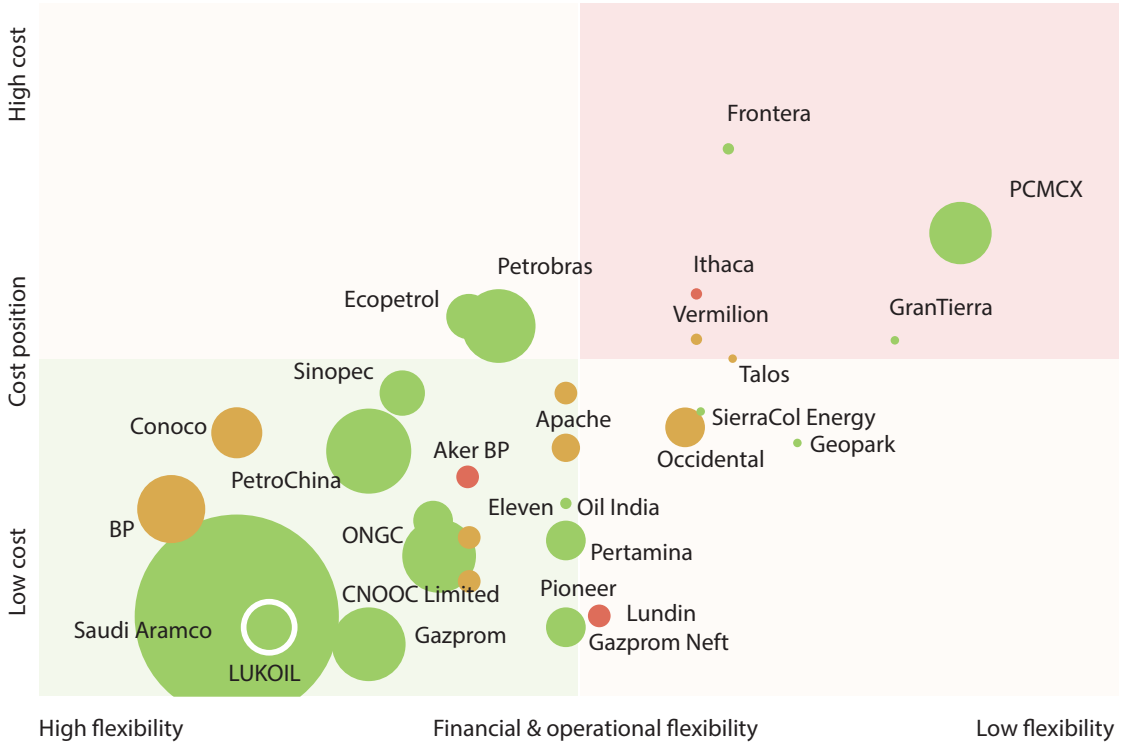
36 Moody's 27 May 2021. ESG – Global: Environmental heat map update: Risks rise for oil and gas, chemicals, metals & mining.
37 S&P Global Ratings ESG-Driven Industry Risk Assessments Update For Corporate And Infrastructure Ratings Jan 27, 2021.
38 S&P, May 17, 2021, Request For Comment: Environmental, Social, And Governance Principles in credit rating.
39 Fitch Ratings, Nov 23, 2021, Climate Change Physical Risks a Growing Threat to Sovereigns.

Lastly, the regulations and policies that drive transitional risks can broadly differ by geography or more specifically by jurisdiction, and by industry sector. For example, Fitch Ratings has developed a four-factor approach to assessing the vulnerability of its rated oil and gas issuers to energy transition trends: this is "*driven by local regulation and asset efficiency, energy-transition strategies, cost positions, and financial and operational flexibility*", signalling that smaller, high cost producers operating in more tightly regulated jurisdictions are more likely to see an impact on ratings in the near term[40].

Figure 13 **Fitch Ratings' Four-Factor Approach**

Application of Four-Factor Approach to Determine Candidates for ESG.RS of '4'

Companies operating in stringent regulatory environments with high cost basics and lower flexibility are more likely to receive an increased score.



Note: Bubble size indicated CBITDAsize. Bublle colour indicates climate related regulatory environment (red: stringent; amber: mid; green: benign), taking into account whether a company's energy transition strategies offset the impact of regulations.
Source: Fitch Ratings.

Bottom-up approaches consider issuer-specific environmental risk factors with top-down factors such as sector-related risks providing useful context. Moody's performs a bottom-up separate Carbon Transition Assessment (CTA)[41] which analyses the most material carbon transition factors for specific sectors and considers forward-looking indicators of risk exposure and response levels (over different time horizons) that are specific to each issuer, as shown in the diagram below. Whilst the CTAs are "*not credit ratings and are not directly linked to credit ratings*", they inform the specific issuer's environmental IPS and benchmark the issuer against its peers.

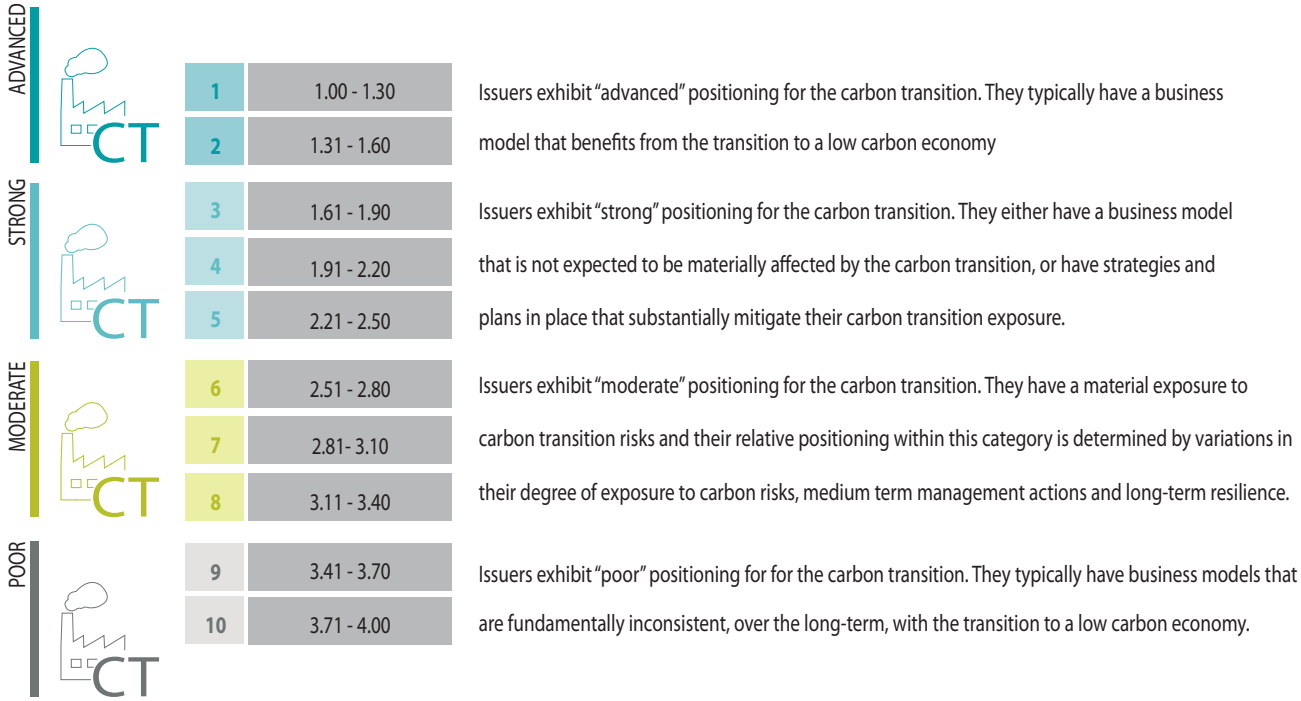
40 Fitch Ratings, Dec 14 2021, ESG Relevance Scores for Global Oil and Gas.

41 Moody's July 1, 2021 Exploration and Production – Global Carbon transition assessment framework for exploration and production companies. CTA framework published for auto manufacturers; refining and marketing companies; electric utilities and power generators; exploration and production (E&P) industry.

Figure 14 **Moody's Carbon Transition Assessment**

Carbon Assessment Scale Definitions

CTAs are grouped into four categories on scale of 1 to 10

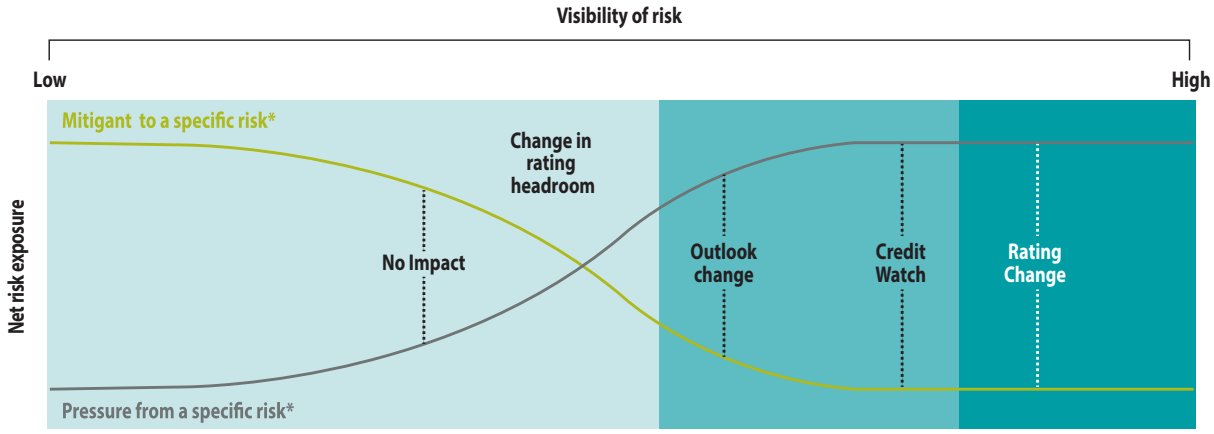


All three CRAs note that that the influence of ESG credit factors may change over time for several drivers as visibility increases. First, globally accepted ESG standards and the related definition of ESG issues are dynamic, because of changes in policy, consumer and investor preferences, stakeholder expectations, scientific knowledge and technological advancement etc. Furthermore, enhanced risk-based disclosures and new public policies such as carbon taxes can increase respectively the visibility and the likelihood of certain environmental issues materialising.

Finally yet importantly, the direction, visibility and relevance of environmental credit factors may change and in a rapid manner, due to changes in the underlying pressure from risks and mitigants, as illustrated in the diagram below. This uncertainty can create difficulties in assessing risk differentials, for example any differential related to policy changes. Differences in how well policies are anticipated by issuers, how much advance notice is provided by policy makers, and how implementation is phased in, affect the ability of issuers to develop mitigating responses.

Figure 15 **S&P's diagram on the potential influence of ESG risks on credit ratings over time**

Visibility of Risks: Impact on Ratings



** Both the pressure from the risk and the mitigants to the risk can change or stay the same over time. This charts shows how the influence of a specific ESG risk –or opportunity – may change over time as visibility increases.*
Source: S&P Global Ratings.

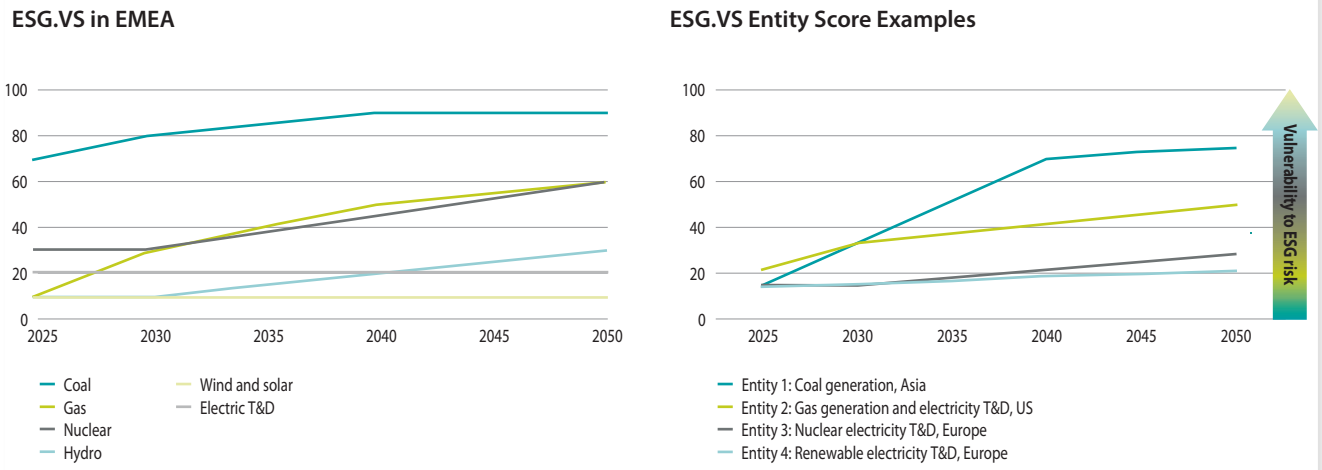
Some CRAs have started using scenario analysis to assess the potential credit impact of ESG factors over a longer time horizon.

- Fitch has analysed how ESG factors can affect the creditworthiness of non-financial corporates and infrastructure entities under a central stress scenario based on a 2050 Paris-aligned scenario[42]. The scenario attempts to provide realistic forecasts of a range of policies in line with below-2°C warming, reflecting technological and just transition constraints. Whilst other scenarios are also considered, Fitch considers regulatory change as the most significant driver of credit impact from ESG factors. In line with the top-down approach described earlier, Fitch's Climate Vulnerability Score (Climate VS, previously ESG.VS) analysis starts with an identification of vulnerabilities at sector and subsector levels as shown in the below left diagram and the progress of risk is differentiated by geography. As shown in the below right diagram, the output is a Climate VS assigned to individual entities and debt instruments which provides milestone assessments of credit risk vulnerability every 5 years from 2025 through to 2050. The subsequent diagram describes the scoring system to reflect cumulative risks up to 2050. Fitch has used a 0-100 scoring framework to assign entity-level Climate VS to 100 global utilities, adjusting the relative vulnerability score based on sectoral and company-specific modifiers[43]:

42 Based on the PRI's Inevitable Policy Response *Forecasted Policy Scenario.*

43 Fitch Ratings, April 12, 2021. Fitch Ratings Assigns ESG Vulnerability Scores to 100 Utilities.

Figure 16 **Fitch Ratings' approach to assessing vulnerability of sectors and entities to ESG factors**



Source: Fitch Ratings.

Sector ESG.VS Numerical Definitions

	Sector ESG.VS				
	10	30	50	70	90
Description of cumulative risks to a point in time (e.g. 2050)	ESG trend is neutral to positive for sector prospects	Fundamental demand drivers are neutral to positive, despite major changes to existing business models or a need for large investment	Solid demand drivers but a need for material changes to products or production methods, which may threaten profitability	Major changes to markets, regulation and business model are likely to disrupt profitability for an extended period	One or more ESG factors have the potential in a credible scenario to pose an existential threat to core business activities

Note: Higher scores denote greater vulnerability. Entities will be assigned scores between 0 and 100, combining sector scores and entity specific modifiers.
Source: Fitch Ratings.

4.2. Credit rating agencies' practices with respect to risk differentials analysis

4.2.1. Based on the analysis of CRAs' methodologies and research findings, credit ratings and ESG factors do not seem to exhibit an evident positive correlation, due to the influence of other material credit considerations

The approach undertaken by CRAs to assess creditworthiness is not designed for, and therefore does not facilitate, the quantification of any correlation between an instrument's or entity's credit risk and its green credentials. Entities with strong creditworthiness do not necessarily have strong environmental or climate characteristics. Conversely, it is possible for entities that are engaged in green activities, such as renewable energy projects, to have a poor credit profile. In addition to ESG credit factors, CRAs include other material credit considerations including cash flows, capital structure, liquidity, management, industry risk, competitive position into their credit assessment. **As such, at a general level, there is no clear evidence of a direct correlation between the credit rating and the ESG score of an entity, although S&P are of the view that ESG credit factors that are material to rating analyses tend to have a negative skew[44].** The credit impact scales developed by the CRAs are skewed towards the negative end with more negative than positive scoring levels. This is due to the CRAs' views that where ESG factors impact a credit rating analysis, the impact is more often negative rather than positive.

44 S&P, 13 October 2021, ESG Credit Indicator Definitions and Application.

Moreover, the additional capital expenditures or costs incurred to enhance ESG performance reduce cash flows available for debt service in the short run and may potentially decrease the ability to meet financial obligations in the event of a negative shock or other downside scenario. In the medium to long term, such investments can effectively enhance the ESG performance of an entity and the resilience of its business model, depending on the investment returns. **As such, depending on the time horizon selected and the investment returns, the relationship between creditworthiness and ESG performance can change.**

It is important to note the structural difference with the approach typically taken by financial institutions with regard to use of proceeds green instruments. **Credit ratings are assessed at the issuer/credit counterparty or issue level rather than the activity level, as are the impacts of the ESG factors on credit considerations.** ESG credit factors are usually assessed first at a sector level and subsequently at individual entity/transaction level within that sector. Even for issue credit ratings, CRAs typically begin with an evaluation of the creditworthiness of the issuer, before considering additional factors such as the ranking in the capital structure of the specific debt issue being rated. In contrast, green bonds' and green loans' green credentials are assessed at the activity level, as these are 'use of proceeds' instruments. These bonds and loans are often defined as green assets, which should not be misconstrued to mean the issuer/borrower is green or greener than peers. The greenness of the activity being financed is not correlated to the greenness of the issuer/borrower, as the latter is not required to be assessed under green bond/loan frameworks currently used in the market. This fundamental distinction is important to consider in assessing the existence of a risk differential for green assets.

Against this background, there is no evident correlation between the greenness of issuers of debt instruments and their credit rating. Backtesting exercises on the default experience have not attempted to disaggregate the credit impact of ESG factors and there is no sufficient historical data to quantify the statistical relationship between climate-related factors and credit ratings. To some extent, it is possible to infer from the deeper assessment by CRAs of climate transition risk as well as the increased focus on physical climate risks (e.g. geographical location and exposure to extreme and chronic weather conditions) that climate factors have an increasing influence on credit ratings. Indeed, climate factors can affect economic and financial actors through various transmission mechanisms and can materialise into traditional sources of risks such as credit risk. Carbon taxes as well as regulations restricting access to markets by higher carbon technologies (e.g. internal combustion engine cars) are clear examples.

4.2.2. Potential impact of ESG factors on credit ratings is not pre-determined or limited, but difficult to disaggregate

CRAs have indicated that there is no formal limitation on the impact that ESG factors can have on the credit rating of an issuer. As such, while ESG factors can theoretically have significant impacts on the creditworthiness of entities, the actual impacts depend on several variables including the materiality of the risk driver, how it is mitigated and the headroom in the credit ratings. In recent evaluations – where CRAs are disclosing more information as to the drivers of credit rating changes - the effect has generally been 1-2 notches. Indeed, one CRA assessed that governance and social issues (which include COVID-19-related factors) were responsible for the majority of the rating actions in the last two years[45]. Among environmental considerations, carbon transition risk was the most frequently cited in rating actions. Further environmental elements considered were waste and pollution issues, human-made accidents and the "circular economy".

However, there are limitations to quantifying the impact of ESG factors on credit ratings to assess the existence of any risk differential. It is difficult to segregate and measure the impact of ESG factors versus other factors due to the limitations highlighted in chapter 4.3., the use of qualitative inputs and the use of different classification methodologies. In many cases it is unclear whether the ESG considerations cited on reports are the main drivers of the credit rating changes,

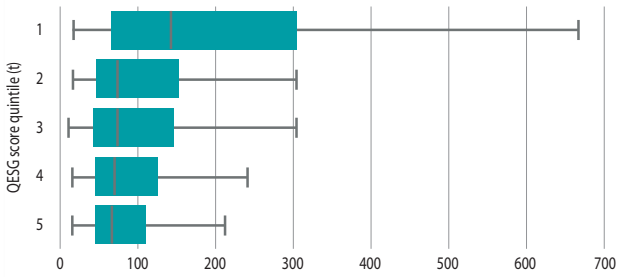
45 One of the surveyed CRAs stated that "*ESG risks were cited as material credit considerations in 85% of private-sector credit rating actions [over 8,700 actions] in 2020, largely driven by COVID-19*". This represented a significant increase from the 2019 level of 32% due to "*the impact of the COVID-19 pandemic, evolving regulatory environments, the growing effects of climate change, and associated policy measures to mitigate these risks*". Moody's noted that there is a significant increase of importance of all three ESG categories in comparison with the previous year in private sector rating actions, with 71% of actions citing "S" factors, 53% citing "G" factors and 13% for "E" factors in 2020 versus 7% "S", 29% "G" and 5% "E" in 2019.

or if they were just one of several factors or an indirect factor that triggered the rating action. For example, S&P differentiates its rating actions between ESG-driven or non-ESG-driven: in the case of COVID-19, S&P states that rating changes on issuers whose products and services "for which demand has significantly dropped" for reasons "tied directly to health and safety concerns" have been tagged as ESG-driven; whereas rating actions tied to the recession triggered by the COVID-19 pandemic were not tagged as ESG-driven[46]. In contrast, Moody's adopts a wider classification for COVID-19-related ESG ratings actions, which explains the increase in ESG citations in private-sector credit rating actions from 32% in 2019 to 85% in 2020[47]. For example, Moody's classifies rating actions driven by (i) corporate risk management measures to mitigate the pandemic-led downturn and (ii) issuers' strategic resilience and ability to adapt to accelerating ESG trends that are amplified by the pandemic, under "governance" credit factors.

A 2021 study demonstrated a correlation between credit default swap (CDS) spreads and ESG performance, i.e. lower CDS spreads are achieved by the companies with better ESG performance and vice versa[48]. The significant relationship was present even after controlling for operating and financial risks as measured by credit ratings. This may be a sign that CDS spreads are more sensitive to ESG factors than credit ratings, reflecting real time market sentiment, and may therefore be useful leading indicators of potential risk differentials.

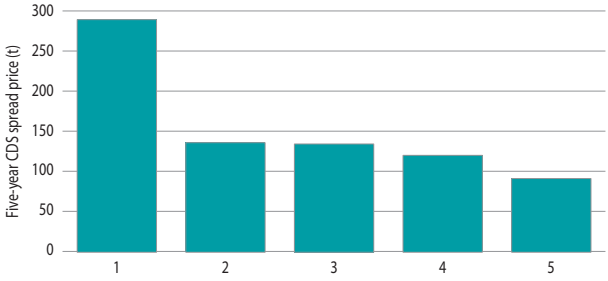
Figure 17 **Federated Hermes Study on the pricing of ESG risks in credit markets**

2012-2020



Source: Federated Hermes, as at 31 December 2020.

2012-2020



Source: Federated Hermes, as at 31 December 2020.

4.2.3. Impact on risk differential due to sector-specific characteristics

There is evidence to show that the risk differential in terms of negative skew can be sector-driven or at least sector-influenced. In the case of environmental risk, Moody's classifies sectors according to their "E" risk to create a heatmap. As shown in the diagram below, Moody's frequently cited environmental considerations for 2020 rating actions in those sectors identified as high or very high in terms of their E risk, i.e. coal mining & terminals, oil and gas – integrated oil companies, steel and mining – metals, excluding coal.

46 S&P, 15 February 2021, The ESG Pulse 2020 Lookback.

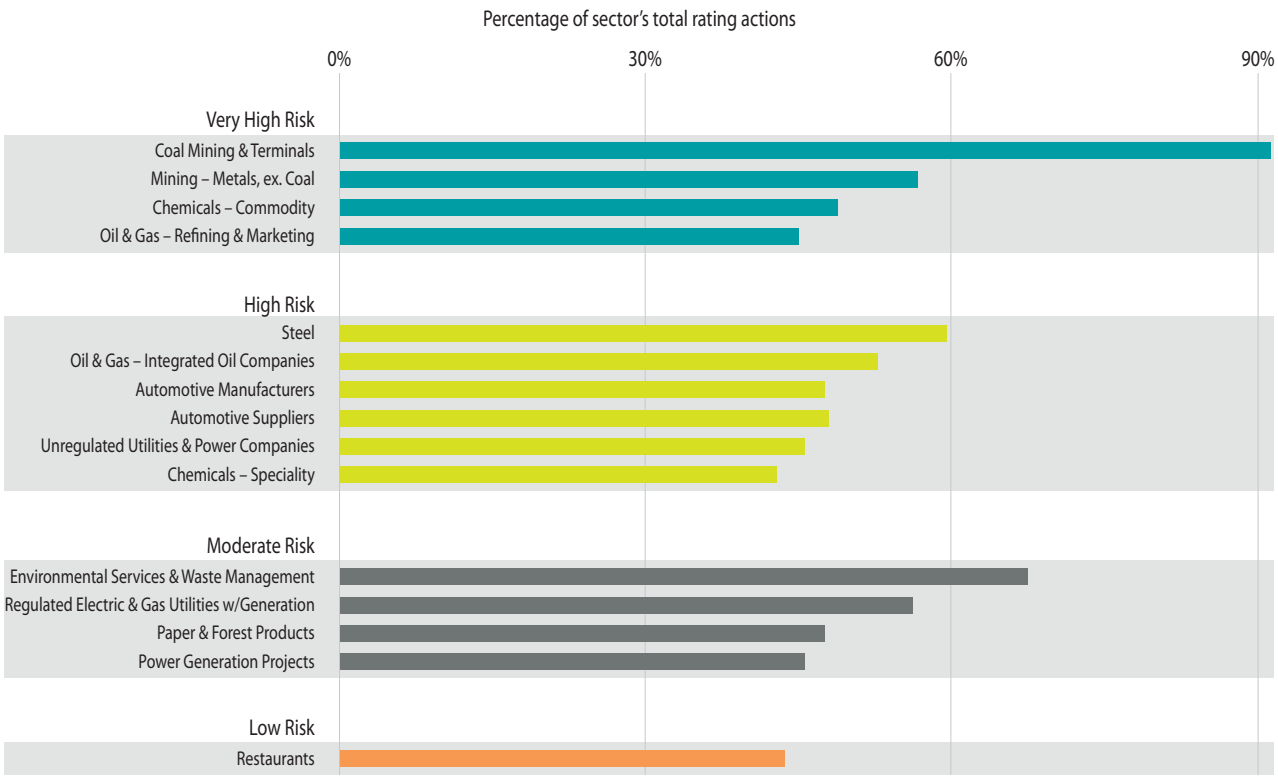
47 Moody's, 28 June 2021, COVID-19 amplified credit-relevant ESG issues in 2020 private-sector rating actions.

48 Federated Hermes, March 2021, Pricing ESG risk in credit markets.

Figure 18 **Moody's diagram about the correlation between rating actions and sectors' vulnerability to environmental risks**

Strong correlation between sectors facing very high or high environmental risk and rating actions in 2020

Sectors in which at least 40% of 2020 rating actions cited environmental considerations



Source: Moody's Investors Sevice.

The sector level approach may be relevant when assessing potential policy changes and their effects on companies' operations. On this matter, Fitch considers that the corporate and infrastructure sectors are more vulnerable to sudden policy changes in ESG-related policies, as compared to physical effects of climate change – where relocation could serve as a mitigation strategy[49]. They find differences between sector and sub-sector vulnerabilities to ESG factors under a two-degree warming scenario, over time and between countries and regions. In their assessment, carbon-intensive sub-sectors are much more vulnerable to evolving policies and regulations than to the physical risks of climate change.

4.2.4. Impact of ESG factors on credit ratings may differ by asset classes

Other studies assess risk differentials considering specific asset classes and, within them, financial products more directly linked with sustainability.

- Moody's analysed the default and recovery rates for project finance bank loans, using data from 1983-2018 and found that sustainable projects, defined as projects with green use of proceeds or social responsibility characteristics projects, have lower default rates[50]. However, the main driver of lower default rates was

49 Fitch wire October 15, 2020, Corporates' ESG Risk Driven by Policy, not Physical Changes.

50 Moody's, 17 August 2020, Default and recovery rates for project finance bank loans,1983-2018: Sustainable project finance bank loans.

not sustainability, but other factors such as differences in contractual arrangements, phase of the credit cycle, jurisdiction, industry and idiosyncratic project risks. Therefore, while there is an observed risk differential for sustainable projects within specific asset classes, where "green projects have a 10-year cumulative default rate (CDR) of 4.9% (Basel) and 2.9% (Moody's), below those of non-green projects with a 10-year CDR of 7.1% (Basel) and 4.7% (Moody's)", it cannot be concluded that the risk differential arose primarily from sustainability factors (see chapter 4.3.2).

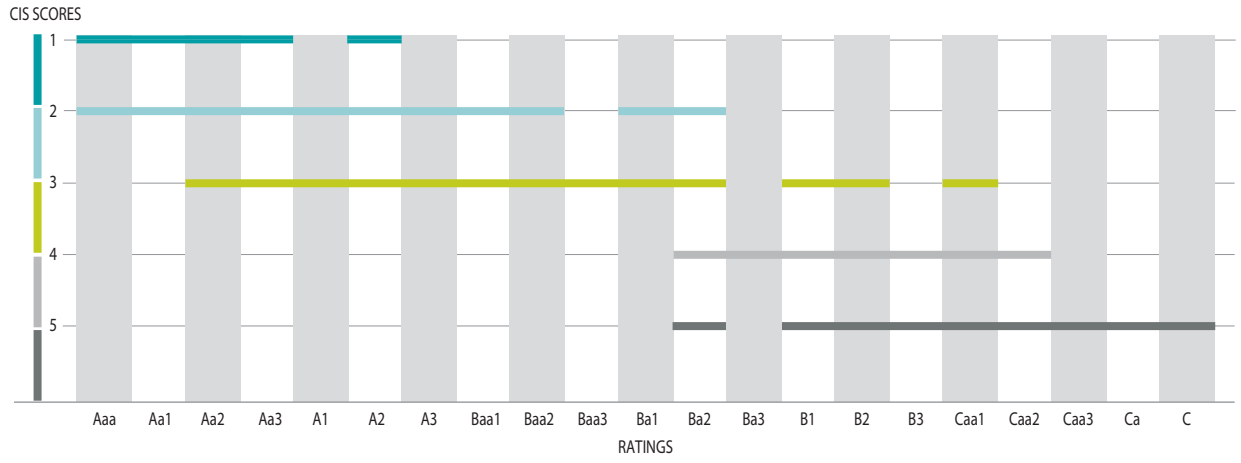
- In another study, S&P noted that 27% and 21% of their 2020 rating actions were related to ESG factors for sovereigns and international public finance entities respectively, whereas the equivalent figure for corporates and rated infrastructure was 16%. The figure for the banking and insurance sectors was much lower at 1%, as COVID-19's impact on these sectors was indirect via rising credit risks and financial market volatility and tagged as non-ESG.

- Amongst Fitch-rated entities and transactions, changes in scores across entities, transactions and asset classes can also be indicative. In 2021, instances where ESG.RS deteriorated (in other words, where scores increased to signify a higher rating impact – typically negative) were nearly equal to the number of cases where scores improved. One commonly cited area of negative impact in 2021 was in US Public Finance, which had the highest concentrations of any asset class around a single ESG issue in 2021 because of extreme cold weather conditions in the Southern United States. Financial institutions were a major source of changes in ESG.RS in 2021[51].

- The table below shows Moody's analysis of the strong 87% correlation between their credit impact scores (the extent to which ESG factors impacted the rating of an issuer or transaction) and sovereign credit ratings[52]. Sovereign credit risk and resilience are influenced by the quality of governance, including the governance of E&S risks, as well as exposure to other E&S risks.

Figure 19 **Moody's analysis on the correlation between credit ratings and credit impact scores[1]**

Correlation between CIS and Credit Ratings



1 Credit Impact Score (CIS) is an output of the rating process that indicates the extent, if any, to which ESG factors affect the rating of an issuer or transaction.
Source: Sovereigns – Global Explanatory: Comment: New scores depict varied and largely credit-negative impact of ESG factors, 18 January 2021.

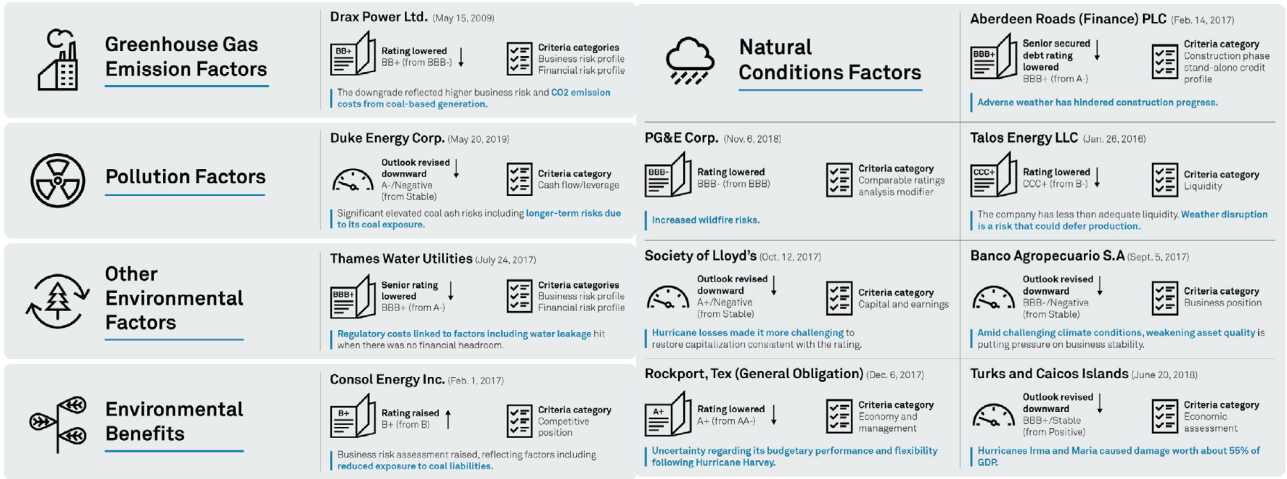
51 Fitch ESG Credit Quarterly – 3Q 2021.

52 Moody's, 18 January 2021, Sovereigns – Global Explanatory Comment: New scores depict varied and largely credit-negative impact of ESG factors.

4.2.5. Impact of particular environmental issues on cash flow at issuer level

Notwithstanding the sector and asset-class approaches to assessing risk differentials, it should be noted it is always the issuer-specific cash flow factors that impact the end result in terms of credit ratings. Therefore, it is useful to identify how a risk differential could be incorporated in the CRAs' evaluation of a particular company, whether or not it belongs to a sector with an inherent risk differential. This differential could be reflected as the number of notches difference in the credit rating of the company as compared to a peer in the same original credit rating group. The differential could stem from a particular entity having reduced access to market financing and insurance, and hence a negative impact on their current and future cash flows. This could be a result of its operations in a particular geography (physical risks), or a certain jurisdiction (environmental regulation or tax-related), or from its specific activities and plans to adopt cleaner technologies (transition risks). S&P have performed a retrospective study that illustrates the effect of environmental credit factors on credit ratings, as shown by the examples below, and a further study could be warranted.

Figure 20 **S&P analysis on the impact of ESG factors on credit rating**



4.3. Challenges faced by CRAs in conducting risk differentials assessment

4.3.1. Data limitations

CRAs report a lack of appropriate and granular firm-level data. Therefore, potential credit data "*must often be inferred or estimated from multiple sources based on reporting that generally is not standardized or consistent*". In fact, financial information (profits and losses, cash flows, exposures) – measured and recorded through accounting standards – failed to correctly represent climate-related risks. In practice, since climate physical and transition risks are often assessed as remote, they are not sufficiently disclosed in terms of climate-related contingent liabilities. Even when data are available, they have to be comprehensible and verifiable. The lack of interoperability of taxonomies and classification systems as well as disclosure standards across different jurisdictions exacerbate the **inadequate level of accuracy** of existing market methodologies, resulting in data whose reliability is difficult to verify. Consequently, the comparability of data across entities even within the same sector is limited.

The other difficulty lies in **the lack of linkage between climate-related and environmental disclosures and financial statements of companies.** There is no consensus practice on the accounting treatment of ESG factors. In 2021, IOSCO's Sustainable Finance Task Force engaged with 60 asset managers across 19 jurisdictions as part of a fact-finding exercise on sustainability disclosures.

These investors lamented the lack of integration of climate- and sustainability-related financial information, noting that companies typically did not quantify ESG impacts on revenues and costs, and did not quantify climate risks via asset impairment or changes to fair valuation, provisions and contingent liabilities.

While CRAs have acquired specialist data providers, information from different jurisdictions may come in different formats, methodologies and levels of detail, thus hindering comparison. In this respect, CRAs have mentioned that they support initiatives to enhance the disclosure of comparable climate and environmental metrics, especially with regard to forward-looking metrics. On this front, a very promising development is the November 3, 2021 establishment of the International Sustainability Standards Board (ISSB) by the IFRS Foundation to develop a global baseline of sustainability disclosure standards, starting with climate, that meet investors' information requirements. The International Organization of Securities Commissions (IOSCO) aims to endorse the ISSB climate standard if its expectations are met. IOSCO assessed the earlier prototype standard and recommended that the IFRS Foundation consider "the inclusion of activity-specific metrics to facilitate comparability and, where appropriate, assessment against widely used taxonomies, including those under development". This development may resolve the issue of lack of comparability of data, and facilitate future risk differential analysis through issuer-level activity metrics such as tonnes CO_2e per kWh electricity generated or per tonne cement produced etc.

4.3.2. Difficulty in isolating and quantifying the specific impact of climate-related and environmental factors on assessment of creditworthiness

ESG factors are only one input into credit risk analysis and may be diluted by other material credit factors – this will make it difficult to identify the risk accruing solely from ESG factors. CRAs have to[53] "incorporate all factors deemed relevant in determining the creditworthiness which shall be supported by statistical, historical experience or evidence". ESG factors are included in the credit rating where there is a clear "transmission channel" on the capacity and willingness to meet the financial obligations as they come due. Environmental factors can be materialised by the additional operating costs (for example, cost of carbon allowance or higher coal prices), investments or claims, which arise as a consequence of the changes in climate policies or regulations, or increasing number and damages stemming from the natural catastrophes.

Besides, the list of ESG factors and their weights (importance) towards the final rating provided vary for each CRA. Even when looking at a single CRA, these factors and their weights are different considering the sector – and often subsector – within which a company operates. Therefore, driving conclusions as to the particular impact of E factors in credit ratings on a general economy wide level is analytically complex.

The difficulties linked to the determination of the statistical dependency are partly derived from the qualitative approach to some ESG factors. Some CRAs are of the opinion that a common ground taxonomy may improve the situation – especially if there is possibility to rank both assets and issuers by alignment to the taxonomy and assess the related environmental risk levels. However, there is still the possibility that overall credit risk depends on too many factors to isolate the ESG impact.

Recent academic studies using empirical approaches to control for non-climate-related credit factors seem to find a correlation between credit ratings and firm-level carbon emissions as well as emissions reductions targets[5455] (see Box 6 in chapter 5). These studies found that higher firm-level carbon emissions tend to be associated with higher credit risk as assessed by CRAs. Commitments to emissions reduction targets were also associated with a half-notch improvement in credit ratings. The ISSB will issue a global baseline of sustainability disclosure standards starting with climate, to complement

53 COMMISSION DELEGATED REGULATION (EU) No 447/2012 of 21 March 2012 supplementing Regulation (EC) No 1060/2009 of the European Parliament and of the Council on credit rating agencies by laying down regulatory technical standards for the assessment of compliance of credit rating methodologies, Article 4, point 1b.

54 Carbone S., Giuzio M., Kapadia S., Krämer J.S., Nyholm K.,and Vozian,K. The low-carbon transition, climate commitments and firm credit risk, ECB Working Paper Series No 2631 / December 2021.

55 M. Safiullah, Md. N. Kabir, and M. D. Miah (2021): "Carbon emissions and credit ratings", Energy Economics, p. 105330.

the IFRS Accounting Standards.[56] The standards will facilitate comprehensive disclosures with connectivity between climate-related and financial reporting. This will ensure that ESG factors that are material to credit risks can be more accurately assessed by CRAs and financial markets, thereby revealing potential risk differentials.

4.3.3. Difficulty in taking into account the specific time horizon of climate-related and environmental risks

The fact that climate-related and environmental risks are more likely to materialise in the medium to long-terms does not prevent credit ratings from taking them into account as long as these risks are deemed material and foreseeable. **Visibility of ESG risks makes for further difficulties, as they have to be financially material to a company's performance and operations in order to affect its credit rating.** Time horizon is a tricky issue, as the credit ratings forecast period may not be aligned with the horizon in which financial impacts of climate change may materialise. Moreover, the longer the time horizon, the less certain is the actual impact. In the longer time horizon, issuers have more opportunities to adapt to the changing situation or to fail it. It will also take time for effects of changes and adaptations made to be visible.

In addition, climate-related factors can manifest with varying severity and volatility depending on time horizons. If a more abrupt global policy response (in line with the NGFS disorderly scenarios or the PRI Inevitable Policy Response) or accelerated physical impacts (NGFS hothouse scenarios, possibly worsened if climate tipping points are breached) manifest, there could arise sudden and unexpected credit rating actions. CRAs have clearly pointed out that more stringent regulation in terms of carbon pricing or restrictions would be material for credit ratings and that in the near future, physical risk could become material in credit ratings for companies operating in areas suffering more severe weather events.

Climate scenarios analysis is a useful tool to deal with the long term uncertainty. To ensure coordination and comparability globally, the NGFS developed in 2020 global scenarios for the financial community[57]. Since then, the NGFS has committed to continuously update its scenarios with the latest climate science and improve them to include more geographic and sectoral granularity, as well as detailed macrofinancial information, effectively making them a public good. **The analysis of the potential longer-term impact of ESG credit factors on creditworthiness through climate scenarios could provide useful insights into how risk differentials may manifest over time.**

56 On 31 March 2022, the ISSB published two Exposure Drafts: one sets out *general sustainability-related disclosure requirements* and the other specifies *climate-related disclosure requirements*.

57 See NGFS, June 2021, *NGFS Climate Scenarios for central banks and supervisors*.

5. Lessons learned from supervisory authorities and regulators' perspectives on risk differentials and a possible way forward

As mentioned in the *NGFS Progress Report on the Guide for Supervisors*, the community of supervisors has been exploring ways to mitigate the impact of climate-related and environmental risks on financial stability and increase the resilience of individual financial institutions, including via the potential adjustment of Pillar 1 capital requirements following a risk-based approach. Such recalibration of existing capital requirements requires accurate quantification of the impact of climate-related and environmental factors on financial risks. In particular, one of the options debated – the introduction of adjustment factors in Pillar 1 capital requirements depending on the "greenness" of an asset – is based on the theory that transition risk might affect "non-green" assets and especially "environmentally harmful" assets more severely. This requires, among other factors, finding robust evidence of the existence of risk differentials between "green" and "non-green" assets. **However, there are only a few examples of such analysis among supervisors at the present stage** (see Case Study 10, Boxes 5 and 6).

Case Study 10

National Bank of Romania's research team – Backward-looking assessment of credit risk difference between non-financial firms taking green loans and those which do not[1]

A research team from the National Bank of Romania conducted an analysis in 2021 on the impact taking green loans has on the credit risk profile of non-financial firms. The data on climate lending, hereinafter referred to as green loans, covers the period 2010–2020 and was collected as a one-off exercise via a questionnaire sent to the largest banks in the Romanian banking system. The green loans definition was mainly based on activities that contribute to the objectives of climate change adaptation and mitigation[2]. This database was combined with loan level data from Credit Register and company level financial statements from the Ministry of Finance.

The study followed several steps in order to assess the difference in credit risk (measured by the Probability of Default) between firms taking green loans and those which do not. First, the probability of a firm to take a green loan was estimated using a logit specification and a bootstrapping procedure. Second, the role of green lending in reducing the PD was analysed, more specifically whether taking a green loan per se has a causal effect on the default risk. Financially sound firms are expected to have better access to green lending and a higher incentive to decarbonise their activities and therefore this bias was controlled by using three average treatment effects models.

The preliminary results indicate that non-financial firms having green loans in their portfolios exhibit a better credit risk profile (PD on average 10 percent lower) than those which do not.

1 This study results from discussions at working level and does not reflect any NBR's official stance at this juncture - see Dragu, F., Neagu, F., Stamate, A., Tatarici, L., Are green loans less risky? Micro-evidence from an European Emerging Economy, in process of publication.

2 Investment in renewable energies, energy efficiency, transport efficiency, green buildings, waste and water usage reduction, financing for energy-efficient technologies and climate change adaptation.

Box 5

European supervisory authorities' ongoing work on risk differentials

As part of its mandate under Capital Requirements Regulation (CRR) Article 501.c, the **European Banking Authority** (EBA) is to assess whether a dedicated prudential treatment of exposures related to assets or activities associated substantially with environmental and/or social activities would be justified[1]. Assessing risk differentials across asset types will be key in following a risk-based prudential approach. The EBA follows a two-step approach in its work on this mandate. In the first instance, a discussion paper will be published in H1 2022. **As part of this first phase of the work, risk-differentials will be explored through existing literature and studies[2]. In light of the current limited availability and maturity of data and methodologies, the EBA foresees the need for continued work in this area.** The second phase will entail the drafting of the final report and will reflect feedback received through the public consultation related to the discussion paper.

In a similar context, based on Article 304a of the proposed revision of the Solvency II Directive, the **European Insurance and Occupational Pensions Authority (EIOPA) will explore by 2023 whether a dedicated prudential treatment of exposures related to assets or activities associated substantially with environmental and social objectives would be justified.** Based on available data and findings, and in exchange with other European Supervisory Authorities, EIOPA will study potential risk differentials in specific asset classes substantially relevant for insurers' investment decisions and conclude on whether a dedicated prudential treatment in Solvency II is justified. Given the expected increase in physical risk exposures due to climate change, **EIOPA will also explore the potential for a dedicated prudential treatment of insurers' underwriting exposures related to climate change adaptation.**

1 *https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02013R0575-20210930&from=EN*

2 The first phase of the work includes a conceptual analysis on how environmental risk drivers are, or could be better, captured in the prudential framework.

Box 6

European Central Bank research team's perspective on the relationship between transition and credit risks

The **European Central Bank (ECB)** recently issued a *working paper*[1] in December 2021[2] including an assessment of how climate-related metrics influence two key measures of firms' credit risk: credit ratings and the market-implied distance-to-default. This working paper shows **data and methodological challenges faced in conducing such analysis.** The research team analysed historical data of 560 European and US listed non-financial firms, covering 10 years of history, i.e. over the 2010-2019. The novel dataset constructed for the analysis combines firm level emissions data over time with climate disclosure practices and forward-looking emissions reductions target retrieved from Urgentem, Refinitiv and the Carbon Disclosure Project. **It uses an empirical approach, which controls for other non-climate-related common factors that could influence credit risk.** The analysis shows that **high emissions and emissions intensities are associated with higher credit risk** at the firm level, for assessments by rating agencies as well as financial markets.

…/…

1 Carbone S., Giuzio M., Kapadia S., Krämer J.S., Nyholm K., and Vozian, K. The low-carbon transition, climate commitments and firm credit risk, ECB Working Paper Series No 2631 / December 2021.

2 A revised version of this paper has been released in the Sveriges Riksbank Working Paper Series. See Carbone S., Giuzio M., Kapadia S., Krämer J.S., Nyholm K.,and Vozian,K. The low-carbon transition, climate commitments and firm credit risk, Sveriges Riksbank Working Paper Series No 409 / January 2022.

According to several academic studies reviewed in the working paper, cash flow volatility and uncertainty in return on assets are potential channels of the causal relationship. A 2021 study finds a negative, economically meaningful impact of firm-level carbon emissions on credit ratings due to higher uncertainty of cash flows in a study of 3,116 firm-year observations in the US over 2004-2018[3]. This relationship is not unique to US firms. Another 2021 study also finds a significant and negative impact of emissions on distance-to-default, a market-based measure of default risk, in a study of 2,785 firms across 42 economies over the same period[4]. These two studies confirms an earlier 2020 study, which shows a positive correlation between market assessment of corporate default risk as measured by the distance to default and carbon emissions and intensity[5].

This study investigates whether the relationship between emissions and credit ratings may be causal. For this purpose, it uses the event of the Paris agreement in December 2015, which was closely followed by the moment when credit rating agencies S&P and Moody's signed the Principles of Responsible Investment committing to account for climate-related risks. After 2015, the credit ratings of firms that were most exposed to transition risk deteriorated relative to otherwise comparable firms, with the effect larger for European than US firms. The difference in the effect may probably reflect **differential climate policy expectations in Europe versus the US**.

At the same time, disclosing emissions and setting a forward-looking emission target has a positive effect on firms' credit risk. The act of disclosing emissions and reducing emissions is associated with better credit ratings, while the relationship between such disclosure and market-implied credit risk is weaker. Transition risk matters for the credit risk of both firms which are already close to default as well as for all other firms, with firms which have **high-yield credit ratings exhibiting stronger sensitivity**. In addition, committing to emissions reductions targets is associated with an improvement in credit rating of about half a notch, as well as more favourable market-based credit assessments. In particular, the paper suggests that **climate-related risks are to some extent priced in financial markets**. However, coupled with the uncertainty around future policy responses, it is possible that rating agencies and market participants materially **underestimate climate-related credit risks[6].**

Yet, external credit ratings can be used to determine risk weights in the Standardised Approach by financial institutions, by comparison with internal credit ratings under the Internal Rating-Based Approach (IRBA). **Therefore, there is a need to improve the granularity and transparency of CRAs' methodologies with respect to the incorporation of ESG factors in their credit rating process. In addition, policies to strengthen and make consistent corporate disclosures on emissions and forward-looking transition plans are important for the appropriate assessment and pricing of these climate-related risks by both CRAs and financial markets.** Overall, consistent, comparable and reliable disclosures will generate more robust data to assess the strength and causality of any association of climate-related factors with credit risk, to determine if there is a quantifiable risk differential. Nevertheless, such caveats should not stop analysis leveraging already available data sources.

3 Safiullah, M., M. N. Kabir, and M. D. Miah (2021): "Carbon emissions and credit ratings", Energy Economics, p. 105330.

4 Kabir, M. N., S. Rahman, M. A. Rahman, and M. Anwar (2021): "Carbon emissions and default risk: International evidence from firm-level data", Economic Modelling, 103, 105617.

5 Capasso, G., G. Gianfrate, and M. Spinelli (2020): "Climate change and credit risk", Journal of Cleaner Production, 266, 121634.

6 Schnabel, I. (2021): "From market neutrality to market efficiency", speech at the ECB DG Research Symposium "Climate change, financial markets and green growth", Frankfurt am Main, 14 June.

Even though the lack of evidence of historical risk differentials – among other factors – could preclude the inclusion of adjustment factors related to climate-related risks in the Pillar 1 microprudential framework, in the near term, **other options could be explored to make sure the regulatory capital framework adequately reflects climate-related risks.** This seems all the more relevant since the introduction of adjustment factors in Pillar 1 capital requirements depending on the "greenness" or "environmental harmfulness" of an asset is still highly debated as shown in the different stances adopted by regulators (see Boxes 7 and 8). Therefore, further focusing on risk differential analysis through a backward-looking approach might not be the way forward to adjust the prudential framework.

Box 7

The Prudential Regulatory Authority's report on the links between climate change and the regulatory capital framework

The 2021 *Climate Change Adaptation Report* of the **Prudential Regulatory Authority** (PRA) explores the links between climate change and the regulatory capital framework, with the aim of accelerating research to inform their future approach. The PRA's first finding is that regulatory capital is not the right tool to address the *causes* of climate change (i.e. reduce greenhouse gas emissions), but can be used to address its *consequences* (i.e. climate-related financial risks).

The PRA performed a gap analysis to assess whether the current capital framework captures climate-related risks, looking across Pillar 1, Pillar 2A, PRA Buffer and Combined Buffer (for banks) and SCR/MCR calculation (for insurers). It found that climate-related financial risks are partially captured by current frameworks, but there are gaps: "Capability gaps", difficulties in estimating risks, included data limitations for modelling risk including the lack of taxonomy and disclosure standards, significant modelling variations between supervised entities, and the lack of clarity of the scale and timing of climate-related risks; "Regime gaps", challenges in capturing risks due to design or use of methodologies, included the one-year time horizon of the majority of capital requirements, the reliance on historical data, and the high-level "bucketing" of assets. Estimating the materiality of these gaps is complex, which raises fundamental questions for the framework, such as the time horizon for capital in light of climate change. More analysis and research is required, including on specific options.

The Annex of the PRA's report, a review of current research, covered literature on the appropriateness of adjustment factors in the capital framework depending on the emission-intensity of an asset with the purpose of facilitating a quicker transition, e.g. supporting or penalising factors that lower risk weights for green assets. The PRA noted that the emission-intensity of assets does not necessarily translate to financial risk, due to the influence of other prudential risks. The PRA therefore noted that in light of evidence today it would not be effective nor consistent with its objectives to attempt to internalise the social and economic cost of emissions through capital frameworks, such as by using these adjustment factors. The potential misalignment between emissions and actual risk could jeopardise the safety and soundness of financial institutions (where capital requirements were lowered) or deprive actively transitioning firms of much needed capital (where capital requirements were increased), thereby constraining the transition.

To address the regime gaps identified in the report, the PRA is undertaking further work. As underlined in the report, implementation and calibration for climate-related risks would ultimately depend on further robust evidence around future risks, including evidence of risk differential on specific exposures (e.g. green housing), which would be supported by clarity on future climate policy.

Over the coming year, the PRA will undertake further analysis and research to explore the materiality of these gaps and the needed enhancements to the regulatory capital frameworks. It will work with other SSBs and academics to inform its approach and will provide an update by end-2022.

Box 8

A Green Discount in the insurance Pillar 1 framework – the Guernsey Financial Services Commission Approach

After *public consultation on its paper issued in October 2020*, the Guernsey Financial Services Commission ("the Commission") altered its Rules to allow life insurers to apply for a green discount on their holdings of green bonds. The Commission considers that green bonds potentially address two problems. The first is the need for life insurers to buy long-term assets and the second is the need to address climate change. Regulators should therefore encourage life insurers to hold green bonds.

According to the Commission, there is as yet no reliable statistical approach to accurately calibrate a discount for a green bond in Pillar 1. Therefore, it has adopted a factor-based approach. In brief, this allows a life insurer to "upgrade" a green bond by an investment notch subject to a) the bond meeting certain green criteria, b) a cap to the maximum capital relief thereby permitted and c) the maintenance of a non-green capital floor.

The "Green Discount" applies when a life insurer is calculating the spread risk component of its Prescribed Capital Requirement. The stresses applied to the corporate bonds an insurer holds are based on each security's credit rating; lower credit ratings require more capital to be held against them.

The Green Discount allows life insurers to treat a green bond, exposed to spread risk, as though it were a credit rating band higher than its actual rating. For example, this would allow a green bond with an actual credit rating band of A to be treated as though it had a credit rating band of AA.

In light of these developments, supervisors may find it preferable to focus their efforts on the forward-looking assessment of climate-related and environmental risks. To that end, supervisors could consider developing, and encouraging financial institutions to further develop, forward-looking tools to assess the impact of different climate change pathways on financial risk parameters as well as the alignment of financial institutions' balance sheet with climate policy scenarios. Some supervisors[58] are already approaching these risks from a forward-looking perspective[59] as shown in the case study dedicated to Banco de España's methodology (Case Study 11) and detailed further in the recent NGFS *Progress Report on the Guide for Supervisors* and *Scenarios in Action: a progress report on global supervisory and central bank climate scenario exercises*.

Going forward, supervisors could seek to further their understanding of the range of potential risk differentials as manifested through stress testing and scenario analysis, how this could be applied at the individual institution's level and how this could eventually factor in climate mitigation and adaption strategies by their counterparties.

This could also imply using forward-looking tools such as scenarios to set capital requirements and buffers. However, in the short term, in light of challenges posed by data gaps and methodological uncertainties, no members as of yet envisage calibrating prudential policies such as capital requirements on the basis of their climate scenario analysis[60].

58 See I. Faiella, L. Lavecchia, V. Michelangeli, A. Mistretta. "A micro-founded climate stress test on the financial vulnerability of Italian households and firms". Occasional Paper 639, Banca d'Italia (2021) and Journal of Policy Modeling (2021); M.A. Aiello, C. Angelico. "Climate change and credit risk: the effect of carbon taxes on Italian banks' business loan default rates". Occasional Paper 688, Banca d'Italia (2022).

59 In that context, the *new vintage of NGFS Scenarios* published in 2021 provides a useful reference framework to assess and manage the future financial and economic risks stemming from climate change by providing a coherent set of transition pathways, climate impact projections, and economic indicators at country-level, over a long time horizon and under varying assumptions.

60 See NGFS, October 2021, *Scenarios in Action*.

Case Study 11

Banco de España – Forward-looking assessment of risk differentials conducted by a supervisor

Banco de España (BdE) has developed a methodological framework to analyse the impact on the banking sector of different scenarios associated with the first steps of potential transition policies in Spain[1]. Specifically, the Forward Looking Exercise on Spanish Banks (FLESB) top-down framework has been enriched to enable the assessment of the sensitivity of the PD of the non-financial firms´ portfolios of Spanish banks to short-term transition risk scenarios. The scenarios have been designed by the BdE[2], and have been estimated starting from an economic situation similar to the steady state, as transition measures would likely be implemented under an economic environment more similar to the one existing before the Covid-19 pandemic. Over this baseline scenario, the effects of different shocks are estimated over three years based on assumptions on the implementation of transition measures towards a low-carbon economy. By using granular loan level data from the Banco de España Credit Register, the exposures of each bank to the non-financial firms are grouped to build portfolios by kind of borrower (corporates, SMEs and sole proprietorships) and its sector according to a similar sectoral breakdown to that provided by the scenarios. This database contains information about the payment status of the borrowers, so credit risk parameters can be estimated by portfolio. In terms of modelling, PDs of each portfolio are projected by using econometric models that capture their historical correlations with the characteristics of the sector they belong to (i.e. variables to account for their profitability, leverage, real value added, among others) and macroeconomic variables.

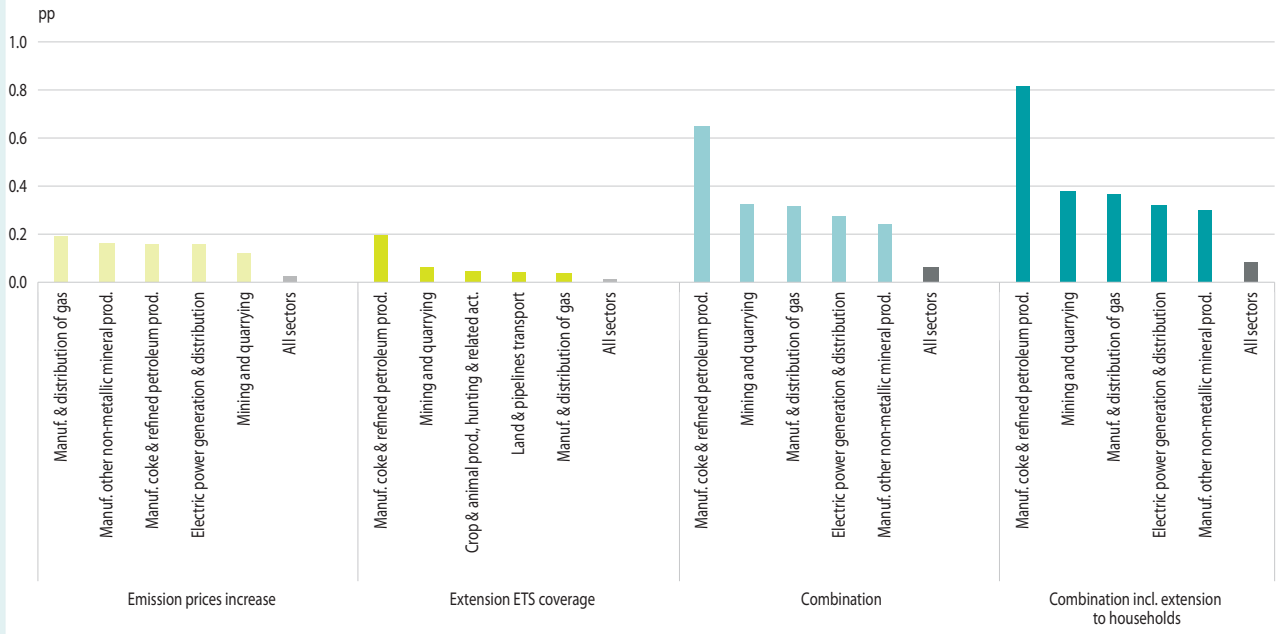
The first results show a moderate but heterogeneous impact on the PDs of the sectors. As expected, the most affected sectors are the ones with higher decreases in their value added in the transition risks scenarios compared to a scenario based on a steady state situation. In the most severe scenario, the average PD over the three-year horizon of the most affected sector (manufacture of coke and refined petroleum products) could be 0.8 pp higher than in the baseline scenario. The differences between the average PD of each transition scenario and the baseline scenario can be seen as risk differentials. The PDs are estimated by bank, sector and size of the company to which each bank is exposed, but the chart shows, for each sector, the weighted average by the number of borrowers.

…/…

1 Further information can be found in the article *An initial analysis of energy transition risks using the Banco de España's FLESB stress-testing framework*. BdE Financial Stability Review, Autumn 2021.

2 The Carbon Tax Sectorial Model (CATS) has been used to generate the scenarios, according to the methodology published by Aguilar, P., González, B., & Hurtado, S. (2021). *The design of macroeconomic scenarios for climate change stress tests*. BdE Financial Stability Review (40), Spring 2021. The model takes into account the energy-type intensity of each kind of sector, interrelations according to the input-output tables of the Spanish Economy and general equilibrium effects in terms of changes in relative prices and sectoral reallocation. The model allows the projection of macroeconomic variables and different paths of value added for more than 50 sectors of the Spanish economy based on their specific transition risks. The scenarios are: (i) emission price increase; (ii) extension of the emissions Trading System (ETS) to all corporate sectors; (iii) combination of the former two shocks; and (iv) combination of both shocks including the extension of the ETS coverage to households. Box 3.1 of the BdE Autumn 2021 FSR summarises technical issues and caveats on the scope of the transition risks scenarios designed for this exercise, which suggest that the effect of the disturbances can be considered as a lower bound.

Figure 21 **Differences in average PDs between the transition risk scenarios and the baseline scenario (average t+1, t+2 and t+3)**



In relation to this forward-looking perspective, considering transition plans appears to be an increasing part of financial institutions' risk management practices.

- **In this respect, supervisors could examine the relevance and extent to which financial institutions should consider counterparties´ transition plans**. In particular, supervisors could consider developing supervisory expectations for financial institutions to consider counterparties' transition plans in their analysis of exposures to and management of transition risks. Such an approach would allow the financial institutions to better understand how climate-related and environmental risks can or will affect their portfolios over the short, medium and long terms, and under the various scenarios. Importantly, this is not intended to call for outright divestment of carbon-intensive sectors; rather, this is to allow the banks to more fully appreciate the differentiated transition paths of different sectors and geographical regions and to proactively manage the risks.
- **Progress on that front will hinge on the issuance of guidance to ensure the consistent and more systematic elaboration of transition plans by non-financial corporates and their adequate disclosures, which might not be under supervisors' mandates.** More broadly, disclosures of relevant metrics by non-financial corporates such as their transition plans and consistent alignment and activity metrics should be encouraged, and could eventually become mandatory, for due diligence and approval of financing where relevant. Overall, there is a need for enhancing linkages between climate-related and environmental disclosures and financial statements and for consensus practice on the accounting treatment of ESG factors.

Appendix I: Overview of the EU regulatory framework with respect to classification and reporting requirements

Since the initial European Commission´s Action plan on sustainable finance in 2018, there have been several legislative proposals in the European Union that are shaping the regulatory requirements for all types of corporates, including financial institutions, with specific requirements regarding the latter.

The *EU Taxonomy*, as defined by Regulation 2020/852 and a series of delegated acts being adopted, is considered a cornerstone of the EU sustainable finance framework. It establishes that an economic activity qualifies as environmentally sustainable where it:

(i) contributes substantially to one or more of six predefined environmental objectives;
(ii) does not significantly harm any of the (other) environmental objectives;
(iii) is carried out in compliance with certain minimum safeguards (e.g. OECD Guidelines on Multinational Enterprises and the UN Guiding Principles on Business and Human Rights); and
(iv) complies with all technical screening criteria that have been specified in delegated legislation (for the moment, those have only been defined for climate mitigation and adaptation).

The EU taxonomy is considered a "green taxonomy", covering not only climate change but also more broadly environmental objectives (at this stage, there is minor coverage of social objectives through compliance with "minimum safeguards"). As for the objective of climate change mitigation, the taxonomy also includes certain transition-friendly activities that are not fully sustainable, but currently lack a technologically and economically feasible low-carbon alternative (referred to as "transitional activities")[1]. The EU is considering extending its scope[2] to activities that are significantly harmful to the environment and social aspects.

The EU Taxonomy Regulation sets mandatory requirements only in terms of disclosure, with the aim of providing transparency on environmental performance. Large financial and non-financial companies that fall under the scope of the Non-Financial Reporting Directive (NFRD) will have to disclose to what extent the activities that they carry out meet the criteria set out in the EU Taxonomy. However, the usability of the EU taxonomy is much broader and it is expected that even financial institutions that are out of scope of the NFRD will start using it on a voluntary basis for other purposes such as a criterion in their due diligence for screening sustainable investment opportunities.

Another important piece of legislation is the *Sustainable Finance Disclosure Regulation* **(SFDR, Regulation 2019/2088**) whose main objective is to complement corporate disclosures by creating a comprehensive reporting framework for financial products and financial entities. The SFDR requirements are linked with those under the EU Taxonomy by including "environmentally sustainable economic activities" as defined by the Taxonomy Regulation in the definition of 'sustainable investments' in the SFDR. It requires the pre-contractual disclosure of some "green products" to include a key performance indicator (KPI) on the taxonomy-alignment of the product itself. The three European Supervisory Authorities (ESAs) – namely, the European Securities and Markets Authority (ESMA), the European Banking authority (EBA) and the European Insurance and Occupational Pensions Authority (EIOPA) – **developed standards to further specify disclosure requirements for "dark green" and "light green" financial products** in terms of substance as well as presentation of

1 That being said, the EU Taxonomy first climate-delegated act covers the economic activities of roughly 40% of listed companies in the EU, in sectors which are responsible for almost 80% of direct greenhouse gas emissions in Europe. Through this coverage, the EU Taxonomy can significantly increase the potential that green financing offers to support transition, in particular for carbon-intensive sectors where change is urgently needed (source: FAQ: What is the EU Taxonomy and how will it work in practice? (europa.eu)).

2 The EU considers extending the Taxonomy due to Article 26.2 of the Taxonomy Regulation and following the Platform on Sustainable Finance's Transition Finance report published in March 2021.

information by means of standardised templates across the financial services sectors. Many surveyed financial institutions may have chosen this classification for practical reasons, as they will have to comply with it by January 2023.

Finally, in July 2021, the European Commission proposed a *Regulation on an EU Green Bond Standard (EUGBS)*. The EUGBS is a voluntary standard to help scale up and raise the environmental ambitions of the green bond market. It will be open to any issuer of green bonds, including companies, public authorities, and issuers located outside of the EU. The key requirements under the proposed framework are: (i) the funds raised by the bond must be fully allocated to projects that are aligned with the EU taxonomy; (ii) there must be full transparency on how the bond proceeds are allocated through detailed reporting requirements; (iii) all EUGB must be checked by an external reviewer to ensure compliance with the Regulation and taxonomy alignment of the funded projects.

Appendix II: Surveyed financial institutions' risk management practices

While the analyses of risk differentials between green and other assets remain at an early stage and continue to evolve, this has not impeded financial institutions' broader efforts to integrate climate-related and environmental risks within their risk management frameworks and, to a certain extent, to "green" their balance sheet. Financial institutions have generally made good progress in developing policies and practices to assess, monitor and mitigate their exposures to these risks.

A significant number of the financial institutions surveyed have taken steps to integrate climate-related and environmental risks into their risk management frameworks (see Case Study 12), **though the extent of implementation varies.** Most respondents consider climate-related and broader environmental risks as drivers of traditional risk categories, and are looking to incorporate them in their credit, market and operational risks frameworks and policies. One third of the respondents have included ESG risks in stress test and risk monitoring. Some banks and insurers have even started to factor these risks in their Internal Capital Adequacy Assessment (ICAAP) and Own Risk and Solvency Assessment (ORSA) processes, respectively, albeit in a more progressive manner, subject to the development of risk quantification methodologies.

Some progress has been made on the integration of climate-related and broader environmental risks into credit rating assignment processes for clients, in particular non-retail clients, though it is noted that these are still based more on qualitative rather than quantitative information. Key challenges in modelling the impact of climate and environmental risks on internal rating based (IRB) model parameters (i.e. PD/LGD/EAD) remain, such as the lack of high quality data and difference in time horizons, with IRB models using a one-year horizon for PD estimates while climate-related and environmental risks need to be assessed from a much longer-term perspective. As such, the majority of respondents have not implemented changes in their IRB systems to factor in climate-related and environmental risks.

The development of key quantitative metrics, indicators and limits remains work in progress for many financial institutions. Many of the respondents are continuing to make use of qualitative assessments through a variety of approaches. These include amongst others, the use of heatmaps and scorecards for clients in vulnerable sectors, application of expert judgement in client risk assessment, and monitoring of adverse news and climate-relevant information. Just over a quarter of respondents have set limits and key performance indicators (KPIs)/risk indicators (KRIs) on climate-related and environmental risks in accordance with their risk appetites through the elaboration of exclusion policies or credit risk limits on sectors highly exposed to transition risks. In addition, some respondents plan to assess the need to set climate-specific stress loss appetite based on stress testing results.

Case Study 12

Integration of environmental risks into an insurance company's risk management processes

A surveyed insurance company has developed a combination of bottom-up and top-down approaches to develop a deep understanding of the potential physical and transition impacts of climate change on its businesses and take necessary actions.

The bottom-up approach aims to develop measures and tools to mitigate identified climate-related risks or capture its opportunities within the relevant segments of the company. The most relevant processes under the bottom-up approach include: portfolio construction, exclusions and engagement within its asset management business, development of new products and services within mortgages and property and casualty (P&C) businesses. In turn, the top-down approach relies on climate scenario analyses, which provide support to the narrative for regulators and reporting, and allow the company to look into the future and better quantify risk factors.

The company is developing tools to use these climate scenarios to support quantitative assessments within other business lines, most notably real estate. In addition, climate-related risks identified are incorporated into the scenario analysis of the Own Risk and Solvency Assessment (ORSA) and quantified by the business actuary teams. Within the asset management business, the company uses this assessment in the annual cycle and has built on this work to develop emission reduction pathways for its investment portfolios.

Overall, the identification and analysis of physical and transition risks are integrated into regular risk management processes of all business lines of the company.

Respondents include climate-related risks mostly in the ICAAP, ILAAP and ORSA frameworks. Banks do so through, for instance, sensitivity analyses with regard to climate-related risks e.g. at a portfolio level for exposures to high carbon sectors on the corporate book or exposure to residential mortgages within the retail portfolios. Some banks are gradually integrating or planning to integrate climate-related and environmental risks into their ICAAP subject to the development of risk quantification and stress-testing methodologies. A few surveyed financial institutions are starting to cover climate-related risks in their risk inventory, with risk assessment for the most relevant liquidity risk drivers and their potential manifestations. Many insurance companies replied that they classify climate change as a material risk and include or plan to include it in the ORSA report.

About half of financial institutions surveyed indicate that metrics to monitor exposures to climate-related and environmental risks are under development. In developing these metrics, most respondents seek a portfolio level approach in order to monitor their exposures to ESG-sensitive sectors. Their monitoring activities mainly analyse the progress towards the institution's sustainability targets as set in its internal strategy, the potential increase in the portfolio's expected credit loss in relation to climate-related or ESG risks; or the evolution of their green/"brown" exposure ratio. Respondents that seek alignment with public policy monitor a temperature indicator or the development of their sustainable assets versus their fossil fuel portfolio as well as ESG-related controversies. Some financial institutions focus on specific exposures such as real estate exposures, for which respondents monitor the extent of exposures towards energy efficient buildings or buildings exposed to physical risks. Monitoring and reporting in line with the TCFD are a frequently adopted solution. Combined approaches tracking exposures at counterparty and portfolio levels are scarce at this juncture.

Many of the financial institutions surveyed are implementing or have plans to implement measures to mitigate climate-related and environmental risks, as their capabilities in risk analysis mature over time. These mitigation measures include integrating sustainability considerations within their financing and investing processes aligned with their risk appetites, implementing exclusion criteria for investments and financing that are not in line with their sustainability objectives, limiting their exposures to higher-risk sectors, and engaging customers and investee companies on their carbon reduction plans and targets. A handful of financial institutions are exploring the incorporation of sustainability risk considerations into their interest pricing and collateral valuation in future. The efficient pricing of these risks into financial products will benefit from more definitive analysis of risk differentials amongst different groups of assets over time (see Case Study 13).

Case Study 13

Risk management measures related to mortgages implemented by surveyed financial institutions

Some institutions have offered more favourable interest rates on real estate loans if the property securing the loan has a good energy efficiency rating. These institutions expect borrowers with high energy efficient homes to have lower energy costs and therefore a better repayment capacity. This practice is set-up to incentivise customers, and is not exclusively risk-based. However, recent research supports a risk differential. In particular, EeDaPP ("Final report on correlation analysis between energy efficiency and risk", EeDaPP August 2020) provides evidence that high energy efficient properties are associated with lower default risk compared to low energy efficient properties due to (1) higher value of the property, (2) lower energy consumption, and (3) lower energy transition risk.

One financial institution has developed a platform where customers can check the options for improving the energy efficiency of a building, the required investment and payback time before taking out a mortgage. A customised advisory report with guarantees about the exact investment and the energy label they can achieve is available. The advisory report is provided by an independent sustainability partner, who can implement the measures and offer assistance with applying for subsidies and arranging the new energy label. The guarantees provided by the sustainability report reduce uncertainty for consumers and mortgage advisers. This platform allows institutional investors to invest directly in the sustainability transition of the housing market. In addition, the platform offers an interest rate discount for energy label B (or higher) for the entire term and quantum of the mortgage.

Another financial institution offers an additional mortgage loan part to the mortgage with an extra low interest rate for up to fifteen years. This mortgage loan part can only be used to finance sustainability-enhancing housing improvements such as insulation solutions, solar panels and heat pumps. This mortgage loan part can easily be added onto a standard mortgage, as it is embedded in a standard procedure where it is offered to every new customer who qualifies. The lower interest rate is justified by the better estimated future Loan to Income ratio (LtI), as energy-efficiency enhancements lower the energy costs of the house and could improve the income to spending ratio. These enhancements typically increase the market value of the house, so the Loan to Value (LtV) deterioration due to housing improvement costs is usually very limited. The LtV also benefits directly from home improvement cost subsidies provided by the government of the country where the institution is mainly active. The risk assessment of these mortgages is done in line with other regular mortgage loans, and factors in the LtV effects supported by market valuations and the Loan to Income impacts from energy savings. Therefore, the company´s assessment reveals that despite their low interest rate, mortgages that encourage sustainable housing offer an attractive excess return, have lower default rates and support organic value creation.

Acknowledgements

This Report is a collaborative effort of the members of the Workstream on supervision and micro-prudential practices of the NGFS. However, it would not have been possible to achieve without ninety-seven major financial institutions around the world and three credit rating agencies putting time, resources and effort into responding to the questionnaires sent out by the workstream. We would like to express our deepest gratitude towards each one of them.

This document was prepared under the auspices of Nadia Lavin (Banco de España), serving as team lead with support from the chair of the Workstream, Gek Choo Goh (Monetary Authority of Singapore), and from the NGFS Secretariat, Marion Aubert, Erlan Le Calvar and Marie Ney-Brochard (Banque de France).

This document relies on the analysis and drafting work of a dedicated team composed of Workstream members. The NGFS is especially thankful to Irene Pablos (Banco de España), Jeanne Stampe (Monetary Authority of Singapore), Yue (Nina) Chen (New York State Department of Financial Services) for assisting the team lead and the NGFS Secretariat in coordinating the work of the team.

Other team members included Barbara Picchi and Stefania Vanacore (Banca d'Italia), Amalia Stamate (Banca Naţională a României), Silvia Merino (Banco de España), María Antonieta Campa Rojas (Banco de México), Kue-Peng Chuah (Bank Negara Malaysia), Olga Wittchen (Deutsche Bundesbank), Niek Verhoeven (De Nederlandsche Bank), Katrin Weissenberg (European Banking Authority), Carlo di Maio (European Central Bank), Jesus Cisneros and Fabian Regele (European Insurance and Occupational Pensions Authority), Christian Elbers (German Federal Financial Supervisory Authority - BaFin), Aleksandra Vartelskaya (Federal Reserve Bank of New York), Rie Asakura (Financial Services Agency, Japan), Aurélien Cosma (International Association of Insurance Supervisors), Agnieszka Groniowska (Komisja Nadzoru Finansowego), Róbert Mátrai (Magyar Nemzeti Bank), Weilun Lim and Nina Wong (Monetary Authority of Singapore), Janka Rajtoková (Národná banka Slovenska).

The NGFS is also grateful to its other members and observers as well as other members of the Secretariat for providing comments and contributing materials to this document.

List of boxes, figures and case studies

BOXES

FIGURES

CASE STUDIES


BANQUE DE FRANCE
EUROSYSTÈME
NGFS
Secretariat