



WHITE PAPER

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“Caging the Green Swan”—A Global Take on ESG Risk Management

Intensifying demands from regulators, investors, and the public for attention to environmental, social, and governance (“ESG”) considerations presents a key challenge for risk managers, particularly those in the financial sector. This *White Paper* provides an overview of how regulators in the European Union, United States, United Kingdom, and Australia are responding in this area, particularly with respect to climate change. It also discusses approaches for integrating ESG risk factors into the risk management frameworks of financial institutions under the Basel framework.

This publication is the first in a series of *White Papers* on regulatory developments relevant to ESG. In our forthcoming publications, we will analyze ESG regulation concerning bond issuers, product manufacturers such as investment banks, distributors of financial instruments such as broker dealers and trading platforms, managers of investment funds, and depositaries or custodians, as well as asset purchase programs and other monetary policy aspects.

TABLE OF CONTENTS

INTRODUCTION	1
CONSIDERATIONS FOR AN ESG STRATEGY	1
RECENT DEVELOPMENTS IN ESG REGULATION	2
International Initiatives	2
Regulatory Developments in the European Union	2
Regulatory Developments in the United States	3
Regulatory Developments in the United Kingdom	3
Regulatory Developments in Australia	3
INTEGRATION OF ESG IN RISK MANAGEMENT	4
Four Steps to Approach Managing Climate Change and Environmental Risks	4
Transformation of Environmental to Financial Risk	4
Credit Risk	6
Access and Structuring of Basel-Compliant Credit Risk Mitigation	6
Modeling Climate-Related Credit Risk	6
Choosing the Relevant Data	7
Time Horizon	7
Data Granularity	7
Appropriate Metrics	7
Transforming Data into PD, LGD, and EAD	7
Liquidity Risk	8
Market Risk	8
Operational, Strategic, and Reputational Risk	9
CONCLUSION	9
LAWYER CONTACTS	9
ENDNOTES	10

“The failure of financial institutions to appropriately and adequately account for and measure [climate] risks threatens the competitiveness of U.S. companies and markets, the life savings and pensions of U.S. workers and families, and the ability of U.S. financial institutions to serve communities.”

— President Joseph R. Biden (May 20, 2021, Executive Order on Climate-Related Financial Risk)

“One of the financial sector’s most essential functions is the distribution of risk—ensuring that it falls across investors and institutions well placed to manage it. Climate change introduces new and increasing types of risk.”

— U.S. Treasury Secretary Janet L. Yellen (Apr. 21, 2021)

INTRODUCTION

Since environmental, social, and governance (“ESG”) has become one of two “megatrends of our time in the financial sector,”¹ regulatory efforts to strengthen financial institutions’ resilience against ecological shocks or “Green Swans”² and to push for green financing, diversity, and other social and ethical goals have increased significantly. As with the other megatrend—the digital revolution—ESG has wide-ranging implications but will affect financial institutions differently based on myriad factors. These include the interests of the stakeholders, the industries in which they invest and lend, and their geographic location. Although there is no denying its significance, there is no consensus around what constitutes ESG and how to measure compliance with ESG goals. Even as it pertains to climate change, regulators in Europe, the United States, and other markets have different mandates, are proceeding on different timetables, and approaches to ESG risk factors by financial institutions are often still at an early stage. This creates both sector-wide risks and competitive opportunities as institutions seek to differentiate themselves with respect to ESG.

Stakeholders’, investors’, and, increasingly, regulators’ expectations as to ESG can impact financial institutions on a number of fronts. First, they create pressure within these financial institutions on a range of issues, including: (i) structuring what are perceived to be green or ethically sound instruments or portfolios; (ii) promoting diversity and inclusion within their institutions; and (iii) pursuing other aspirations of social justice in supply chains, such as combatting child labor, human trafficking, or corruption. Second, they seek to have financial institutions screen their exposure in ways that take ESG risk factors into account, including in some instances by providing

funds, liquid instruments, and meaningful steering processes, to meet regulatory and supervisory expectations of sound risk management and reporting.

CONSIDERATIONS FOR AN ESG STRATEGY

There is no one-size-fits-all approach to ESG. However, several important considerations will underlie successful implementation of ESG principles in the management and operations of a financial institution:

- **Management should review its internal and external communications concerning its commitment to the global ESG mission, so that, wherever possible, they are tied to specific, measurable, and attainable steps and use forward-looking statements to articulate aspirational objectives or goals.**
- **Institutions should establish designated units or personnel and work with outside advisors to monitor relevant ESG developments with a focus on their strategic, operational, and legal implications.** The regulatory landscape and demand for ESG-oriented action is highly dynamic, and financial institutions need to stay current.
- **Institutions should implement their ESG efforts by capitalizing on efficient links between analytical and operational functions to help promote implementation of action items on the ground.** Data collection and ongoing reviews and stress testing in terms of own funds, governance, and risk management will be important in this effort.
- **Institutions proactively should engage, either individually or through trade and industry associations, with regulators as new standards are developed.** Active engagement can help prevent overlapping or conflicting standards,

promote guidelines that are both effective in pursuing their ESG objectives and attainable for the financial sector, and identify instances where regulators may improperly seek to exceed their mandates.

RECENT DEVELOPMENTS IN ESG REGULATION

In some jurisdictions, financial institutions are already subject to mandatory obligations in respect of managing and disclosing ESG risk. Such obligations can arise from existing prudential and securities regulations, accounting standards, and company law. In other jurisdictions, regulators have announced plans to explore new or expanded ESG disclosure regimes. Some international institutions that are grappling with proliferation of varying regulations are taking a pragmatic approach and opting to comply with the mandatory high watermark, as this exists across multiple jurisdictions. Many institutions are adopting voluntary standards, such as the Recommendations of the Task Force on Climate-related Financial Disclosures,³ often motivated by the expectations of investors, shareholders, and customers, and sometimes seeking to take leading positions in adopting voluntary climate standards. This may be driven by the perceived benefit of “leading the pack” or of seeking to future-proof their business model in the face of uncertainty.

International Initiatives

The Network for Greening the Financial System (“NGFS”) is an influential think tank for the financial sector standards on an international level. It currently consists of 89 central banks and financial supervisors, including the U.S. Federal Reserve Bank, the European Central Bank (“ECB”), the People’s Bank of China, the Reserve Bank of Australia, Banco de Mexico, and the South African Reserve Bank, to name a few. Among the significant number of publications since its establishment in 2017—which cover topics such as “Adapting central bank operations to a hotter world” and the “Guide to climate scenario analysis for central banks and supervisors”—is an “Overview of Environmental Risk Analysis (ERA)”, which is accompanied by a voluminous “Occasional Paper on Case Studies of Environment Risk Analysis Methodologies.”⁴ These documents contain references to the tools and methodologies that banks, asset managers, and insurers may use for measuring their exposure to environmental and climate risks and for assessing the financial implications of these risks in

a forward-looking manner, including via stress testing and scenario analysis.

The Basel Committee on Banking Supervision (“BCBS”) established a high-level Task Force on Climate-related Financial Risks (“TFCR”), which is engaging directly with the private sector. In April 2020, it published a survey on current initiatives regarding climate-related financial risks, which summarizes the main results of a stocktake of BCBS members’ initiatives on climate-related financial risks.⁵ Further, the BCBS recently published a report on how climate-related financial risks can arise and impact both banks and the banking system. The report synthesizes much of the existing literature,⁶ illustrates in concise format how physical and transition climate-risk drivers affect banks’ financial risks via micro- and macroeconomic transmission channels, and explores factors determining the likelihood or size of the impact from climate-related risk drivers.

Regulatory Developments in the European Union

In the European Union, there are a large number of regulatory initiatives to strengthen the commitment to ESG standards in the financial sector and the economy as a whole. Key developments on the EU level are:

- The European Green Deal, which sets out the objective of making Europe the first climate-neutral continent by 2050;⁷
- The Commission action plan on financing sustainable growth, which contains key expectations for the financial sector;⁸
- The Non-Financial Reporting Directive, requiring large companies to disclose their business model, policies, outcomes, principal risks, and key performance indicators, including on environmental matters, social and employee aspects, respect for human rights, anti-corruption, and bribery issues;⁹
- The Sustainable Finance Disclosure Regulation, requiring investment funds, insurers, and credit institutions to be transparent about their sustainability risks in their portfolios;¹⁰
- The Taxonomy Regulation, which establishes criteria for determining whether and to what degree an economic activity qualifies as environmentally sustainable;¹¹
- The ECB guide on climate-related and environmental risks, which sets out the ECB’s risk management and disclosure expectations;¹² and

- The European Banking Authority (“EBA”) proposal on how ESG factors and risks could be included in the regulatory and supervisory framework for credit institutions and investment firms.¹³

Regulatory Developments in the United States

In the United States, ESG regulation has not been issued to the same extent as in the European Union, although the Biden administration has increased this focus, particularly relative to climate. In April 2021, President Biden announced a new target in connection with the Paris Agreement for the United States to achieve an approximately 50% reduction in carbon emissions by 2030 from 2005 levels.

U.S. Treasury Secretary Janet Yellen pledged a “whole-of-economy” approach to climate change and identified the Treasury Department’s Financial Stability Oversight Council as having a key role within the U.S. government in analyzing and coordinating various regulators’ perspectives on how to improve disclosures related to climate-related financial risk.¹⁴ At the U.S. Securities and Exchange Commission (“SEC”), recently confirmed Chairman Gary Gensler announced that climate risk and human capital disclosures will be “an early focus” of his tenure. Already, the SEC is engaged in a process to review and update its 2010 guidance on climate-related disclosures, and it has established a Climate and ESG Task Force within its Division of Enforcement. The SEC stated that the initial focus will be on material gaps and misstatements under the existing rules.¹⁵ In the policy debates surrounding revised or new disclosure ESG rules, the definition and application of materiality principles that long have governed U.S. securities law likely will feature prominently.¹⁶

These efforts may draw on a CFTC report titled “Managing Climate Risk in the U.S. Financial System”, which contains an action plan in the shape of several recommendations, extending to the risk management of financial institutions as well.¹⁷ The recommendations include embedding climate-risk monitoring and management into the firms’ governance frameworks by means of clearly defined oversight responsibilities in the board of directors and conducting climate-risk stress testing. For its part, the CFTC recently announced the formation of the Climate Risk Unit, which will focus “on the role of derivatives in understanding, pricing, and addressing climate-related risk and transitioning to a low carbon economy.”¹⁸

Not only federal regulators pay attention to ESG regulation. For example, the New York Department of Financial Services—a significant regulator of insurers, banking, and other financial institutions—is considering Guidance for New York Insurers on Managing the Financial Risks from Climate Change.¹⁹

Finally, on May 20, 2021, the President issued an “Executive Order on Climate-Related Financial Risk” to U.S. government agencies, such as the Federal Reserve, the SEC, and the Comptroller of the Currency (“OCC”), which demands the establishment of a comprehensive, government-wide strategy on measuring, financing, and public–private roles. The strategy will consider: (i) assessing the climate-related financial risk to the financial stability of the government and the U.S. financial system and (ii) facilitating the sharing of climate-related financial risk data and information among executive departments and agencies.²⁰

Regulatory Developments in the United Kingdom

The British Prudential Regulation Authority (“PRA”) appears to be a front-runner in the development of granular regulatory standards regarding ESG in the financial sector. PRA expects firms by the end of 2021 to be able to demonstrate how they have embedded climate risk management within their frameworks to identify, measure, monitor, manage, and report on their exposure to climate risks against a well-defined risk appetite that considers the current balance sheet and business model risk. It issued a report titled “Transition in thinking: The impact of climate change on the UK banking sector”²¹ and a supervisory statement for banks and insurers regarding climate risk across governance arrangements, risk management, stress testing, scenario analysis, and disclosure.²² In addition, it also has recently published a consultation paper on credit risk that addresses the “identification of the nature, severity, and duration of an economic downturn for the purposes of Internal Ratings Based (IRB) models”.²³ With the aim to reduce “unwarranted variability from IRB models,” the latter initiative builds on the EBA’s roadmap for the implementation of the regulatory review of internal models,²⁴ which, *inter alia*, relates to the specification of an economic downturn under Basel’s Pillar 1.

Regulatory Developments in Australia

In April 2021, the Australian Prudential Regulation Authority (“APRA”) issued for consultation a draft Prudential Practice Guide on Climate Change Financial Risks (“CPG 229”). The

draft guidance is aligned with the Financial Stability Board's Task Force on Climate-related Financial Disclosures recommendations and reflects APRA's expectation that management of material climate-related risks will be integrated into existing risk and governance frameworks of regulated entities. The draft guidance is targeted at all regulated entities including financial institutions, superannuation funds, and insurers, and it refers specifically to the role of boards and senior management in managing climate risk. APRA's stated intention is that final guidance will be released before the end of 2021.²⁵

INTEGRATION OF ESG IN RISK MANAGEMENT

Regulatory and supervisory expectations on the integration of ESG factors and strategies in financial institutions have visibly intensified, as the number of recent initiatives and publications show. Financial institutions around the world increasingly are expected to adequately classify and integrate ESG risk factors in their risk-management framework. This includes reducing liability risks where possible to keep the capital requirements resulting from operational risk at an acceptable level. Although disclosure rules are the most advanced to date, ESG risks and regulatory expectations in many jurisdictions go far beyond a reporting exercise and directly concern the available capital for business operations. Monitoring the different expectations of regulators in all relevant jurisdictions and markets, to manage data gaps and resolve difficulties in mapping the transmission of climate risks on institution and systemic level, thus appears almost inevitable.

Four Steps to Approach Managing Climate Change and Environmental Risks

1. **Identification** of the ESG risk factors that may turn into financial risks, such as value impairment from sea-level increases, extreme weather events, declining prices for fossil fuels, devaluation of associated infrastructure, interruption of supply chains, increased emission, and pollution costs.
2. **Measuring the sizes of the exposures** to these risks, e.g., "20% of loan book exposed to interruption of supply chain interruptions."

3. **Estimating probabilities and magnitudes of financial losses** arising from these risks by way of scenario analysis and stress testing.
4. **Applying risk mitigation techniques**, such as own funds efficient insurances or hedging derivatives, internal policies, and processes that discourage exposures to unsustainable assets. For example, this may include reducing carbon-intensive infrastructure exposures to avoid a carbon lock-in resulting in "stranded assets" in the long run.

Transformation of Environmental to Financial Risk

Regulators around the globe, generally, have identified two main sources of climate change and environmental risk: (i) physical risks of direct damage to financial, physical, and natural capital or the supply chain due to environmental changes; and (ii) transition risks of direct or indirect costs of moving to a lower-carbon economy, which may prompt a wide-ranging re-evaluation of business models, strategies, and regulations. While physical risks come from extreme weather events, chronic weather patterns, water stress, resource scarcity, biodiversity loss, or pollution, sources of transition risks are policy and regulation, technology, and market sentiment.

Physical and transition risks are intertwined, i.e., the increase of one risk may reduce the other and vice versa. For example, abrupt climate policy changes to bring about a swift transition to a low-carbon economy may cause significant transition risks and economic disruption now, but they may reduce physical risks going forward. On the other hand, a slow or delayed reaction to climate change risks may avoid transition risks for now but would likely result in higher transition and physical risks in the long run. These risks may have knock-on consequences that are also interlinked, such as:

- Reputation risks, e.g., activism criticizing a history of lending to borrowers with large carbon footprints.
- Regulatory risks in the form of losses arising from new regulations to protect the environment and changes to rules around disclosures and market transparency.
- Direct or indirect liability risks arising from parties who have suffered loss or damage from physical or transition risk factors seeking to recover losses from those they hold responsible. Even if a financial institution is not directly held liable, the risk may materialize in a borrower or counterparty default based on such liability. Significantly, litigation carries

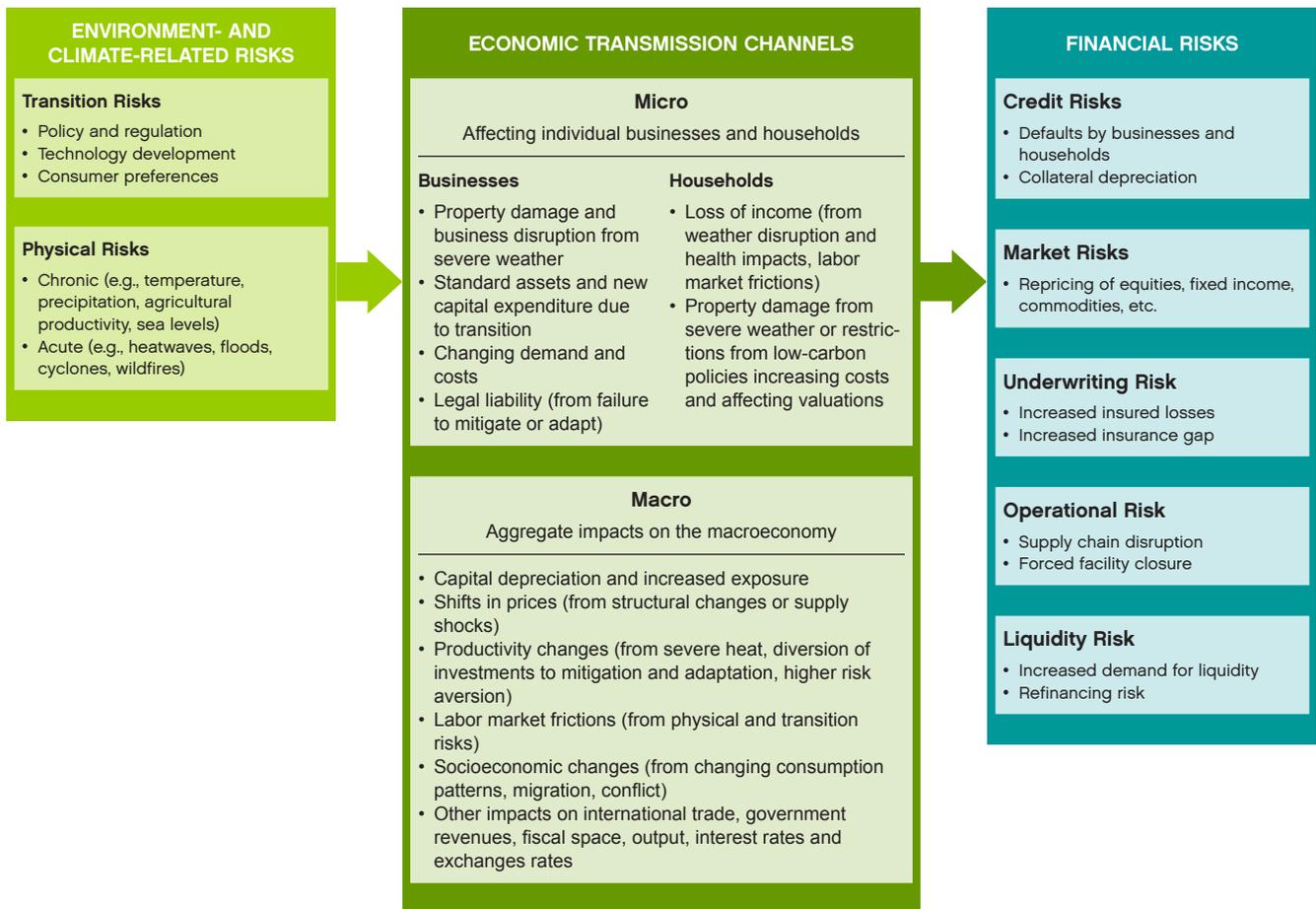
with it not only the risk of liability but also significant reputational and business interruption risks.

- Social risks in the form of costs to social and human capital due to the need to adapt to climate change.

How physical and transition risks are to be integrated into the existing or traditional Basel-oriented categories of banking risk depends largely on the specificities of the relevant contract,

asset, or exposure; the institution's business model and processes; and, most importantly, on the geographical location and industry sector of the customer base and the (underlying) assets. Climate and environmental risks linked to an asset or exposure are rarely subject to only one risk category. Hence, it is necessary for banks to undertake a careful risk mapping and analysis in order to avoid excessive risk provisioning.

Schematic Illustration of the Transmission from Environmental to Financial Risks



Source: NGFS 2020

There are numerous scenarios in which environmental risk transforms into financial risk. The actual risk attached to these scenarios should be quantified in stress tests and the results used to challenge capital and liquidity adequacy assessments. The environmental risk analysis may well result in an increase in an institution's market, credit, liquidity, and other risks, such as operational including legal and underwriting risk, and it will often be necessary to address a certain risk scenario in several of Basel's risk buckets. This concerns the calculation own funds and liquid instruments in both Pillar 1 and 2. It appears that ESG considerations will first enter the Internal Capital and Liquidity Adequacy Processes, or ICAAP/ILAAP, concerning predominantly the economic capital and subsequently be integrated in the more static Pillar 1 assessments. Efficient risk mapping thus requires dynamic "thinking out-of-the-box," combined with a solid awareness of the (latest) scientific research in relevant areas, as failures may cause a severe underestimation of the potential magnitude of a loss from exposure to environmentally unsustainable assets. The reason for such a loss may, for example, be a rising NPL ratio in the coal-fired power companies' sector, combined with reputational damage and even legal action from shareholders and investors if the institution has violated its committed goals and strategy.²⁶

Credit Risk

Currently, most risk-weighted assets in the global banking sector are predominantly subject to credit and counterparty (default) risk. While ESG risk factors may over time increase the relevance in particular of operational risks, quite likely resulting in parallel classifications of exposures, it appears that for the time being, credit risk will be the main focus of regulators and supervisors. The central factor underlying ESG credit risk assessment is that climate change may impact borrowers' and bond issuers' wealth and incomes, hence affecting their ability to meet their repayment obligations.

In view of still-high carbon emissions throughout the world economy,²⁷ the risk that exposures linked to carbon-intensive activities result in unrecoverable, or "stranded," assets will be relevant for many, if not most lenders. Importantly, the PRA emphasized that although the underlying source of risk is the same for all climate-related credit exposures, a distinguishing feature is the "wrong-way risk" for collateralized exposures. Such wrong-way risk refers to loss events that impair both the credit of the borrower, increasing the probability of

default, as well as the value of the collateral underpinning the loan. Further, the PRA stated that it considers managing such 'wrong way risk' exposures is inherently difficult and requires a more sophisticated approach.²⁸ However, the main action points for financial institutions as regards the ESG adaptation of their credit assessments are currently:

- To develop appropriate standards for the assessment of the loan book's medium- to long-term sustainability, and
- To introduce controls, like scenario analysis, assessing the loan book's resilience to transition or physical risks.

This takes a solid definition or understanding of how ESG factors drive credit risk on a portfolio-by-portfolio basis, how ESG risks form part of the decision-making in the loan origination process, and how ESG risk drivers are embedded in the risk appetite and risk strategy of the institution.

Access and Structuring of Basel-Compliant Credit Risk Mitigation.

If ESG factors impact credit risk, institutions may consider credit risk mitigation tools, such as guarantees, derivatives, and collateral, not only to avoid losses but also to obtain capital relief by meeting the relevant Basel requirements for own funds reductions. There are, however, certain challenges, in particular to obtain insurance protection against counterparty defaults, which meet Basel's stringent legal requirements of a credit insurance or hedging derivative to be considered sufficiently robust to be recognized as own funds-efficient credit risk mitigation technique. This will likely turn into a key challenge for lenders in the mid-term. The same applies for banks acquiring securitization exposures that are subject to ESG risk factors. It has already been observed that insurance contracts, primarily written on a one-year basis, are frequently repriced, and there are already examples of private insurance coverage being withdrawn, negatively impacting property values.²⁹ It appears likely, however, that insurance companies will correspond to the increasing demand for protection against ESG risks. Availability and pricing of such insurance will likely turn into a key consideration in structuring lending and securitization transactions.

Modeling Climate-Related Credit Risk. Another key challenge is modeling climate-related credit risk in a way that satisfies regulatory expectations for internal models under Basel's IRB approach.

Choosing the Relevant Data. It appears particularly true for ESG risk factors that the value of historical data is rather limited, which shifts the focus to forward-looking studies that may contain deviating assumptions on how different ESG risk factors may realize globally or in certain areas. Designing a model thus requires a decision on:

- Which climate related hazards are modeled;
- Which regions are studied;
- Which (regional) granularity is applied; and
- Which climate change severity and trajectory is assumed.

Climate scenarios are often vulnerable, as the underlying assumptions are subject to complex interdependencies of ecological and economical parameters. In practical terms, this means that a solid risk management must be able to quickly adapt existing models to new developments relevant to physical and transition risk.

Time Horizon. It also appears necessary to significantly expand the time horizon of credit risk models beyond the current one to three years when it comes to ESG factors. A case has been made for expanding the usual horizon to 15 years and more, based on two reasons: (i) while the financial risks may be realized in full over an extended time horizon, the risks call for action in the short-term to reduce impact in the mid- or long-term; and (ii) because when risks become perceptible, not all lenders will be able to cut their exposures at the same time and in an orderly fashion.³⁰

Data Granularity. Risk managers also need to find the right level of data granularity. To avoid misleading data inputs, it appears necessary to single out data that is directly relevant to the borrower or bond issuer linked to the exposure in question. This will often be a question of granularity and may not be achieved by relying only on sector-specific data, as such approach cannot take account of the fact that there are usually winners and losers within the same sector. Transition risks may affect companies of one industry sector quite differently, as some oil companies, for example, may have a larger exposure to renewable energy than others.

With regard to physical risks, it may not be appropriate to use data regarding the impact of a risk factor on an entire region, as such approach may disregard different degrees of asset resilience within this region. However, fully taking account of

the specificities of every credit risk-weighted asset on an institution's balance sheet might sometimes increase the costs for risk management on asset level beyond bearable limits, provided that the relevant data is available at all.

There is thus a trade-off between the accuracy of the exposure assessment and costs of the underlying data. Where to strike the balance will ultimately depend on the individual case and may change over time, as data becomes more readily available. Most importantly, credit institutions should make sure to be well-prepared for discussions with regulators about the outcome of credit risk models under the applicable Basel requirements, which includes the principles for effective risk data aggregation and risk reporting, known as "BCBS 239."³¹

Appropriate Metrics. A similar challenge appears in view of the appropriate metrics to assess climate-related exposures. The counterparty's location may not always be indicative of an asset's resilience against physical risks. In addition, transition risks can often not be assessed exclusively on the basis of a borrower's carbon footprint, given that some companies may pass on higher costs for carbon emissions reduction to customers and others may not. Extending the scope of carbon emissions to the entire supply chain might also lead to different outcomes. More sophisticated methodologies thus take into account investment plans, green technology patents, qualitative information on a borrower's climate strategy, and price elastics reflecting the ability of a borrower or bond issuer to pass on cost increases.³²

Transforming Data into PD, LGD, and EAD. To determine the risk-weighted exposure amounts for loan and bond portfolios under the IRB approach, the outcome of the data analysis must be translated into the applicable regulatory categories or risk measures, i.e., probability of default ("PD"), loss given default ("LGD"), and earnings at default ("EAD"), in order to calculate or model the expected loss.

Under the frequently used "Merton model," the PD calculation is based on estimates of the likelihood that the value of a counterparty's assets falls below its liabilities, making it incapable of repaying its debts and thus triggering a default. Estimating the impact of climate risks on a counterparty's PD thus starts with an assessment of how climate-change incurred costs, such as changes in cash flows and write-offs, affect its balance sheet. A climate-risk adjusted valuation is

then achieved by subtracting the present net value of all physical and transition costs from the current valuation.

On the basis that climate risk will often be linked to an economic downturn, which is among the relevant categories under the current regulation that must be applied in own LGD estimates,³³ the PRA has proposed requirements for the severity and duration of an economic downturn to ensure that downturn estimates of LGD and EAD adequately reflect scenarios and periods. For example, U.S. corporates experienced an average drop of 2-3% in sales growth following a major natural disaster that affects their suppliers, ultimately causing a 1% drop in corporates' equity value.³⁴ The PRA's key indicators for an economic downturn applicable to all exposures are the GDP, the unemployment rate, and externally provided default rates and credit losses, where available.

For particular exposures, the PRA has proposed further criteria, such as sector- or industry-specific indices for retail exposures to small and medium-sized enterprises and exposures to corporates, and for project finance the prices for the underlying products supplied.³⁵ Overall, the PRA proposals seem to fit well into the usually more general expectations of other regulators and may thus be used when preparing applications for model changes, an exercise that will eventually have to be conducted by all IRBA institutions around the globe.

Liquidity Risk

Not only credit-risk exposures but also a financial institution's ability to liquidate assets or raise liquidity through market operations can be directly exposed to ESG risk factors, with a direct effect on net cash outflows and liquidity buffers. The transformation of physical and transition risks into the calculation of liquidity risk works, to a certain degree, in a manner similar to that of credit risk. Counterparty defaults may directly affect an institution's defaults in the loan book but also its liquidity position and thereby—in a severe scenario—eat up liquidity buffers.

Lending operations in a post-disaster environment are difficult when customers abruptly demand large stacks of liquidity. In such a situation, a bank may have to choose between a rock and a hard place, i.e., between an immediately defaulting customer or (another) high-risk exposure. To what extent liquidity risks materialize will strongly depend on access to

central bank facilities when banks are faced with households and corporates affected by climate disasters and thus need extraordinary bank liquidity to finance recovery—in particular by drawing on agreed credit lines or by withdrawing deposits.

As a result, regulators expect credit institutions to consider a combined idiosyncratic and market stress situation occurring simultaneously with the materialization of environmental risks to link their business strategy with the allocation of liquidity resources. This implies internal pricing process and the specific marginal cost of funding of sustainable refinancing instruments, as well as the liquidity cost or benefit compared to ordinary refinancing instruments.³⁶

Market Risk

Climate risk drivers may also cause adverse changes in market prices, with the potential to substantially increase the market risk of capital markets-oriented financial institutions. The relevant transmission channels for both physical and transition risks are stock, currencies, or commodity prices. Financial institutions are thus faced with the challenge to make sure that climate risk is appropriately priced in by recognizing the possibility of downward price shocks, increased market volatility in traded assets, or a breakdown in correlations between assets, reducing the effectiveness of hedges.

Physical risks may cause stock price volatility, for example where a natural disaster leads to consumption shocks affecting the profitability and hence the share price of stock companies. Similarly, stock options of firms located in the forecasted trajectory or eventual landfall region of a hurricane are likely to experience increased volatility. In particular, property-related securities appear to be vulnerable to natural disasters and other physical risks.

The transition to a low-carbon economy is likely to change market prices, due either to increases in the regulatory cost of carbon-intensive business operations or to changing consumer preferences. Transition risk may realize due to changes in public sector policy, investor sentiment, and technological progress, as they may affect interest rates for loans or lead to an abrupt repricing of financial assets. Market participants could reward borrowers they consider resilient, or even to be in a position to gain from the transition to a low-carbon economy. At the same time, investors could increase the risk

premiums they demand from carbon-intensive borrowers or bond issuers.

While physical risks are less likely to realize within the rather short holding periods of the instruments held in a financial institution's trading book, collateral in the form of financial assets is more likely to be affected, as it often remains for some time with a lending institution. On the other hand, transition risk, such as legal and regulatory changes, have already been detected to affect the prices of municipal bonds, corporate debt, and some equities.³⁷ The regulatory efforts to harmonize disclosures may facilitate market-risk assessments, as it gives market participants the possibility to directly compare the progress of issuers to reduce or mitigate ESG risk factors.

Operational, Strategic, and Reputational Risk

Finally, operational risk, commonly defined as the risk of loss caused by operational failures such as human error, inadequate internal processes, or external events, may also become a key issue in the banking sector, together with reputational and strategic risk in view of climate change and changing investor sentiment. While natural disasters may affect any company's, and thus also a financial institution's, infrastructure, a more specific danger arises from legal and compliance violations that become more likely with the rapidly increasing financial regulation addressing ESG. Strategic and reputational risks may arise as a consequence of materialized operational risks, such as litigation brought forward by

investors challenging the ESG compliance of financial instruments or regulatory fines for not complying with the expectations of supervisors. To avoid reputational or litigation risks arising from controversy in connection with products with an adverse environmental impact, institutions may implement international or local best practices, such as the Climate Bonds Standard³⁸ provided by the Climate Bonds Initiative or forthcoming EU Green Bond Standard,³⁹ which both emphasize the increasingly important role in financing assets needed for the low-carbon transition.

CONCLUSION

The current developments show that ESG already dominates the financial sector. Hence, for the risk management of financial institutions, it is already a game-changer that requires a reassessment of current exposures and strategies with multiple issues regarding contracts, liability, and regulatory compliance. While the intensity of regulatory and public pressure to become green and sustainable may depend on the specific operations, markets, and geographic regions in which the institution is active, these developments are relevant to all major financial institutions. These changes require diligent assessments of legal and regulatory risks and call for careful planning concerning engagement with stakeholders, investors, and regulators.

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ENDNOTES

- 1 Joachim Wuermeling: [A new world ahead. What do sustainable finance and digitalisation mean for supervision?](#) (October 2019); see also Kevin J Stirih: [The Basel Committee's initiatives on climate-related financial risks](#) (October 2020).
- 2 The term was coined in January 2020 in the context of a report by the Bank for International Settlements ("BIS") and Banque de France: [The green swan—Central banking and financial stability in the age of climate change](#) (January 2020), and takes inspiration from the expression "Black Swan," which refers to an unpredictable event that has severe consequences, especially from an economic perspective.
- 3 Recommendations of the Task Force on Climate-related Financial Disclosures (June 2017).
- 4 [Overview of Environmental Risk Analysis by Financial Institutions; Occasional Paper on Case Studies of Environment Risk Analysis Methodologies](#), both issued in September 2020.
- 5 [Climate-related financial risks: a survey on current initiatives](#) (April 2020). The survey suggests that: (i) the majority of members consider it appropriate to address climate-related financial risks within their existing regulatory and supervisory frameworks and have raised risk awareness with banks. Hence, many banks are disclosing information related to climate-related financial risks to some extent; (ii) most members conducted research related to the measurement of climate-related financial risks, while some identified operational challenges in assessing climate-related financial risks such as data availability, methodological challenges, and difficulties in mapping of transmission channels; and (iii) approximately two-fifths of members have issued, or are in process of issuing, more principles-based guidance regarding climate-related financial risks. However, the majority of members have not factored, or have not yet considered factoring, the mitigation of such risks into the prudential capital framework.
- 6 [Climate-related risk drivers and their transmission channels](#) (April 2021).
- 7 Communication from the Commission to the European Parliament, the European Council, The Council, the European Economic and Social Committee, and the Committee of the Regions: [The European Green Deal](#) (December 2019).
- 8 Communication from the Commission to the European Parliament, the European Council, The Council, the European Economic and Social Committee, and the Committee of the Regions: [Action Plan: Financing Sustainable Growth](#) (March 2018).
- 9 [Directive 2014/95/EU](#) of the European Parliament and of the Council of October 22, 2014, amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups.
- 10 [Regulation \(EU\) 2019/2088](#) of the European Parliament and of the Council of November 27, 2019, on sustainability related disclosures in the financial services sector. A [draft Level 2 act](#) that is expected to enter into force in January 2022 proposes disclosure of pre-contractual information and the presentation of the same, disclosure of information on the firm's website, periodic report disclosures, and information relating to the "do not significantly harm" principle.
- 11 [Regulation \(EU\) 2020/852](#) of the European Parliament and of the Council of June 18, 2020, on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088.
- 12 [ECB Guide on climate-related and environmental risks](#)—supervisory expectations relating to risk management and disclosure (November 2020). For the second year, the ECB listed ESG as one of its supervisory priorities for 2021, and it appears quite likely that it will remain a priority in the next years.
- 13 [EBA Discussion paper on management and supervision of ESG risks for credit institutions and investment firms](#) (October 2020). The period for stakeholder feedback ended in February 2021.
- 14 [Secretary of the Treasury Janet L. Yellen's Remarks to the Institute of International Finance](#) (April 2021).
- 15 [SEC Statement: Input Welcomed on Climate Change Disclosures](#) (March 2021).
- 16 [SEC Statement](#) on Proposed Amendments to Modernize and Enhance Financial Disclosures; Other Ongoing Disclosure Modernization Initiatives; Impact of the Coronavirus; Environmental and Climate-Related Disclosure (January 2020).
- 17 [Managing Climate Risk in the U.S. Financial System](#)—Report of the Climate-Related Market Risk Subcommittee, Market Risk Advisory Committee of the U.S. Commodity Futures Trading Commission (October 2020).
- 18 [Press Release Number 8368-21](#)—CFTC Acting Chairman Behnam Establishes New Climate Risk Unit.
- 19 [Superintendent Lacewell announces proposed DFS guidance to New York insurers managing the financial risks from climate change](#), press release (March 2021).
- 20 The White House, [Executive Order on Climate-Related Financial Risk](#) (May 2021).
- 21 [Transition in thinking: The impact of climate change on the UK banking sector](#) (September 2018).
- 22 [Supervisory Statement I SS3/19](#)—Enhancing banks' and insurers' approaches to managing the financial risks from climate change (April 2019).
- 23 [Consultation Paper I CP7/21 Credit Risk](#): The identification of the nature, severity, and duration of an economic downturn for the purposes of Internal Ratings Based (IRB) models (April 2021). The consultation period ends on July 7, 2021.
- 24 [Final Draft Regulatory Technical Standards](#) on the specification of the nature, severity, and duration of an economic downturn in accordance with Articles 181(3)(a) and 182(4)(a) of Regulation (EU) No 575/2013 (November 2018).
- 25 APRA, [Prudential Practice Guide](#)—Draft CPG 229 Climate Change Financial Risks (April 2021)
- 26 HSBC estimates that unburnable fossil fuels may result in a 40% to 60% decrease in the market capitalization of some major resource-focused global companies; see HSBC Global Research, [Oil & carbon revisited—Value at risk from unburnable reserves](#) (January 2013).
- 27 Hannah Ritchie and Max Roser: [CO₂ and Greenhouse Gas Emissions](#) (May 2017, last revised in August 2020).
- 28 [Transition in thinking: The impact of climate change on the UK banking sector](#) (September 2018), p. 22.
- 29 Prudential Regulation Authority (UK): [The impact of climate change on the UK insurance sector—A Climate Change Adaptation Report by the Prudential Regulation Authority](#) (September 2015), p. 43.
- 30 Pierre Monnin: [Integrating Climate Risks into Credit Risk Assessment—Current Methodologies and the Case of Central Banks Corporate Bond Purchases](#) (December 2018), p. 6, with further references.
- 31 Basel Committee on Banking Supervision: [Principles for effective risk data aggregation and risk reporting](#) (January 2013).
- 32 See [Carbon Delta Methodologies Overview](#) (2018); Schrodgers: [Climate change: redefining the risks](#) (September 2017).
- 33 See Article 181(1)(b) and for conversion factors for the quantification of risk parameters to be associated with rating grades or pools, Article 182(1)(b) of the [Capital Requirements Regulation \(CRR\)](#), as currently applicable in both the UK and the EU.
- 34 See BIS: [Climate-related risk drivers and their transmission channels](#) (April 2021), p. 12.
- 35 See [Consultation Paper I CP7/21 Credit risk](#): The identification of the nature, severity, and duration of an economic downturn for the purposes of Internal Ratings Based (IRB) models (April 2021), p. 3 and 4.
- 36 [ECB Guide on climate-related and environmental risks](#)—Supervisory expectations relating to risk management and disclosure (November 2020), p. 44.
- 37 BIS: [Climate-related risk drivers and their transmission channels](#) (April 2021), p. 16.

- 38 [Climate Bonds Standard Version 3.0](#)—International best practice for labelling green investments (December 2019).
- 39 On October 19, 2020, the European Commission published the [Commission Work Programme 2021](#), where the legislative proposal is scheduled to be delivered in the second quarter of 2021. See the [Report on EU Green Bond Standard](#) (June 2019) of the Technical Expert Group on sustainable finance, which was set up by the European Commission.

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